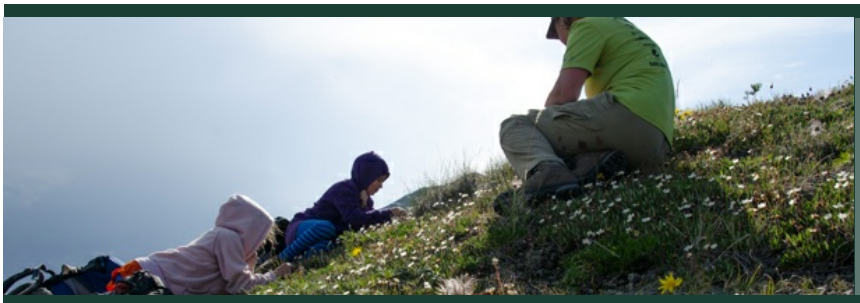

Yukon State of the Environment

Reporting on environmental indicators - 2018

ABOUT THE REPORT

State of the environment reports show the public how Yukon is progressing towards the goal of maintaining and improving the quality of Yukon's natural environment for this and future generations. They reflect on the status of the environment and help guide future decision-making. The reports also:

- provide early warning and analysis of potential environmental problems;
- chart the achievement of the objectives set out in the *Environment Act*; and
- provide baseline information for environmental planning, assessment and regulation.

Under Yukon's *Environment Act* the Minister of Environment must table a full state of the environment report in the legislature every three years, as well as interim reports in the intervening years. This year, the report transitioned to an accessible and interactive online version that will be periodically updated.

The report provides information on climate change, air, water, landscape, and fish and wildlife. Analysis is provided through key indicators used to monitor, describe, and interpret changes in the environment. The report uses the most recent and best information available.

Alaskan Phlox.

Yukon State of the Environment Report 47

(1) The Government of the Yukon shall report publicly on the state of the environment pursuant to this Act.

(2) The purpose of a report under subsection (1) is

(a) to provide early warning and analysis of potential problems for the environment;

(b) to allow the public to monitor progress toward the achievement of the objectives of this Act; and

(c) to provide baseline information for environmental planning, assessment, and regula-tion. S.Y. 2002, c.76, s.47

Requirements for the Yukon State of the Environment Report 48

(1) The Minister shall prepare and submit to the Legislative Assembly a Yukon State of the Environment Report within three years of the date this section comes into force and there-after within three years of the date of the previous report.

5(2) The Yukon State of the Environment Report shall

(a) present baseline information on the environment;

(b) incorporate the traditional knowledge of Yukon First Nation members as it relates to the environment;

(c) establish indicators of impairment of or improvement to the environment and identify and present analyses of trends or changes in the indicators; and

(d) identify emerging problems for the environ-ment, especially those involving long-term and cumulative effects. S.Y. 2014, c.6, s. 9; S.Y. 2002, c.76, s.48

(e) (3) [Repealed S.Y. 2014, c.6, s.9]

Review by Council 49

Upon the establishment of a Council under section 40, it shall review a Yukon State of the Environment Report and submit a report of its review to the Legislative Assembly. S.Y. 2014, c.6, s.10;S.Y. 2002, c.76, s.49

Interim report 50

Commencing from the date of the first Yukon State of the Environment Report, for every period of 12 consecutive months in which a Yukon State of the Environment Report is not made, the

(1) Minister shall prepare an interim re-port and submit it to the Legislative Assembly.

(2) An interim report under subsection (1) shall comment on matters contained in the previous Yukon State of the Environment Report. S.Y. 2002, c.76, s.50

Woodland Caribou near Watson Lake. David Law.

ACKNOWLEDGMENTS (2018)

The State of the Environment Report is a collective effort involving scientific experts and specialists from government agencies and non-governmental organisations who have provided information, data and advice.

Project Coordination:
Department of Environment: Carol Spillette, Amy Law, Jennifer Meurer (Policy, Planning and Aboriginal Relations Branch)

Reviewers and Contributors:
Government of Yukon:
Department of Community Services: Sarah Russo(Community Affairs Branch); Kris Johnson, John Wright (Wildland Fire Management Branch); Dwayne Muckosky(Community Operations Program)

Department of Energy, Mines and Resources: Lisa Walker (Forest Management Branch); Robin Sharples, Robert Legare, Aldo Vaneyk (Forest Operations); Doris Dreyer, Tomoko Hagio (Land Planning Branch); Panya Lipovsky (Yukon Geological Survey); Jim Bell, Nick Grzybowski (Cor-porate Policy and Planning Branch); Bradley Barton (Agriculture Branch)

Department of Environment: Aaron Foos, Troy Hegel, Todd Powell, Bruce Bennett, Randi Mulder, Michelle Sicotte, Tyler Kuhn, Christine Cleghorn (Fish and Wildlife Branch); Cameron Eckert, Jessica Elliot, Jean Langlois (Yukon Parks); Kirsten Burrows, Stephen Roddick, Rebecca World (Climate Change Secretariat); Jennifer Dagg, Sarah Chan (Environmental Programs Branch); Tyler Williams, Veronica Huggard, John Millar (Water Resources Branch); Gerry Perrier (Information Management and Technology Branch); Jane Harms, Meghan Larivee (Animal Health Unit); Michal Wojcik, Jennifer Solomon, Roxanne Stasyszyn (Communications Branch)
Executive Council Office: Gary Brown (Yukon Bureau of Statistics)

Others:

City of Whitehorse: Bryna Cable

Ducks Unlimited: James Kenyon

Environment and Climate Change Canada: Margaret Campbell

Fisheries and Oceans Canada: Nathan Millar

Indigenous and Northern Affairs Canada: Ellen Sedlack, Mary Gamberg, Gary Stern, Hayley Hung

Yukon College, Yukon Research Centre: Alison Perrin

Yukon Environment and Socio-economic Assessment Board: Rob Yeomans, Erin Spiewak

Photos: Government of Yukon, unless otherwise noted.

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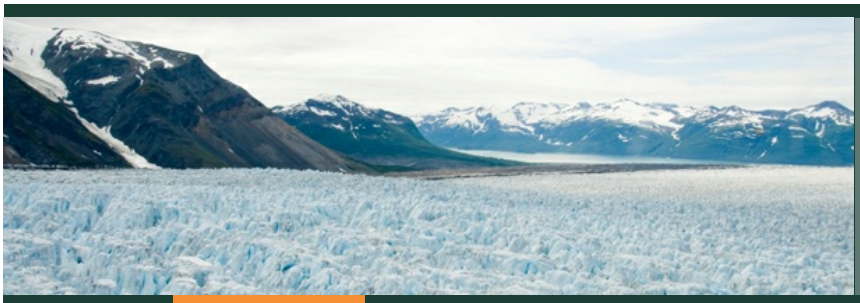

Yukon State of the Environment

Reporting on environmental indicators - 2018

Introduction

The Yukon government recognizes that climate change is happening, that human behaviour is a major contributor, and that a coordinated response is needed.

The Intergovernmental Panel on Climate Change is the leading international body for the assessment of climate change. This panel of scientists states that:

- global climate change is the most significant threat our environment faces today;
- the human influence on the climate system is certain and growing;
- climate change is affecting the Arctic at a pace greater than elsewhere on the planet;
- impacts of climate change include atmosphere and ocean warming, reduced extents of snow and ice, a higher sea level and an increase in the frequency of heavy precipitation events. (Intergovernmental Panel on Climate Change, 2014).

In Yukon, we are already seeing the effects of climate change across all aspects of the environment. Changes have started to, and are expected to continue to, impact the distribution and abundance of vegetation, fish and wildlife in Yukon, as well as impact Yukon infrastructure, economy and communities.

The *Climate Change Action Plan* was released in 2009 and later updated in progress reports released in 2012 and 2015. Find out more on the Yukon government's *Climate Change Action Plan* page.

The effects of climate change are wide-reaching and affect many indicators in this report. Indicators that measure Yukon's contribution to climate change and the impacts of climate change on Yukon's environment are identified in other sections by the thermometer symbol.

PROFILE

COP 22

In November 2016, Yukon government participated in the 22nd Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 22) in Marrakesh, Morocco. The Yukon government recognizes the importance of youth involvement in climate change issues and included Annina Altherr as a Youth Ambassador in Yukon's COP 22 delegation.

Reference

Intergovernmental Panel on Climate Change (IPCC). 2014. Climate Change 2014 Synthesis Report. IPCC, Geneva, Switzerland. Available from: http://ar5-syr.ipcc.ch/.

Indicators related to climate change

AIR

Long-term temperature variation

The Arctic is warming more quickly than other regions, and the warming trend in Yukon is expected to continue.

Levels of particulate matter in Whitehorse

In 2014, the annual mean for particulate matter levels in Whitehorse was 6.7 micrograms per cubic metre (well below the ambient air quality standard).

Trends in Yukon greenhouse gas levels

Yukon's overall GHG emission levels have been decreasing since 2011.

The transportation sector accounts for the largest share of Yukon's GHG emissions.

WATER

Long-term precipitation variation

Precipitation amounts change from year to year, but there is an increasing precipitation trend in Yukon.

River ice break-up dates

Yukon river ice-break up at Dawson City now occurs close to seven days earlier on average since records began in 1896.

Extreme high and low water in lakes and rivers

An increase in winter low flows has occurred across the territory over the past 50 years.

Snow accumulation

There has been a significant increase in snow water equvalent in the last several decades.

Arctic sea ice extent and volume

Arctic sea ice is melting; summer sea ice will likely disappear within decades.

LAND

Area of fire burned annually and number of Yukon wildland fires

Dramatic fluctuations in area burned occur annually. Fires greater than 200 hectares usually represent a small percentage of all fires but account for most of the overall area burned.

Presence of alien and introduced species

As of November 2015, an estimated 169 alien plant species have been identified in Yukon. Twenty of these are considered invasive. Other species that have been introduced to Yukon include three mammals, four birds and two fish species.

FISH AND WILDLIFE

Density of snowshoe hares

The snowshoe hare is a keystone species in the boreal forest; changes in hare population cycles can be an early warning system for ecosystem changes due to climate change.

Winter tick surveillance

Winter ticks have not caused serious problems for Yukon wildlife. However, given their distribution across several Yukon species, they are likely here to stay.

Number of spawning Chinook salmon

The spawning escapement target for Canadian-origin Yukon River Chinook salmon was met in 2015.

Monitoring breeding waterfowl

Monitoring waterfowl presence and abundance gives a good indication of the ecological health of the area, as waterfowl depend on wetland areas for food, nesting areas and safety.

Number of species at risk in Yukon

Yukon's healthy ecosystems are a refuge to many species that are considered at risk nationally due to declines outside the territory.

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Yukon State of the Environment

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TEMPERATURE

Long-term temperature variation

The Arctic is warming more quickly than other regions, and the warming trend in Yukon is expected to continue.

AIR QUALITY AND EMISSIONS

Levels of particulate matter in Whitehorse

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Yukon's overall GHG emission levels have been decreasing since 2011.

The transportation sector accounts for the largest share of Yukon's GHG emissions.

Organic pollutants in air

Human-made chemicals, such as flame retardants and pesticides, are monitored at Little Fox Lake. Regulated flame retardants show a declining trend from 2011 to 2014, but new flame retardants are being detected.

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TEMPERATURE

LONG-TERM TEMPERATURE VARIATION

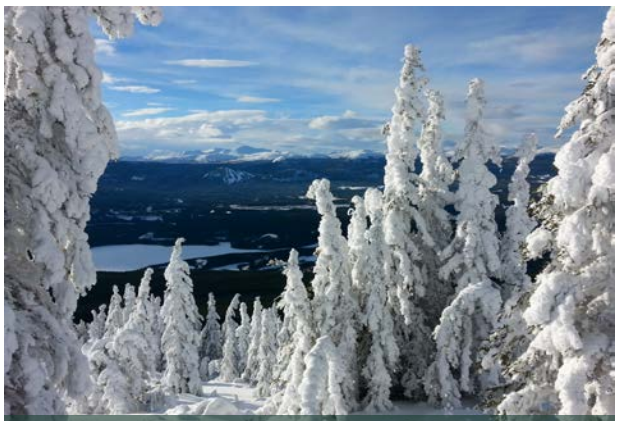
> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Temperature and precipitation are the two most commonly used variables to demonstrate changes in climate.

Global studies, including the *2014 Intergovernmental Panel on Climate Change Fifth Assessment Report*, show that the Arctic is warming more quickly than other regions.

Climatic changes have started to impact the distribution and abundance of vegetation, fish and wildlife in Yukon. Climate change is also affecting Yukon infrastructure, economy and communities.



Yukon River Valley, Whitehorse. R. Cherepak.

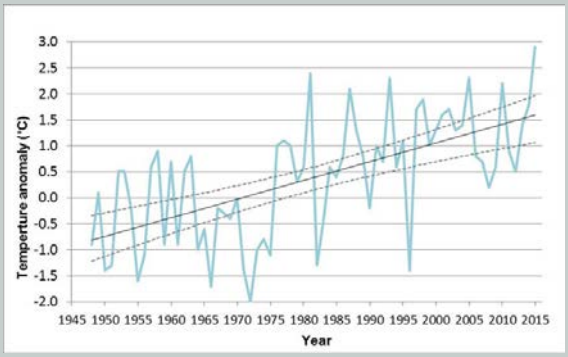
What is happening?

Annual temperature

Monitoring the temperature departures from the average over the past 30 years helps us to understand the rate and extent of changes occurring in Yukon.

- Temperature variability is measured by the departure from a baseline—the 30-year average from 1961–1990. Temperature departures are given as a change in ºC from this average (Figure 1).

FIGURE 1: Yukon annual temperature variation, 1950-2016.



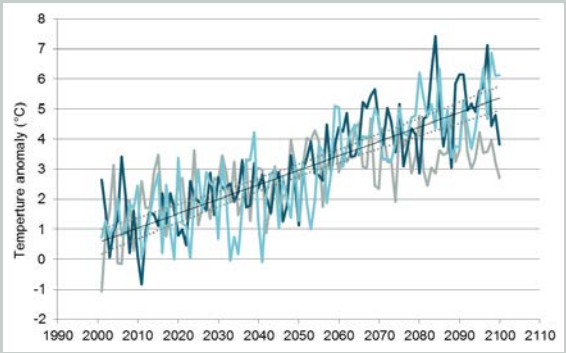
Over the past 50 years:

- Yukon annual average temperature has increased by 2ºC, twice the global rate.

Projected temperature

- Global studies, including the 2014 Intergovernmental Panel on Climate Change Fifth Assessment Report, show that climate scenarios project a significant increase in temperature over the next 50 years (Figure 2).
- Winters are warming more than other seasons, with an average increase of 4ºC.

FIGURE 2: Yukon projected annual temperature anomalies (A2, A1B, B1)



- The three different lines in Figure 2 represent three potential temperature futures based on emissions scenarios developed by Intergovernmental Panel on Climate Change.
- All scenarios show an increase in temperature and its variability.

Taking action

The Government of Yukon partnered with the Northern Climate ExChange at Yukon College on developing a *Yukon Climate Change Indicators and Key Findings* report. This cross-sector, structured, evidence-based assessment of Yukon climate change knowledge synthesizes our current understanding, providing researchers, decision-makers and the general public with an objective overview of the climate system and any potential changes. Temperature change and projections are two indicators presented in this report.

Reducing GHG emissions in Yukon will help to reduce the long-term negative impacts of the trends presented in this indicator.

Yukon River. Richard Legner.

Data quality

- The data are exclusively from Environment and Climate Change Canada's Climate Trends and Variations Bulletins.
- The data spans from 1948 to present and are complete.
- Northern B.C. is included in Environment and Climate Change Canada's regional separation of the data, meaning results could be skewed towards southern Yukon.

References

Environment and Climate Change Canada, Climate Research Branch. 2014-2015. Climate Trends and Variations Bulletins [modified 2016 Mar 22; cited 2016 Mar 3]. Available from: http://ec.gc.ca/sc-cs/default.asp?lang=En&n=A3837393-1 .

Intergovernmental Panel on Climate Change (IPCC). 2014. Climate Change 2014 Synthesis Report. IPCC, Geneva, Switzerland. Available from: http://ar5-syr.ipcc.ch/.

Streicker, J. 2016. Yukon Climate Change Indicators and Key Findings 2015. Northern Climate ExChange, Yukon Research Centre, Yukon College, Whitehorse, Yukon, Canada. Available from: https://www.yukoncollege.yk.ca/research/abstracts/indicators

PROFILE

TR'ONDËK HWËCH'IN TEACHING AND WORKING FARM

The hard work of the students and staff at the Tr'ondëk Hwëch'in Teaching Farm bear fruit this past summer (Photo courtesy of Tr'ondëk Hwëch'in).

TR'ONDËK HWËCH'IN TEACHING AND WORKING FARM

Nän käk nishi tr'ënòshe gha hëtr'ohoh'ąy

"On the land we learn to grow our food"

The hard work of the students and staff at the Tr'ondek Hwech'in Teaching Farm bear fruit this past summer (Photo courtesy of Tr'ondek Hwech'in).
The ability to grow local food is becoming an increasingly import-ant topic in northern communities. Warming temperatures as a result of climate change are providing longer shoulder seasons and warmer growing seasons for agricultural pursuits in the north.

What is happening?

The Tr'ondek Hwech'in, in partnership with Yukon College, have created a unique practical teaching and working farm in the traditional territory of the Tr'ondek Hwech'in (TH) First Nation, just outside of Dawson City. The teaching farm's fundamental goals include preserving a way of life based upon a respectful and spiritual relationship with the land while also providing a consistent sustainable source of fresh vegetables year round. This unique method of experiential teaching at the working farm provides an on-the-land opportunity to learn about, grow, and harvest traditional indigenous foods, in addition to obtaining the skills to sustainably and respectfully grow food in a northern environment.

Both abiotic and biotic components are being studied on the farm. Some of these components include soils, existing vegeta-tion, topography, hazards, permafrost, irrigation and watercours-es, heritage values, and fish and wildlife. Students also learn skills for the reclamation and preservation of indigenous plants and shrubs that are culturally significant to the TH, including plants used for traditional medicines and food.

Some of the topics the students are learning about are:

- sustainable soils and water management;
- plant science;
- integrated pest management (1PM);
- animal agriculture;
- market and fruit crop production;
- farm business planning and management;
- forage crop production;
- small farm construction;
- traditional food practices;
- seed saving;
- medicinal plants;
- equipment operation and maintenance;
- first aid; and
- food handling .

The inaugural class of Tr'ondek Hwech'in Teaching Farm gathers to learn a range of skills, from electric fence construction to carpentry and basic botany. Photo courtesy of Tr'ondek Hwech'in.

While the program was developed for the benefit of TH citizens, there were participants from other First Nations as well as one non-First Nation student. The age, education, and agricultural experience of the students varied, which enhanced the overall experience of the students.

The farm fosters a healthy respect for the environment and a rewarding use of the land for TH citizens and all community members. Students are able to develop the skills to start their own farm or to seek employment in other farm-oriented businesses. Selling the vegetables also provides a way to make a living in a more sustainable and environmentally friendly manner.

References

Environment and Climate Change Canada, Climate Research Branch. 2014-2015. Climate Trends and Variations Bulletins [modified 2016 Mar 22; cited 2016 Mar 3]. Available from: http://ec.gc.ca/sc-cs/default.asp?lang;En&n;A3837393-1.

Intergovernmental Panel on Climate Change (IPCC). 2014. Climate Change 2014 Synthesis Report. IPCC, Geneva, Switzerland. Available from:http://ar5-syr.ipee.ch/.

Streicker, J. 2016. Yukon Climate Change Indicators and Key Findings 2015. Northern Climate Exchange, Yukon Research Centre, Yukon College, Whitehorse, Yukon, Canada. Available from: https://www.yukoncollege.yk.ca/research/abstracts/indicators.

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Yukon State of the Environment

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AIR QUALITY AND EMISSIONS

LEVELS OF PARTICULATE MATTER

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Particulate matter are microscopic airborne particles that come in either solid or liquid form. Small particles of concern include:

- fine particulate matter, such as those found in woodsmoke, that are smaller than 2.5 micrometers in diameter ($PM_{2.5}$); and
- coarse particulate matter, such as those found near roadways and industrial activities (e.g., quarries), that are larger than $PM_{2.5}$, but smaller than 10 micrometers in diameter (PM_{10}).

Health effects

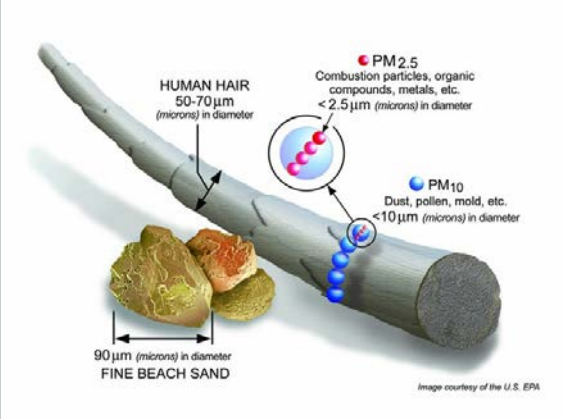
The size of particles is directly linked to their potential for causing health problems; smaller particles pose large health problems as these particles can more readily get deep into the lungs and potentially into the bloodstream (haikerwal et al., 2015). Fine particulate matter also stays airborne for longer periods than coarse particulate matter (as coarse PM settles to the ground faster), and are therefore associated with longer explosure periods. Exposure to particulate matter has been linked to a variety of health issues, including:

- aggravated asthma;
- decreased lung function;
- heart attacks and/or irregular heartbeat;
- premature death in people with heart or lung disease; and
- increased respiratory symptoms, such as irritation of the airways, coughing or difficulty breathing.

The elderly, children, and people with chronic respiratory illnesses are most at risk, but even healthy people can experience temporary symptoms.

Exposure to particulate matter has been scientifically proven to be detrimental to both public health and the environment. Sources of fine particulate matter in the Yukon include:

FIGURE 1: Sizes of Particulate Matter



Source: United States Environmental Protection Agency 2016

Other environmental effects

Particulate matter may also affect the environment through:

- High pollution levels impairing visibility, which may affect driving, aviation, and outdoor sports or recreational activities like fishing, hiking, or camping.
- Changing nutrient and/or acidity balance in soil or water when particulate matter carried by the wind settles on the ground.
- Black carbon, a component of $PM_{2.5}$, is considered a short-lived climate pollutant (SLCP). These pollutants have a relatively short lifetime in the atmosphere—a few days to a few decades—and are generally more potent than carbon dioxide in terms of their climate warming potential.
- Temperature inversions, when air higher in the atmosphere is warmer than air closer to the earth, can increase the impacts of particulate matter pollution. Inversions act like a cap on the atmosphere, preventing the dispersion of pollutants away from valley bottoms. In Yukon, the most heavily populated communities, Whitehorse and Dawson City, are located in valleys.

Natural sources	Anthropogenic sources
Forest fires: Although the predominant air flow is westerly (from Alaska), smoke from fires in B.C. and the N.W.T. occasionally affect Yukon's air quality	Emissions from fossil fuel burning, such as transportation, electricity generation, oil and gas
Wind-blown dust from gravel roads, especially in spring	Wood burning for residential / commercial heating, land clearing, or recreational burning
Pollen	Incineration or open burning of waste
Volcanic activity, sometimes from as far away as Asia.	Fugitive dust from vehicles, quarrying or construction

Yukon Ambient Air Quality Standards have been developed under the *Environment Act* to protect human health and the environment. The Department of Environment monitors levels of $PM_{2.5}$ in Whitehorse. Continuous, 24/7-monitoring of $PM_{2.5}$ provides an indication of the state of, and trends in, local air quality. It is in addition to providing a point of comparison of Yukon air quality to national results.

What is happening?

Annual mean levels

In September 2014, the Government of Yukon updated the Yukon ambient air quality standards to include an annual mean standard for $PM_{2.5}$ of 10µg/m^3.

- Measurements taken at the Whitehorse National Air Pollution Surveillance station since 2002 have not found levels in excess of the annual mean standard for $PM_{2.5}$.
- The annual mean has steadily increased over the past five years. This could be due to a number of factors such as population growth, increase in use of wood as a heating source, or meteorological variations. Due to equipment malfunction, there is not enough data available to calculate a mean annual value for 2015.
- Note: The NAPS monitoring station was relocated from a relatively windy site on the Yukon River to downtown Whitehorse in 2011. At the same time, a new, technically advanced higher-precision analyzer $PM_{2.5}$ monitoring instrument was installed.

24 hour average exceedances

Number of days/year that the 24-hour Yukon standard for $PM_{2.5}$ was exceeded in Whitehorse

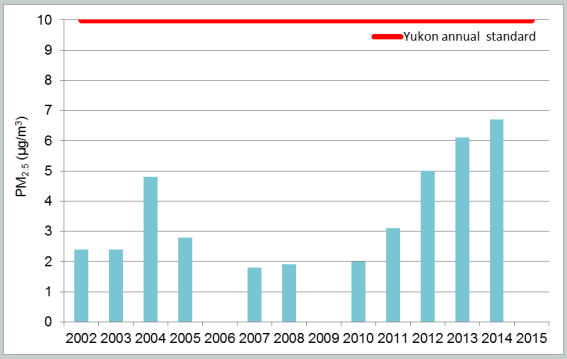
Year	Number of days 24-hour standard exceeded
2002	0
2003	0
2004	12
2005	4
2006	N/A
2007	0
2008	0
2009	15
2010	7
2011	7
2012	19
2013	2
2014	2
2015	0

Monthly comparison of $PM_{2.5}$

While the level of $PM_{2.5}$ in Whitehorse can vary greatly over a year due to local meteorological events, transboundary flows, exceptional events and human activities, comparing particulate matter levels by month is helpful to give a picture of trends and seasonality of ambient fine particulate matter pollution.

- Winter months have higher levels of particulate matter than summer months. Heating buildings from wood or fossil fuels can drive $PM_{2.5}$ levels up.
- $PM_{2.5}$ can increase in summer months due to spring road dust and wildland forest fires.

FIGURE 2: Annual mean level of $PM_{2.5}$ in Whitehorse



In 2014, the Yukon's 24-hour average standard for $PM_{2.5}$ changed from 30 to 28 µg/m^3, in alignment with the Canadian Ambient Air Quality Standards. The table shows the number of days each year that $PM_{2.5}$ exceeded the 24-hour Yukon standard in Whitehorse.

Although 2012 had more exceedances throughout the year than 2014, the extent and duration of the exceedances on the two days in February 2014 resulted in a higher monthly average (Figure 3).

PROFILE

AIR QUALITY MANAGEMENT SYSTEM

Air quality monitoring in the Hidden Valley.

AIR QUALITY MANAGEMENT SYSTEM

The Canadian Council of Ministers of the Environment (CCME) is a 14-member council of environment ministers from federal, provincial, and territorial governments. The CCME focuses on national issues that require the collective attention of all governments.

In 2012, the CCME established the Air Quality Management System (AQMS). It is a comprehensive approach for improving air quality throughout Canada. AQMS is the product of extensive collaboration by government and stakeholders on air quality.

Air Zones:

AQMS requires the establishment of air zones within each jurisdiction. Air zones are geographical-based zones that will allow the provincial/ territorial governments to manage local ambient air quality within their jurisdiction with the goal of continuous improvements in air quality. Provinces and territories, with assistance from the federal government, will beare responsible for managing each air zone within their jurisdictions and reporting to their residents on air quality and the measures taken to implement AQMS.

Yukon has a single air zone (the 'Yukon Air Zone') which covers the entire territory. Major anthropogenic air emissions sources in the Yukon Air Zone include emissions from fossil fuel burning (transportation, heating and power generation), wood burning, waste disposal (incineration and open burning), and fugitive dust from roads, quarrying and construction. Natural sources of particulate matter include forest fires, wind-blown dust, pollen and transboundary flows and exceptional events (e.g. overseas volcanic eruption).

Canadian Ambient Air Quality Standards:

The previously used Canada-wide standards for fine particulate matter and ground-level ozone were replaced by the Canadian Ambient Air Quality Standards (CCAQS) in 2013. The CAAQS are the driver for air quality management under AQMS and standards have been established for fine particulate matter and ozone. An air zone metric for each pollutant (PM2.5 and ozone) is calculated to determine the achievement status of a given standard and the associated management level for air quality within an air zone.

In 2016, Department of Environment reported on the achievement of the CAAQS for the years 2014 and 2015 through the publication of annual air zone reports. Air zone reports are a commitment of the Government of Yukon under the AQMS, and form the basis for monitoring, reporting and taking action on air quality issues. AQMS has established four colour-coded Management Levels (Green, Yellow, Orange and Red) to that ensure proactive measures are taken to protect air quality. The Red level indicates that the CAAQS have been exceeded, while the Green level indicates good air quality. The Management Level to which an air zone is assigned for a particular pollutant drives actions to improve or maintain air quality, with progressively more rigorous actions from Green to Red. Yearly achievement of the CAAQS is based on a running mean of three years of data; the 2014 metrics, for example, are calculated based on data from 2012-2014.

In 2014, the Yukon Air Zone's pollutant metrics were below CAAQS exceedance thresholds. For both ozone and particulate matter, the Yukon Air Zone achieved the Yellow Management Level. The objective for the Yellow Management Level is to improve air quality using early and ongoing actions for continuous improvement. The results are presented in Table 1, below.

Table 1. Air Quality Standards and 2014 Results for the Yukon Air

Zone	CAAQS	2014 Results	Management Level	Management Action
$PM_{2.5}$ - 24-hour ($\mu g/m^3$)	28	18.9		Actions for preventing air quality deterioration
$PM_{2.5}$ - Annual ($\mu g/m^3$)	10	5.9		Actions for preventing air quality deterioration
Ozone - 8-hour average (ppb)	63	51.4		Actions for preventing air quality deterioration

2014 results for all three reporting metrics are based on two years of data instead of the recommended three years due to data loss.

In 2015, reporting for the years 2013-2015, ground-level ozone achieved a Management Level of Yellow, which is the same as the previous reported year. For particulate matter for the 2015 reporting period, there was insufficient data collected to meet the statistical requirements needed to calculate a metric; therefore, there is no calculated metric for this year.

Mobile Sources:

Mobile sources are a major contributor of air pollutant and greenhouse gas emissions in Canada. An action plan under the AQMS is being developed to reduce emissions from mobile sources in the transportation sector. The plan would include addressing vehicle tampering and encouraging the conversion of fleets to electric vehicles. Priorities are to implement advanced transportation technologies and proper vehicle maintenance, to reduce emissions from diesel vehicles and engines, and to make vehicle fleets greener.

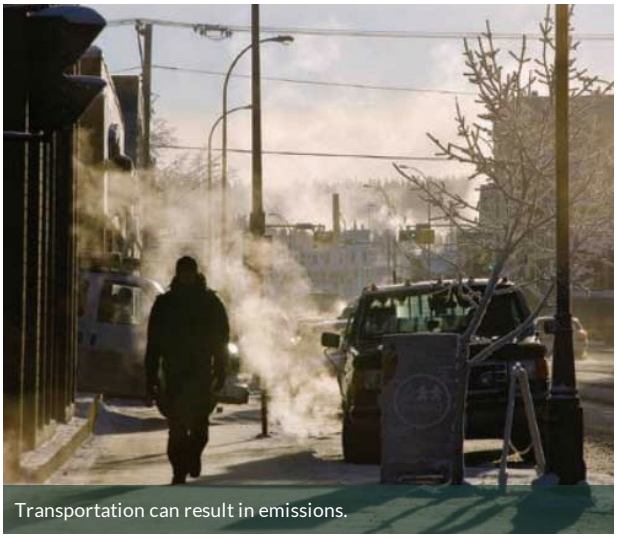
Base-level Industrial Emissions Requirements:

Base-level industrial emissions requirements are intended to ensure that all significant industrial sources in Canada meet a good base-level performance. Performance standards will be established for new and existing major industrial sectors and some equipment types. Monitoring and public reporting is critical for transparency, accountability, and the effective implementation of AQMS.
More information on the Air Quality Management System can be found on the CCME website.

Comparison to national average

- Whitehorse $PM_{2.5}$ levels have never been above the national average during the 2002 – 2015 monitoring period.
- The national average for $PM_{2.5}$ has not exceeded the annual standard of 10 µg/m^3.
- Data are available up to 2013; the 2014 and 2015national averages are not yet available from Environment and Climate Change Canada.

In 2014, the Yukon's 24-hour average standard for $PM_{2.5}$ changed from 30 to 28 µg/m^3, in alignment with the recently established Canadian Ambient Air Quality Standards. The table shows the number of days each year that $PM_{2.5}$ exceeded the 24-hour Yukon standard in Whitehorse. In 2015, there were no exceedances of the $PM_{2.5}$ 24-hour standard. The years with a higher number of exceedances of the 24-hour Yukon standard for $PM_{2.5}$ likely correlate with high wildfire seasons.



Transportation can result in emissions.

FIGURE 3: Monthly comparison of $PM_{2.5}$ in Whitehorse, Yukon

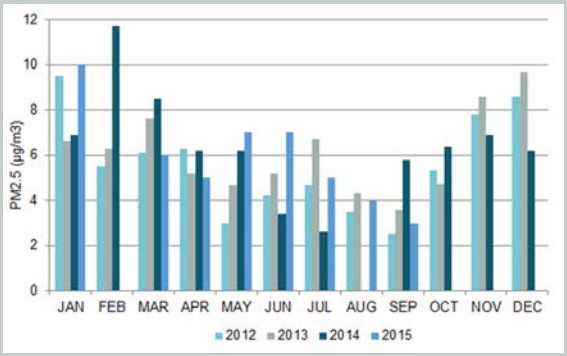
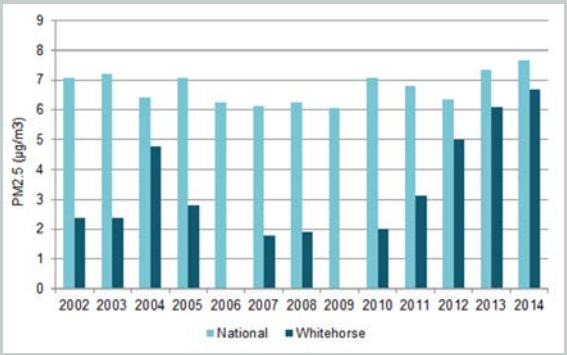


FIGURE 4: Comparison to national average



Taking action

- Monitoring Yukon's air quality occurs as part of the National Air Pollution Surveillance (NAPS) program, which monitors the quality of ambient air in urban areas and provides long-term air quality data of uniform standard across the country. A Memorandum of Understanding establishes the collaborative effort of the program between the federal, provincial, territorial and some municipal governments. Jurisdictions use the air quality data compiled by NAPS to assess and report on the state of the air and to develop programs to address priority air quality issues in air zones. Data provided by NAPS also support public information tools, such as the Air Quality Health Index and the Canadian Environmental Sustainability Indicators. NAPS data can be accessed from the Canada-wide air quality database.

- In the spring of 2016, the Air Quality Health Index (AQHI) was launched for Whitehorse. The AQHI is a public information tool that helps Canadians protect their health on a daily basis from the adverse effects of air pollution. The AQHI is calculated based on the relative risks of a combination of common air pollutants, including ozone, particulate matter and nitrogen dioxide; the data is collected from the Whitehorse NAPS station.
- Data provided by NAPS also support public information tools ,such as such as the Air Quality Health Index and the Canadian Environmental Sustainability Indicators.
- The Department of Environment is currently conducting a fine particulate matter monitoring study in Whitehorse, in conjunction with Health Canada, the City of Whitehorse, the Office of Chief Medical Health Officer, Yukon Health & Social Services; Energy Mines and Resources; and Community Services. This study is collecting data from nine monitoring stations set up around the city. Data will be used to determine the levels and spatial variability of $PM_{2.5}$ pollution in the various neighbourhoods, and subsequently enable partners to make decisions on actions that need to be taken in high-pollutant neighbourhoods. The results of the study are anticipated to be available in 2017.
- The Department of Environment is also participating in a national Health Canada study: Outdoor Air Pollution Exposure and Risk Assessment. It is examining the oxidative potential of PM2.5 and the relationship with human health concerns, including lung cancer and heart attacks. Sampling at the downtown Whitehorse NAPS station began in the spring of 2016 and is expected to continue for two to three years.

NAPS station in Whitehorse.

Data quality

- NAPS data are quality-controlled, assured, and standardized by Environment and Climate Change Canada and the Yukon Department of Environment for inclusion in the Canada-wide air quality database.
- The Whitehorse NAPS station, located in downtown Whitehorse, continuously monitors particulate matter, nitrogen dioxide and ground-level ozone.
- Air quality data collected at the NAPS station are not representative of air quality throughout Whitehorse or Yukon because of differences in geographical layout, population density and pollution sources.
- Canadian Environmental Sustainability Indicators (CESI) measure the progress of the Federal Sustainable Development Strategy, report to Canadians on the state of the environment, and describe Canada's progress on key environmental sustainability issues. The indicators, built on rigorous methodology, are added and updated as new, high quality data become available.

Further information

The Department of Environment: Air Quality

Canadian Lung Association: Outdoor Air Quality

References

Haikerwal A, Akram M, Del Monaco A, et al. Impact of Fine Particulate Matter ($PM_{2.5}$) Exposure During Wildfires on Cardiovascular Health Outcomes. *Journal of the American Heart Association: Cardiovascular and Cerebrovascular Disease.* 2015;4(7):e001653. doi:10.1161/JAHA.114.001653.

United States Environmental Protection Agency. n.d. Particulate Matter (PM) Basic Information. [modified 2016 Feb 23; cited 2016 Mar 3]. Available from: http://www3.epa.gov/airquality/particlepollution/basic.html

Yukon Department of Health and Social Services. 2015. New Study to monitor Whitehorse air quality [News release]. Available from: http://www.hss.gov.yk.ca/15-344.php

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AIR QUALITY AND EMISSIONS

TRENDS IN YUKON GREENHOUSE GAS LEVELS

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Greenhouse gases (GHGs) trap heat in the atmosphere, keeping the Earth's surface warmer than it would be in their absence. This process is essential for sustaining life on the planet, but burning fossil fuels has increased the amount of GHGs in the atmosphere, which enhances the warming effect. Global GHG levels are now at their highest in the last 800,000 years (IPCC 2014) as a result of human activity, resulting in climate change.

GHG emissions include carbon dioxide, methane, and nitrous oxide among others. Carbon dioxide is the principal contributor to human-caused increased atmospheric levels of GHGs; therefore, it is used as a basis to compare all greenhouse gases.

Carbon dioxide equivalent (CO_2e) is the measure most often used to compare emissions from various GHGs based on their potential to contribute to global warming. Tracking GHG emissions (in units of kilotonnes of CO_2e) allows tracking of Yukon's emissions across time, identifying the major sources of emissions and opportunities for reductions, as well as tracking Yukon's contributions to national and global emission levels.

The observed and predicted rate and magnitude of temperature change in Yukon are among the largest in Canada. The Government of Yukon is taking action and has set targets to limit GHG emissions produced from

Alaska Highway.

its operations and those from key sectors. The Government of Yukon is also working on climate change adaptation in the short and long term. These measures take the unique challenges in Yukon into consideration, including long distances from production centres, high demand for heat during cold winters and an isolated electricity grid.

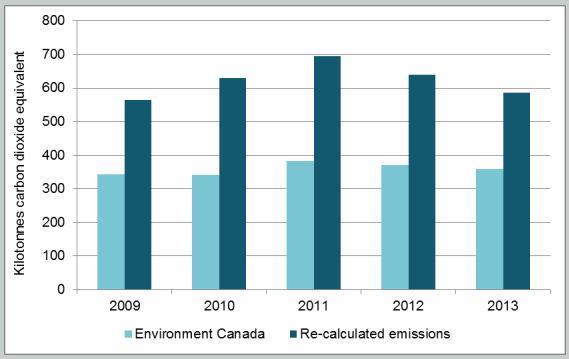
What is happening?

Yukon's emissions

The Government of Yukon is working with local and federal partners to achieve an accurate and consistent emissions profile for Yukon. This profile is necessary to support the effective policy development for minimizing growth in Yukon's overall GHG emissions. To date, two data sets are available to support an understanding of Yukon's overall GHG emissions:

- Emissions estimates by Environment and Climate Change Canada for Yukon (Canada's Greenhouse Gas Inventory), found in the *National Inventory Report 2014: Greenhouse Gas Sources and Sinks in Canada*.
- The Yukon GHG Inventory 2009-2015, developed in partnership between the Yukon Bureau of Statistics and the Department of Environment, with support from the Department of Energy, Mines and Resources. This data is based on reliable fuel tax data collected under the *Fuel Oil Tax Act* and held by the Government of Yukon Department of Finance.

FIGURE 1: Yukon greenhouse gas emissions reported by Environment and Climate Change Canada and by a suggested methodology from Taggart and Pearson's report (2015), 2009-2013.



The Government of Yukon is continuing its work with the federal departments of Environment and Climate Change Canada as well as Statistics Canada to improve accuracy in their data collection and reporting. Until federal data better reflects Yukon's overall GHG emissions, the Government of Yukon considers locally-derived data from the Yukon Bureau of Statistics and Department of Finance as the most accurate.

Summary points from the Yukon GHG Inventory 2009-2015 report include:

- Yukon's overall greenhouse gas emission have decreased by 0.7 per cent since 2009.
- Yukon's total GHG emissions for 2015 were 0.573 megatonnes (573 kilotonnes) of CO2e.
- Yukon's overall greenhouse gas emissions have increased by 0.5 per cent since 2009.
- Transportation accounts for the largest share of greenhouse gas emissions in Yukon: 63 per cent of the total in 2015.
    - On-road gasoline and on-road diesel contribute equally to transportation emissions, at approximately 43 per cent each.
    - This means that passenger vehicles are a significant source of emissions in the territory.
- After transportation, space heating from fuel oil and propane is the next highest source of GHG emissions in Yukon at 18 per cent. Electricity generation accounts for three per cent of Yukon's emissions.

National comparison

- Canada is ranked among the highest of all countries in the world in terms of per capita GHG emissions. Canadians produced 722 megatonnes (722,000 kilotonnes) of CO2e in 2015, about 18 per cent above 1990 levels (Environment and Climate Change Canada 2017).
- Yukon per capita emissions in Yukon in 2015 were 15.3 tonnes per person. Compared to the per capita emissions of the 12 other provinces and territories as reported in the National Inventory Report, Yukon's per capita emissions rank ninth out of 13.
- Yukon's total GHG emissions contributed 0.08 per cent towards the national total in 2015.

PROFILE

RIDE SHARING

RIDE SHARING

In an effort to address transportation-related greenhouse gas (GHG) emissions within the territory, the Department of Environment is partnering with the City of Whitehorse on a Yukon-wide ridesharing program that was launched in April 2016.

The on-line service enables registered users to connect with others interested in saving on fuel and vehicle maintenance costs, as well as reducing their GHG emissions. To date, over 170 users have registered, with numerous others using the "Single Trip" function to find rides for longer distances both within the territory and beyond.

Yukon Rideshare helps to make carpooling and active transportation easier and more convenient, removing some of the barriers that typically prevent individuals from exploring more sustainable and less GHG intensive options.

The platform also helps both the Government of Yukon and the City of Whitehorse keep track of emissions avoided as a result of individuals carpooling, using transit or choosing more active transportation options.

Visit Yukon Rideshare to learn more.

Taking action

The Government of Yukon partnered with the Northern Climate ExChange at Yukon College on developing a *Yukon Climate Change Indicators and Key Findings* report. This cross-sector, structured, evidence-based assessment of Yukon climate change knowledge synthesizes our current understanding, providing researchers, decision-makers and the general public with an objective overview of the climate system and any potential changes.

In 2015, the Government of Yukon published its *Climate Change Action Plan Progress Report*, building upon the leadership and commitments outlined in the 2009 *Climate Change Action Plan* and the 2012 *Progress Report*.

Since the majority of the 33 priority actions which were outlined in the previous reports are either completed or ongoing, the 2015 Progress Report includes 28 new initiatives which support four goals:

- enhance our knowledge and understanding of climate change;
- improve our ability to adapt to the impacts of climate change;
- reduce our greenhouse gas emissions; and
- lead Yukon action in response to climate change.

More detail on those new actions, as well as an update on progress on achieving previous commitments can be found in the 2015 *Climate Change Action Plan Progress Report*.

The Government of Yukon has recently initiated a new strategy on climate change, clean energy, and green economic growth. It is in formative stages, but will be underway between 2017 and 2019, with multiple opportunities for public engagement and input.

PROFILE

SOLAR ENERGY

Solar panels on a rooftop. Credit: John Maissan.

SOLAR ENERGY

Installing solar panels, or photovoltaic (PV) systems, on the roofs of Yukon homes, as shown in the photo above, is becoming a more common sight. Though over 95 per cent of Yukon's electricity is generated from hydroelectricity, producing electricity from the sun using solar panels has the potential to reduce greenhouse gas emissions from power production using fossil fuels, particularly in remote communities, and reduce air and water pollution. Additionally, technical innovations and government incentives are helping to make solar photovoltaics more accessible.

The potential for solar electricity production in Yukon is surprisingly high. Whitehorse, for example, has more annual PV potential (960 kWh/kWp) than Berlin, Germany (848 kWh/kWp) where PV panels are widely used. Experience tells us that PV systems do indeed work well in Yukon.

Bifacial (two-sided) solar panels mean more electricity from less space.

The environmental and health benefits of using solar energy are substantial. When solar power displaces fossil fuels for electricity generation, emissions of carbon dioxide, sulfur dioxide, oxides of nitrogen and particulate matter are all reduced. Increased use of electric vehicles, already present in Yukon, would further increase the expected environmental and health benefits in Yukon.

The lower outdoor ambient temperatures in Yukon help improve winter energy production by 25 per cent or more at -25˚C; better at -40˚C. This is an advantage of solar energy production in Yukon, especially when hydroelectricity generation is reduced during the winter and more diesel and LNG are required to meet demand.

The average energy generated by solar cells can be increased by using bifacial PV cells which collect light from both sides. The amount of electricity that can be generated in the same area is therefore higher and more consistent, at only a slight cost increase. Bifacial solar cells are currently being tested and are in use in Yukon.

There is a benefit to installing PV panels vertically. Work done in Alberta has shown that panels installed vertically rarely, if ever, require snow removal. Production is also higher in the spring and fall when electricity demand is greater, and is lower in summer, when there is typically a surplus of electricity available. For these reasons, it would be advantageous if more vertical solar panels were installed in Yukon.

Because the price of crystalline silicon photovoltaic cells has dropped to less than 1/100th of the cost from 35 years ago (from $76 per Watt to $0.64 per Watt), the cost of solar modules has also dropped. In Yukon, the total price of a PV system is now typically in the range of $2.75 to $4.00 per Watt, installed. Prices can be higher depending on structural requirements. Prices are higher in off-grid locations due to the need for battery banks.

In many locations, the payback for solar panels is dropping to about one to three years depending on the technology used and the size of the system. Currently, the payback in Yukon is generally over ten years, due largely to the small market and shipping costs.

Given the environmental and health benefits, growing interest in independent power production, and declining system costs, it is not surprising that the rate of new solar panel installations is rapidly increasing. Yukon is no exception. In only three years, the number of installations has exceeded 60, bringing the total installed solar electricity generation capacity up to 350 kW or 0.35 MW.

More information is available on the Energy Solutions Centre website at www.emr.gov.yk.ca/energy/solar.html.

Notes:

1. kWh = kilowatt hour, kWp = kilowatt peak (under standard test conditions)
2. A solar panel or module is made up of a number of individual solar cells. There are 60 solar cells in each solar panel in the photo at the beginning of this profile.

Data quality

Previously, the GHG emissions indicator was based on data provided by the federal department of Environment and Climate Change Canada via the *National Inventory Report*, which presents GHG information annually for Yukon in kilotonnes of CO_2e by sector (Energy, Industrial Processes and Product Use, Agriculture and Waste). All national inventory reports are accessible online.

The Yukon GHG Inventory 2009-2015, based on tax and finance data provided by Yukon Bureau of Statistics and Department of Finance, is considered by the Government of Yukon as being the most accurate data for Yukon-wide emissions. The Government of Yukon will continue to work with the federal departments of Environment and Climate Change Canada as well as Statistics Canada to improve data accuracy, and in the meantime, will access and report Yukon data from local sources to inform Yukon GHG emissions results.

References

Environment and Climate Change Canada. 2017 National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada. Pt. 3, p.35. Environment Canada, Gatineau, Quebec, Canada.

Intergovernmental Panel on Climate Change (IPCC). 2014. Climate Change 2014 Synthesis Report. IPCC, Geneva, Switzerland. Available from: http://ar5-syr.ipcc.ch/.

Government of Yukon. The Yukon GHG Inventory 2009-2015. 2017. Available from: http://www.env.gov.yk.ca/air-water-waste/reducing-GHG-emissions-yukon.php#yukon.

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AIR QUALITY AND EMISSIONS

ORGANIC POLLUTANTS IN AIR

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Organic pollutants, such as flame retardants and pesticides, are human-made chemicals that may contaminate ecosystems. Wind and water can carry these chemicals away from their sources to reach places like the Arctic, where they have never been used before. They tend to settle in colder climates and once deposited, can enter arctic ecosystems. Many of these contaminants are toxic and can accumulate in the food chain, affecting the health of wildlife and humans.

Measuring how much organic pollutants are present in arctic air over time will provide us with information on:

- whether their concentrations are decreasing, increasing or not changing over time;
- where these chemicals have come from;
- how much of each chemical comes from which region; and
- what climate conditions influence their movement to the Arctic.

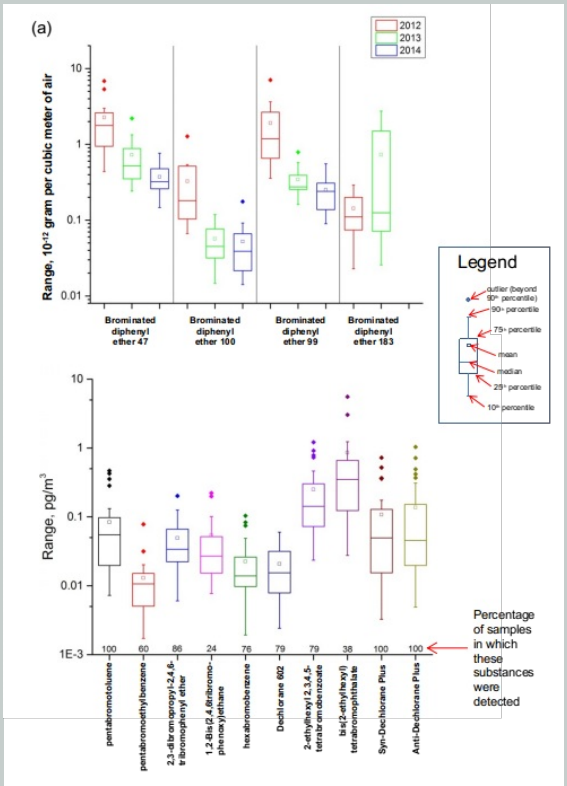
This information can inform policies that limit emissions and hopefully reduce what comes into the Arctic. Results about how organic pollutant concentrations change in air can be used to negotiate and evaluate the effectiveness of domestic and international control agreements and to assess the risks of new contaminants. The results are also used to test atmospheric models that explain contaminant movement from sources in the South to the Arctic.

Air monitoring station at Little Fox Lake. Pat Roach.

What is happening?

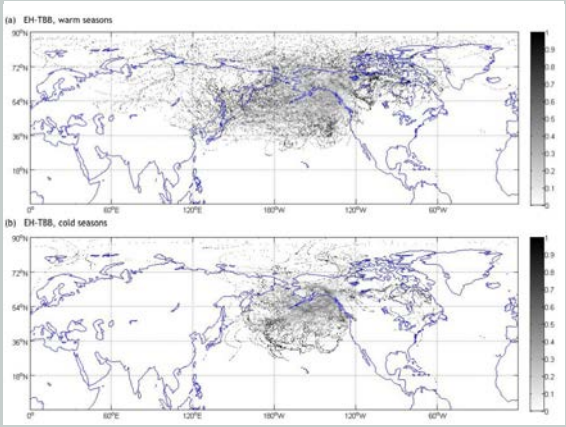
- Air samples have been continuously collected at the Little Fox Lake Station in Yukon since August 2011.
- The detection of these chemicals in the remote subarctic site of Little Fox Lake demonstrates their long range transport through air and suggests that they could contribute to the chemical contamination of remote areas such as the Arctic.
- The air concentrations of two pesticides, hexachlorocyclohexane and endosulfan, are decreasing at Little Fox Lake.
- Measurement results show that globally regulated flame retardants (e.g., some of the polybrominated diphenyl ethers) have declined from 2012 to 2014. Canada regulated these flame retardants in 2008 and they have been regulated globally since 2009.
- Conversely, 10 new flame retardants that are not currently regulated were frequently detected in air at Little Fox Lake (Figure 1).
- Air samples taken at Little Fox Lake in 2015 and 2016 are currently undergoing chemical analysis to investigate if the concentrations of new flame retardants are changing with time.

FIGURE 1: (a) Regulated flame retardants at Little Fox Lake showed declining tendency from 2012 to 2014. (b) Flame retardants found in air in Little Fox Lake that are currently not regulated (Yu et al. 2015).



- In warm seasons, organic pollutants tend to stem from potential sources in Northern Canada, the Pacific and East Asia. In cold seasons, they mainly came from the Pacific Rim. One example of this is a new flame retardant called 2-ethylhexyl 2,3,4,5-tetrabromobenzoate (Figure 2).

FIGURE 2: Maps showing potential source regions for one of the new flame retardants detected at Little Fox Lake, 2-ethylhexyl 2,3,4,5-tetrabromobenzoate. The maps indicate that (a) in the warm seasons most of this chemical observed at Little Fox Lake stemmed from sources in Canada, the Pacific and East Asia; (b) in cold seasons they mainly came from the Pacific Rim. Black dots on map show potential paths of movement of wind carrying this chemical reaching Little Fox Lake.



View from Little Fox Lake monitoring station. Pat Roach.

Taking action

The federal Northern Contaminants Program has measured organic pollutants in air in Yukon since 1992 during three short term studies at Tagish (December 1992 to March 1995) and Little Fox Lake (July 2002 to July 2003 and August 2007 to October 2009).

Continuous measurements are now conducted at Little Fox Lake since August 2011 to determine:

- if the air concentrations are declining for chemicals that are under domestic and international regulations, showing these regulations are effective;
- where these chemicals have come from, and how much from which region; and
- if new chemicals that are currently not under control can be carried to Yukon by wind.

The Little Fox Lake data are provided to support the Stockholm Convention on Persistent Organic Pollutants — a global treaty to protect human health and the environment from the adverse effects of these pollutants. Signatories to the convention work towards controlling how much and what kind of persistent organic pollutants humans release into the environment.

These data also support the Arctic Council's Arctic Monitoring and Assessment Programme that provides information on the status and threats to the Arctic environment, and provide scientific advice on actions to be taken to support Arctic governments in their efforts to take remedial and preventive actions relating to contaminants.

Data quality

- Data are available for air samples taken once a month using a flow-through air sampler, which does not require electrical power to operate, at the Little Fox Lake station.
- Air concentrations of different chemicals may vary with seasons.
- The target chemical list includes pesticides and flame retardants. New chemicals are added to this list from time to time to assess chemicals that may be of concern to the Arctic environment.

Air monitoring station at Little Fox Lake. Pat Roach.

References

Arctic Council. n.d. Arctic Monitoring and Assessment Programme (AMAP). [cited 2016 Mar 3] Available from: http://www.amap.no/

Government of Canada. 2015. Northern Contaminants Program [modified 2016 Jan 25, cited 2016 Mar 3] Available from: http://www.science.gc.ca/default.asp?lang=En&n=7A463DBA-1

Hung, H., Y. Yu, M. Shoeib, T. Harner, A. Steffen, D. Muir, C. Teixeira, L. Jantunen, P. Fellin, P. Roach, F. Wania. 2015. Northern Contaminants Air Monitoring: Organic Pollutant Measurement. Pages 161-171 *in* Aboriginal Affairs and Northern Development Canada. Synopsis of Research Conducted under the 2014-2015 Northern Contaminants Program. Aboriginal Affairs and Northern Development Canada, Gatineau, Quebec, Canada. Available from: http://pubs.aina.ucalgary.ca/ncp/Synopsis20142015.pdf

United Nations Environmental Programme (UNEP). 2015-2016. Stockholm Convention on POPs [cited 2016 Mar 3]. Available from: http://chm.pops.int/default.aspx

Yu, Y., H. Hung, N. Alexandrou, P. Roach, K. Nordin. 2015. Multiyear measurements of flame retardants and organochlorine pesticides in air in Canada's western sub-arctic. Environmental Science & Technology 49 (14): 8623 - 8630.

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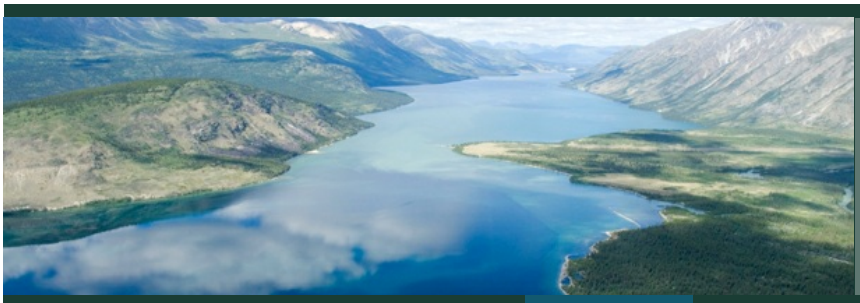

Yukon State of the Environment

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PRECIPITATION

Long-term precipitation variation

Precipitation amounts change from year to year, but there is an increasing precipitation trend in Yukon.

LAKES AND RIVERS

River ice break-up dates

Yukon river ice break-up at Dawson City now occurs close to seven days earlier on average since records began in 1896.

Water quality index ratings

The water quality measured at seven Yukon stations is: excellent (1 station), good (4 stations), and fair (2 stations).

Extreme high and low water in lakes and rivers

An increase in winter low flows has occurred across the territory over the past 50 years.

FROZEN

Arctic sea ice extent and volume

Arctic sea ice is melting; summer sea ice will likely disappear within decades.

Snow accumulation

There has been a significant increase in snow water equvalent in the last several decades.

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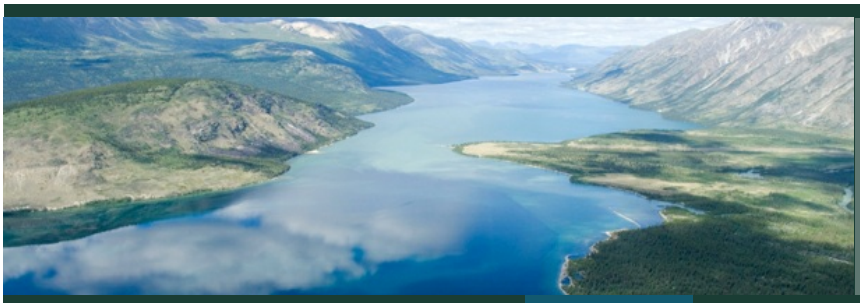

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PRECIPITATION

LONG-TERM PRECIPITATION VARIATION

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Temperature and precipitation are the two most commonly used variables to demonstrate changes in climate.

Monitoring the difference in annual precipitation from the average of the past 30 years helps us to understand the rate and extent of changes occurring in Yukon. Beyond the historic and projected trends for increasing precipitation, the variability of our climate is also expected to increase. This will mean an increase in extreme weather events (like storms) and greater fluctuations in precipitation (rain and snow).

Changes have started and are expected to continue to impact the distribution and abundance of vegetation, fish and wildlife in Yukon. Climate change is also expected to affect Yukon infrastructure, economy and communities, with water levels and extreme events playing a large part in this.

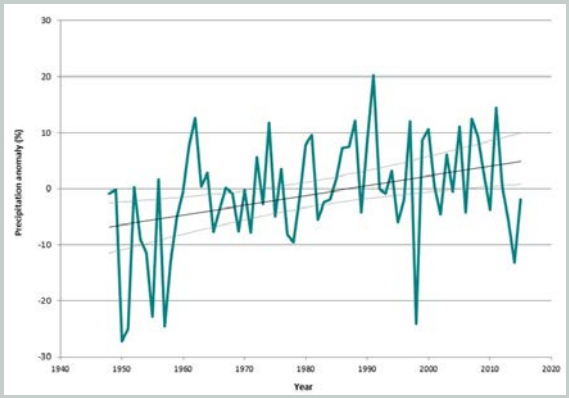
Fog at Samuel Glacier. Cathie Archbould.

What is happening?

Annual precipitation

- Precipitation variability is measured by the departure from a baseline—the 30-year average from 1961 to 1990. Precipitation departures are given as a percentage change from this average (Figure 1).
- Precipitation has increased by about six per cent over the past 50 years.
- The largest increase in precipitation occurred in summers.
- There is variability in terms of where precipitation occurs in the territory, and what time of year it occurs.

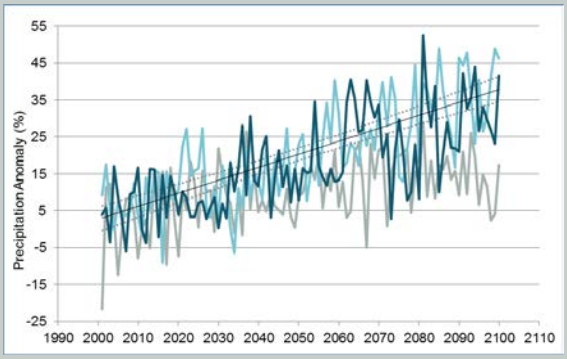
FIGURE 1: Yukon annual precipitation variability, 1950-2016



Projected precipitation

- Global studies, including the 2014 Intergovernmental Panel on Climate Change Fifth Assessment Report, show that climate scenarios project a significant increase in precipitation over the next 50 years (Figure 2).
- The three different lines in Figure 2 represent three potential precipitation futures based on emissions scenarios developed by the Intergovernmental Panel on Climate Change.
- All scenarios show an increase in precipitation and its variability.

FIGURE 2: Yukon projected annual precipitation anomalies (A2, A1B, B1).



Taking action

The Government of Yukon partnered with the Northern Climate ExChange at Yukon College on developing a *Yukon Climate Change Indicators and Key Findings* report. This cross-sector, structured, evidence-based assessment of Yukon climate change knowledge synthesizes our current understanding, providing researchers, decision-makers and the general public with an objective overview of the climate system and any potential changes. Precipitation change and projections are two indicators presented in this report.

Reducing GHG emissions in Yukon will help to reduce the long-term negative impacts of the trends presented in this indicator.

Data quality

- The data are exclusively from Environment and Climate Change Canada's Climate Trends and Variations Bulletins.
- Northern B.C. is included in Environment and Climate Change Canada's regional separation of the data, meaning the results could be skewed towards Southern Yukon.
- There is uncertainty in the identified trends for precipitation because data are collected over a large area with uneven coverage (particularly for winter precipitation), and because of differences in instrument methodology over time.

Storm clouds over St. Elias Mountains. Derek Crowe.

References

Environment and Climate Change Canada, Climate Research Branch.

2014-2015. Climate Trends and Variations Bulletins [modified 2016 Mar 22; cited 2016 Mar 3]. Available from: http://ec.gc.ca/sc-cs/default.asp?lang=En&n=A3837393-1.

Intergovernmental Panel on Climate Change (IPCC). 2014. Climate Change 2014 Synthesis Report. IPCC, Geneva, Switzerland. Available from: http://ar5-syr.ipcc.ch/.

Streicker, J. 2016. Yukon Climate Change Indicators and Key Findings 2015. Northern Climate ExChange, Yukon Research Centre, Yukon College, Whitehorse, Yukon, Canada. Available from: https://www.yukoncollege.yk.ca/research/abstracts/indicators.

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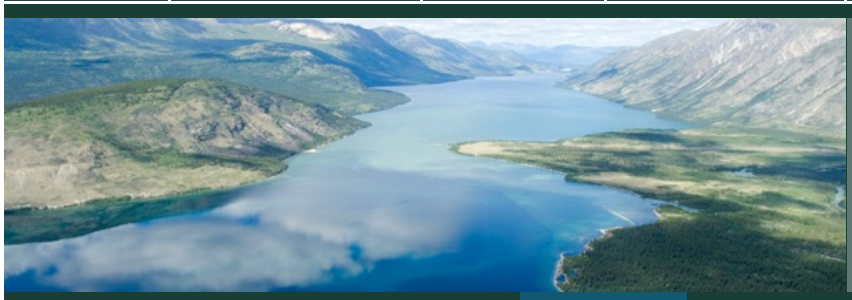

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LAKES AND RIVERS

YUKON RIVER ICE BREAK-UP AT DAWSON CITY

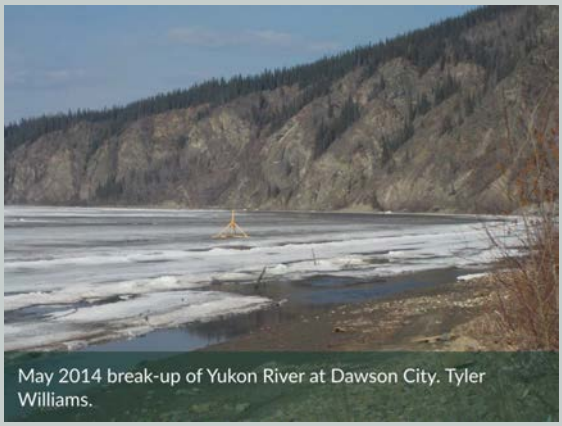
> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

The timing of river ice break-up is one factor influencing the potential for break-up severity and associated negative impacts. In general, earlier break-ups result in a compressed runoff period, increasing the potential for severe ice jams that lead to floods.

River ice conditions also affect transportation routes, both for winter roads and wildlife corridors. Earlier river ice break-up and increased severity of ice-jamming can have detrimental impacts on communities and infrastructure.

Earlier river break-up over the past century is a strong indicator of a changing climate. Warmer spring and winter temperatures contribute to reduced thickness in river ice and earlier break-ups.



May 2014 break-up of Yukon River at Dawson City. Tyler Williams.

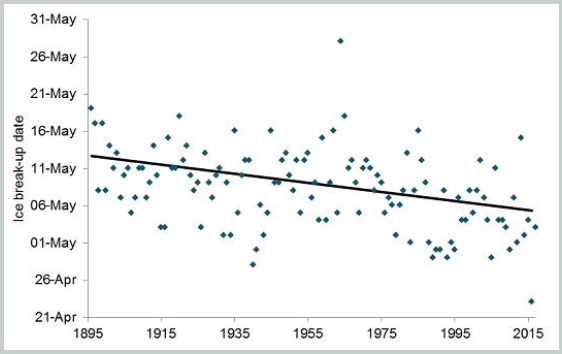
What is happening?

Ice break-up on the Yukon River at Dawson City now occurs more than seven days earlier on average than in 1896, when data collection began (Figure 1).

Eight of the ten earliest recorded break-up events at Dawson City have occurred in the past 30 years.

Yukon River. © Richard Legner 2013.

FIGURE 1: Date of ice break-up on the Yukon River at Dawson City, 1896-2017.



Taking action

Two research projects are underway in collaboration with the Emergency Measures Organization to help Yukon communities prepare for flooding events:

- Yukon flood risk mapping: using high resolution LiDAR elevation data to identify flood prone areas near Yukon communities.
- Development of flood hazard perception stages: categorizing water level stages into severity indices ("Action Stage", "Minor Flooding", "Moderate Flooding" and "Major Flooding") that determine when and what action should be taken against an impending flood.

2013 saw the most floods in Yukon in 30 years.

Data quality

- Yukon River ice break-up at Dawson City statistics and photo documentary are available at: http://www.yukonriverbreakup.com/statistics
- At first a betting tradition, the exact time and date of break-up has been recorded at Dawson since 1896.
- A tripod has been set up on the ice and connected by cable to the Danoja Zho Cultural Centre. When the ice starts moving, it takes the tripod with it and stops the clock, thereby recording the official break-up time.

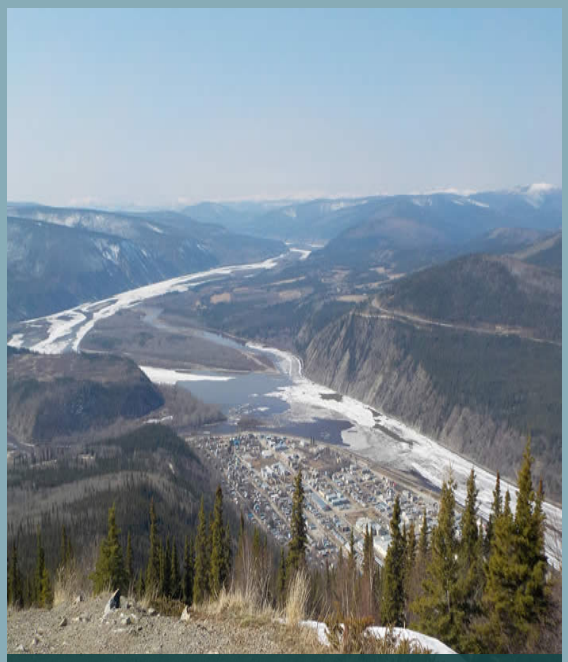
Further information

Visit www.yukonwater.ca to find information about Yukon's water resources and how our water is used, managed and monitored.

A Government of Yukon Water Resources Branch presentation about climate change and water.

PROFILE

RECORD BREAKING BREAK-UP



Spring 2016 earliest river break-up on record for the Yukon River at Dawson.

In 121 (1896 to 2016) years of recorded river break-up dates in Dawson City, the Yukon River has never given way as early as in 2016. Not only did the April 23 break-up set a new record, it smashed the record by four days, and required organizers of the annual river break-up contest in Dawson City to adjust the cut-off date for predictions. The break-up occurred two weeks earlier than average, although this shift is normal, as the average break-up date over the past 30 years has been occurring earlier.

Two primary factors contributed to the record setting river break-up date: air temperatures were well above normal for the first two weeks of April, and the winter was extremely mild. In fact, winter air temperatures in Dawson City were also record breaking and 2016 was the warmest winter on record dating back to 1902.

The mild winter led to a thin ice cover that began melting with the early arrival of above zero temperatures. The conditions caused a “thermal” break-up event, meaning there was significant melting prior to ice movement which lowered the risk of flooding. The 2016 Yukon River break-up had no major ice jams and water levels at Dawson City remained well below flood stage levels.

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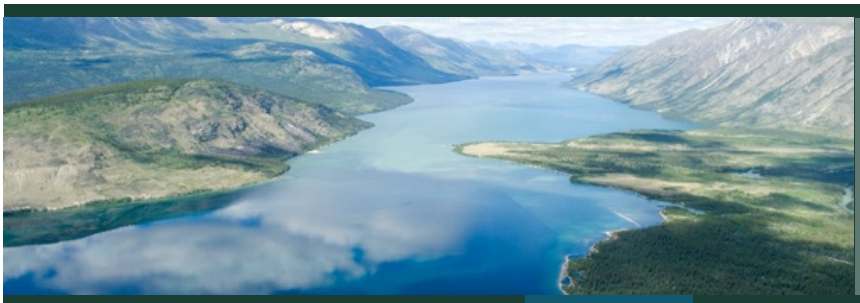

Yukon State of the Environment

Reporting on environmental indicators - 2018

LAKES AND RIVERS

WATER QUALITY INDEX RATINGS

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

The Water Quality Index, developed by the Canadian Council of Ministers of the Environment, summarizes complex water quality data using a scale from 0 to 100. Scores are categorized as:

Excellent (95-100)	Aquatic life is not threatened or impaired. Measurements never or very rarely exceed water quality guidelines.
Good (80-94)	Aquatic life is protected with only a minor degree of threat or impairment. Measurements rarely exceed water quality guidelines and, usually, by a narrow margin
Fair (65-79)	Aquatic life is protected, but at times may be threatened or impaired. Measurements sometimes exceed water quality guidelines and, possibly, by a wide margin.
Marginal (45-64)	Aquatic life frequently may be threatened or impaired. Measurements often exceed water quality guidelines by a considerable margin.
Poor (0-44)	Aquatic life is threatened, impaired or even lost. Measurements usually exceed water quality guidelines by a considerable margin.

Water quality sampling on the Klondike River.

The Water Quality Index provides the public with information about the status of water quality in Canada and identifies emerging trends. It condenses data about the quality of a water body to a number scale corresponding with a straightforward rating.

The Water Quality Index also indicates the suitability of streams to support aquatic life. It measures the frequency and extent to which selected parameters exceed water quality objectives at individual monitoring sites (Canadian Council of Ministers of the Environment, 2001).

What is happening?

The Government of Yukon, in partnership with Environment and Climate Change Canada, currently tracks three-year rolling average Water Quality Index scores for seven monitoring stations. The averages provide additional confidence in ratings.

The following table shows the recorded averages for monitoring stations using the Water Quality Index colour scale above.

Table 1: Three-year rolling average Water Quality Index scores for Yukon monitoring stations

Excellent (95-100)	Good (80-94)	Fair (65-79)	Marginal (45-64)	Poor (0-44)

Location	2003-2005	2004-2006	2005-2007	2006-2008	2007-2009	2008-2010	2009-2011	2010-2012	2011-2013	2012-2014	2013-2015	2014-2016
Dezadeash River at Haines Junction	84.2	84.2	89.5	N/A	89.5	N/A	89.5	87.1				
Klondike River above Bonanza Creek	N/A	N/A	66.8	66.6	67.4	74.2	74.2	74.2	74	73.8	73.7	73.7
Liard River at Upper Crossing	93.6	93.6	93.6	87.2	93.6	87.2	87.1	80.6	80.6		80.6	
South McQuesten River below Flat Creek	N/A	N/A	64.4	64.3	64.0	70	69.5	70.1	70.4	70.6	70	63.8
Rose Creek above Anvil Creek							65.3	80.7				
Yukon River at Marsh Lake Dam	N/A	N/A	100	N/A	100	N/A	100	100				
Yukon River above Takhini River	N/A	N/A	100	100	100	93.6	93.6	93.6	93.6	93.6	93.6	100

- Samples continued to be taken from sites on the Dezadeash River, Rose Creek, and Yukon River at Marsh Lake Dam; however, recent calculations have not been performed to determine WQI ratings at this time.

Taking action

- As guided by the *Yukon Water Strategy and Action Plan*, additional long-term monitoring networks have been added to the existing list of stations. This includes the Porcupine River at Old Crow, Haggart Creek north of Mayo, and the Eagle and Ogilvie rivers along the Dempster highway. Learn more about implementation of the Yukon Water Strategy and Action Plan.

Daglish Creek.

Data quality

- The Water Quality Index measures the frequency and amplitude to which selected parameters exceed water quality objectives.
- Information on the national Water Quality Index used to report water quality data is available through Environment and Climate Change Canada.

Further information

- Data access to these monitoring stations can be found through Environment and Climate Change Canada's Open Data Portal.
- Visit www.yukonwater.ca to find information about Yukon's water resources and how our water is used, managed and monitored.

References

Canadian Council of Ministers of the Environment. 2014. Canadian Environmental Quality Guidelines [cited 2015 June 23]. Available from http://ceqg-rcqe.ccme.ca/en/index.html

Canadian Council of Ministers of the Environment. 2001. Canadian water quality guidelines for the protection of aquatic life: CCME Water Quality Index 1.0, Technical Report. *In*: Canadian Environmental Quality Guidelines. 1999, updated 2002. Canadian Council of Ministers of the Environment, Winnipeg, Manitoba, Canada.

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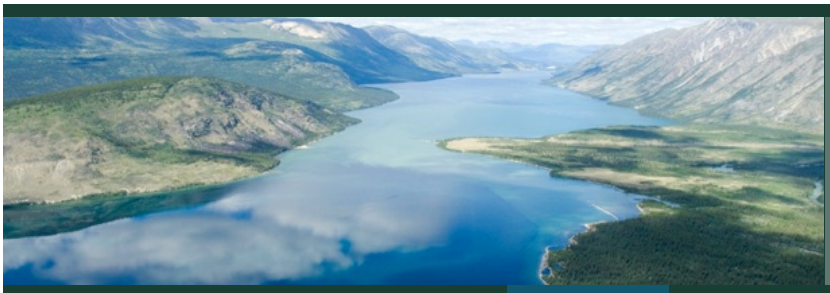


Yukon State of the Environment

Reporting on environmental indicators - 2018

LAKES AND RIVERS

EXTREME HIGH AND LOW WATER IN LAKES AND RIVERS

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Water levels in Yukon, both river flows and lake levels, are susceptible to change from a range of processes, including:

- changes to the timing of snowmelt,
- the phase and magnitude of precipitation,
- permafrost thaw,
- shifts in vegetation, and
- melting glaciers.

These are just some of the processes that can alter the flows in lakes and rivers. The response in water flows to these processes may be different in different regions of the territory.

Higher flows in lakes and rivers can cause:

- Increased sedimentation and contaminants in river systems, affecting human health, drinking water and ecosystems.
- Increased flooding potential if peak flows affect populated areas, which can result in infrastructure loss and economic costs.

Low flows in lakes and rivers can cause:

- Increased concentrations of ions, such as dissolved metals, which can negatively affect aquatic ecosystems.

Changes in water flows and groundwater can affect resource development, such as hydro power production, mining practices or agriculture, as well as the availability of water for communities and other local needs.

Increased water flows in the winter, which is generally a low-flow time

Takhini River flowing into Kusawa Lake.

of year, are a climate change driven trend. It results from warming air temperatures, degrading permafrost, and in some locations, increased precipitation. This trend is expected to continue with future warming, particularly in areas of permafrost where thaw results in increased groundwater flow connections.

What is happening?

Annual river flow

Thirty-two stations across Yukon monitor for trends in annual minimum and maximum river flows:

- Yukon River: 25 stations
- Alsek River: 3 stations
- Liard River: 3 stations
- Peel River: 2 stations
- Porcupine River: 1 station

28 of 32 long-term river stations measured significant increases over time in the volume of water flowing when the river was at its minimum. No stations indicated that there were declining flows over time (Figure 1).

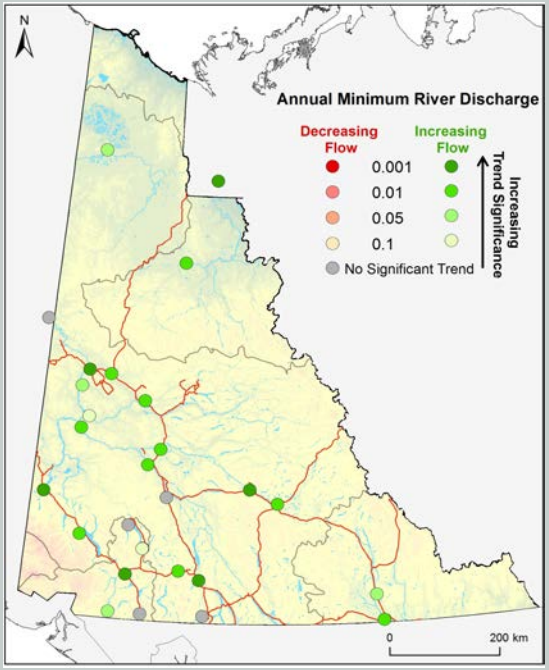
Stations with increasing low flow trends (Figure 1) had a median trend fit of +10 per cent per decade.

Figure 2 shows that most (33 of 34) long-term river stations did not show a significant trend for maximum river flow.

The Whitehorse station measured a significant decrease in annual peak flow volumes (Figure 2), but it has flow volumes which are affected by the Whitehorse dam.

The majority of stations examined are large rivers (29 of 34 are greater than 1,000 km^2).

FIGURES 1-2: Annual minimum and maximum river flow. Period of record varies by station and has information to 2013.



Annual lake levels

In Yukon, there is monitoring for trends in the annual minimum and maximum water levels at six Yukon lakes:

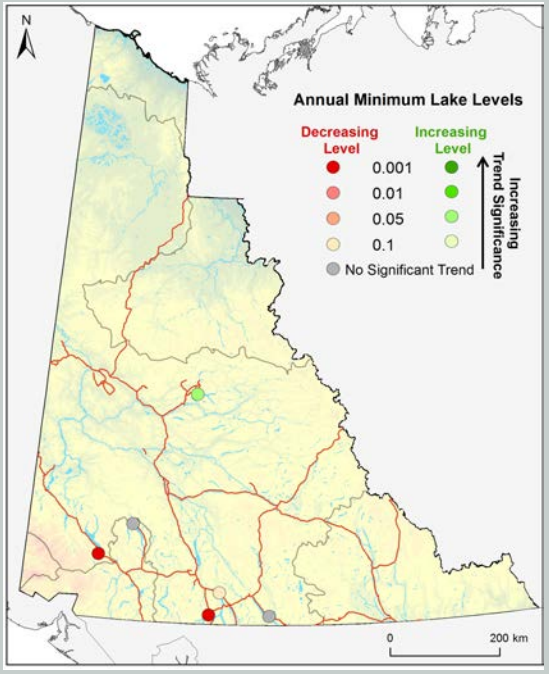
- Bennett Lake
- Kluane Lake
- Marsh Lake
- Mayo Lake
- Aishihik Lake
- Teslin Lake

Three lakes (Bennett, Kluane and Marsh Lake) showed significant declines in low water levels over time (Figure 3); Marsh Lake levels are influenced by the control structure associated with the Whitehorse dam.

Marsh Lake showed a significant increasing trend in high water levels of 0.5 cm per decade (Figure 4); Marsh Lake is a regulated system because of the Whitehorse dam, but the control structure has a minimal effect during periods of high water levels.

Mayo Lake showed significant increases in both low and high water levels; these levels are influenced by the Mayo dam.

FIGURES 3-4: Annual minimum and maximum lake levels. Period of record varies by station and has information to 2013.



Taking action

Two research projects are underway in collaboration with the Emergency Measures Organization to help Yukon communities prepare for flooding events:

- Yukon flood risk mapping: using high resolution LiDAR elevation data to identify flood prone areas near Yukon communities.
- Development of flood hazard perception stages: categorizing water level stages into severity indices ("Action Stage", "Minor Flooding", "Moderate Flooding" and "Major Flooding") that determine when and what action should be taken with an impending flood.

PROFILE

MEASURING WATER VELOCITY

Testing the Acoustic Doppler Profiler on the Yukon River.

MEASURING WATER VELOCITY

The traditional way that the Department of Environment's Water Resources Branch has measured discharge (volume of flow) in the creeks and rivers we monitor is to wade into the water and measure the depth and velocity at multiple points using a mechanical instrument, and use this information to calculate the total flow. One of the biggest challenges is that when the water levels rise, the creeks become impossible or dangerous to wade into. Therefore, we become unable to get measurements at the high flow water levels that are often of the most interest. Previous alternatives to wading into the water were often elaborate, expensive, time- consuming, and did not always produce quality data.

The new instrument Water Resources Branch will start using in spring 2016 is a type of Acoustic Doppler Profiler. The sensor is mounted on a pontoon that floats across the surface of the water; it shoots high frequency sound waves into the water column which are reflected off particles in the water. Using the Doppler Effect (the same effect you notice when the pitch of an ambulance siren moving towards you sounds different then when it's moving away from you) the sensor can determine how fast the water is moving throughout the water column. The sensor produces a visual of this (see the figure), where different colours show different velocities. It also maps out the precise shape of the stream bottom and so is able to produce high resolution data which is used to calculate the total flow.

This technology will produce better data, it will reduce the time needed to perform a measurement, and it will keep field workers safer.

Data quality

- The Water Survey of Canada conducts long-term measurements of large rivers and lakes. They provide summaries of annual peak high and low flows based on daily mean flows and water levels.
- The Water Survey of Canada provides public access to hydrometric data,
- All stations included in the analysis are active sites that have at least 30 years of peak flow data. The oldest station on record began collecting data in 1943.
- Data from the Water Survey of Canada is typically released two years after data collection; currently data is available to 2013.
- The majority of stations have a minimal number (less than 5 per cent) of missing years in the record.

Further information

- Visit www.yukonwater.ca to find information about Yukon's water resources and how our water is used, managed and monitored.
- A Government of Yukon Water Resources Branch presentation about climate change and water.

References

Environment and Climate Change Canada. n.d. Water Survey of Canada Historical Hydrometric Data. Available from: www.wateroffice.ec.gc.ca

Helsel, D.R., D.K. Mueller, and J.R. Slack. 2006. Computer Program for the Kendall Family of Trend Tests: U.S. Geological Survey Scientific Investigations Report 2005–5275. U.S. Geological Survey, Reston, Virginia U.S.A. Available from: http://pubs.usgs.gov/sir/2005/5275/pdf/sir2005-5275.pdf.

Measuring water levels on Boulder Creek.

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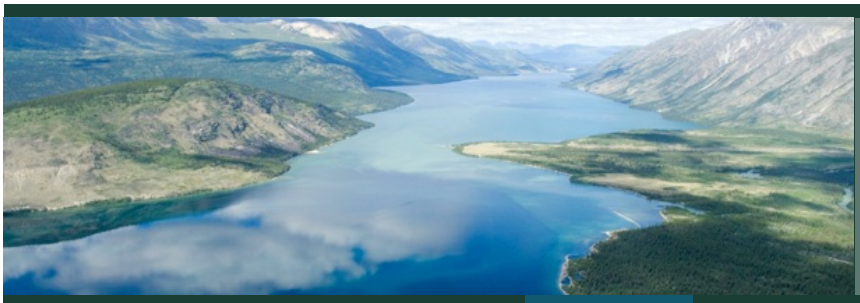

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FROZEN

ARCTIC SEA ICE EXTENT AND VOLUME

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Sea ice melt is the most apparent global indicator of climate change, and is especially relevant for the circumpolar North. As the Earth's energy balance alters, most of the energy goes into the oceans and the remainder into ice, soil and the atmosphere. The Arctic Ocean is a confluence of these three elements.

Arctic sea ice is melting, indicated by changes in the extent of ice across Arctic and northern oceans as well as changes in the thickness (volume) of that ice. Less and less ice is surviving from one year to the next, and the ice that is lasting for more than one season is thinning significantly.

The net result, if this trend continues, is that summer sea ice will melt out in the Arctic within the next decade or decades. This has wide ranging implications for the Arctic and the globe, including sea level rise, increased coastal erosion, damage to human infrastructure and negative impacts on species that depend on sea ice.

Ice on the Beaufort Sea.

What is happening?

- Arctic sea ice is melting, reducing both the area that it covers every year and its overall volume.
- Sea ice melt appears to be accelerating, with most of the melt occurring in the past decade.
- September sea ice loss averages 90,000 km^2 per year, although there is significant variability from one year to the next.
- Figure 2 shows the annual Arctic September sea ice volume (in

FIGURE 1: Arctic September Sea Ice Extent

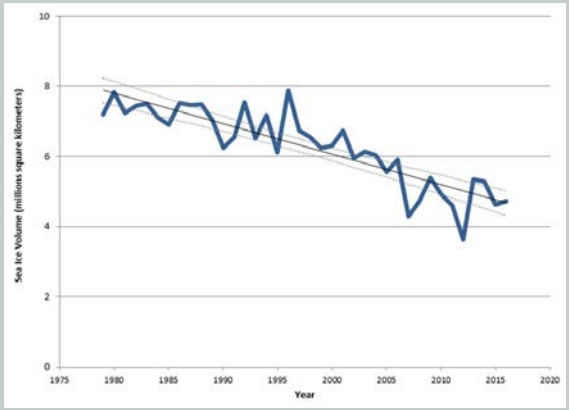
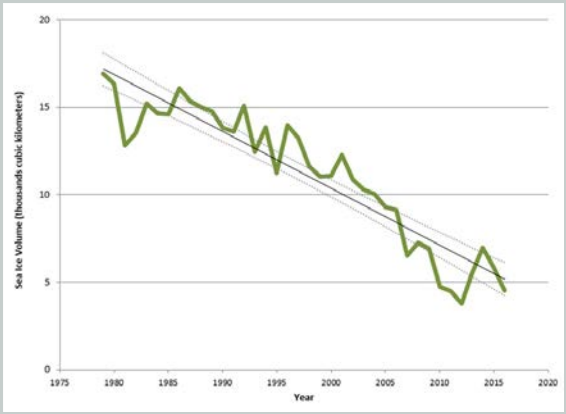


FIGURE 2: Arctic September Sea Ice Volume



Taking action

The Government of Yukon partnered with the Northern Climate ExChange at Yukon College on developing a *Yukon Climate Change Indicators and Key Findings* report. This cross-sector, structured, evidence-based assessment of Yukon climate change knowledge synthesizes our current understanding, providing researchers, decision makers and the general public with an objective overview of the climate system and any potential changes. Sea ice extent and volume are two indicators presented in this report.

Reducing GHG emissions in Yukon will help to reduce the long-term negative impacts of the trends presented in this indicator.

Beaufort Sea, ice along Herschel Island shoreline.

Data quality

- Since sea ice has such a wide annual variation in distribution, it is typical to compare data from a particular month over time. Most often September is used as sea ice reaches its minimum extent each year in September.
- The National Snow and Ice Data Centre gather satellite data to make calculations for sea ice extent. You can find this data online.
- For sea ice volume, data is made available by the University of Washington Pan-Arctic Ice-Ocean Modeling and Assimilation System (PIOMAS) online.

References

National Snow and Ice Data Center. 2015. Sea Ice Index, Version 1. University of Colorado, Boulder, Colorado, U.S.A. Available from: http://nsidc.org/data/g02135.html

Polar Science Center, Applied Physics Laboratory. 1979-2016. PIOMAS Daily Ice Volume Data, 1979-present [cited 2016, Mar 3]. University of Washington, Seattle, Washington, U.S.A. Available from: http://psc.apl.uw.edu/research/projects/arctic-sea-ice-volume-anomaly/data/

Streicker, J. 2016. Yukon Climate Change Indicators and Key Findings 2015. Northern Climate ExChange, Yukon Research Centre, Yukon College, Whitehorse, Yukon, Canada. Available from: https://www.yukoncollege.yk.ca/research/abstracts/indicators.

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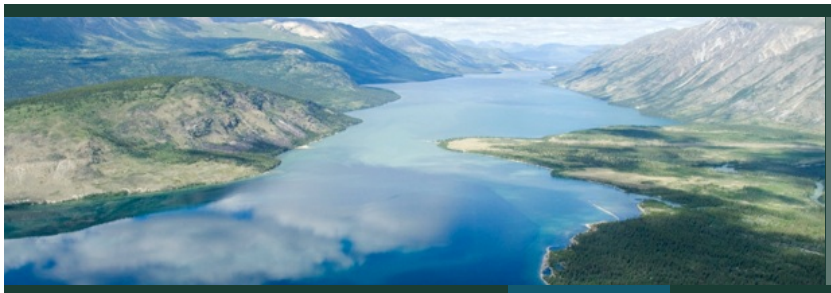

Yukon State of the Environment

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FROZEN

SNOW ACCUMULATION

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

The accumulation of snow is determined through measuring the snow water equivalent at survey stations across Yukon. This is a measurement of the liquid water volume held within a snowpack that can be available when melted.

- Larger snowpacks (with more water) contribute to an increased likelihood of higher spring flows . Therefore, measuring the snow accumulation through snow water equivalent is a major component of spring flood forecasting.
- The size of snowpack can also influence the timing and severity of river ice break-up.
- Larger snowpacks (deeper snow) act to further insulate the ground surface from cold winter air temperatures and can further promote permafrost thaw.
- Many other processes also have the potential to be influenced by changes in snow water equivalent including wildfire risk, shifts in vegetation, soil thermal regimes, and transportation.
- Warming spring air temperatures over the past several decades leads to earlier snowmelt, and this trend is expected to continue.
- Climate change projections generally indicate an increase in winter precipitation over a shorter snowfall period, and a higher proportion of precipitation occurring as rainfall. These contradicting processes to snow accumulation may induce a complex response that may vary significantly by region and over time.

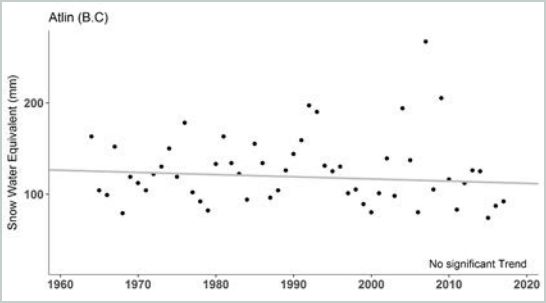
Wolf Creek snow survey.

What is happening?

There has been a significant increase in the snow water equivalent, measured at three of the 14 long-term snow survey stations analysed. None of the sites measured showed significant decreasing trends. Including all 14 locations, the average increase in snow water equivalent per decade is 3 per cent. There are no stations with long-term records available in the far north of the territory.

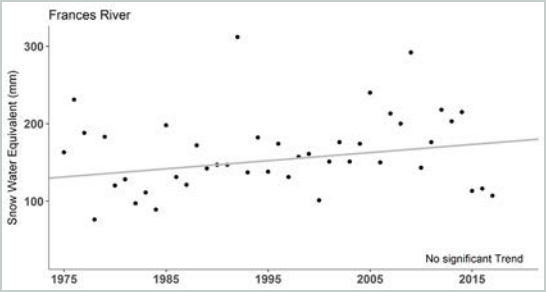
Since the trends were last updated, there have been two years of below average snow throughout most of the territory. This has resulted in three locations that previously indicated significant increasing trends (Watson Lake, Frances River, and King Solomon Dome) to fall slightly below what is considered statistically significant (p-values <0.1). The influence of recent years does not change the overall interpretation of the data, which in general, suggest an increasing maximum snowpack over time, resulting from an increase in winter precipitation.

FIGURES 1-4: Snow accumulation in upper Yukon drainage



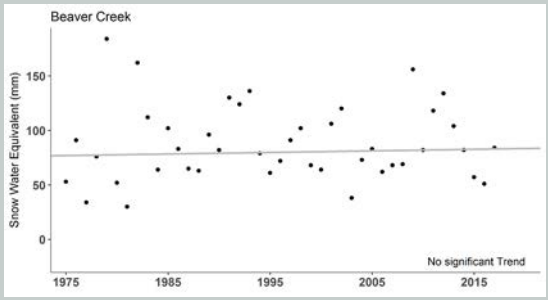
- The stations at both Log Cabin and Meadow Creek showed significant increasing trends in snow accumulation; these were +6 per cent and +4 per cent per decade, respectively.

FIGURES 5-6: Snow accumulation in Liard drainage



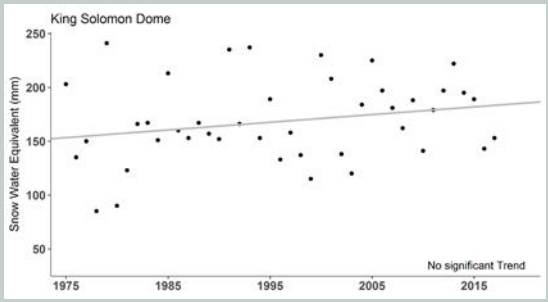
- Recently low snow years have resulted in no significant trends within the Liard drainage.

FIGURES 7-10: Snow accumulation in Central Yukon drainage



- There were no significant trends noted at any of the Central Yukon stations.

FIGURES 11-14: Snow accumulation in Lower Yukon – Peel drainage



- May Airport shows a significant increasing trend in snow accumulation of 5 per cent per decade.

Dog mushing in Ibex Valley. F. Mueller.

Taking action

The Department of Environment's Water Resources staff continue to collect data, as do their partners in Yukon's remote areas including private contractors and staff from the Department of Energy, Mines and Resources. Water Resources compiles and quality controls all snow accumulation data.

Snowmobiling at Fish Lake. Marten Berkman.

Data quality

- Access archived snow survey bulletins: http://www.env.gov.yk.ca/air-water-waste/snow_survey.php
- Current snow survey data from across Alaska and Yukon can be viewed on an interactive map made available through a United States Department of Agriculture webpage.
- There are currently 52 snow survey stations located across Yukon, with an additional four in adjacent areas of Alaska and British Columbia that are used by Water Resources. Most areas of Yukon have good spatial coverage with the exception of the far north, where stations are sparse.

Further information

- Visit http://www.yukonwater.ca to find information about Yukon's water resources and how our water is used, managed and monitored.
- A Government of Yukon Water Resources Branch presentation about climate change and water.

References

A.I. McLeod (2011). Kendall: Kendall rank correlation and Mann-Kendall trend test. R package version 2.2. Available from: https://CRAN.R-project.org/package=Kendall.

H. Wickham. ggplot2: Elegant Graphics for Data Analysis. Springer-Verlag New York, 2009.

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PLANNING

Population of Yukon	Yukon's population is on the rise. Population density is only 0.1 people per square kilometer.
Regional land use planning	There are seven planning regions identified in Yukon with plans completed for one region.
Forest resources management planning	Forest resources management plans are in place for the Tr'ondëk Hwëch'in, Teslin Tlingit, and Champagne and Aishihik Traditional Territories.
Community and local area planning	In order to plan for long-term sustainability, all eight Yukon municipalities have official community plans and there are local area plans for eight of Yukon's unincorporated communities.
Status of parks and protected areas	Land identified for conservation purposes in Yukon amount to a total of 63,275 km^2 of the territory. Of that, 61,486 km^2 or 12.7 per cent are protected lands.

LAND USE ACTIVITIES

Environmental and socio-economic assessments

The Yukon Environmental and Socio-economic Assessment Board assessed 190 project proposals in 2014. The majority of project assessments were received in the Whitehorse and Dawson City areas.

Recreational land use

In 2016, the Government of Yukon's campgrounds included 42 campgrounds and 12 day-use recreation sites. Yukon residents are increasingly using territorial campgrounds.

SOLID WASTE

Waste handled at the Whitehorse Waste Management Facility

The total amount of waste diverted from the Whitehorse landfill by composting and recycling has increased by 63 per cent since 2012.

FORESTS

Area of fire burned annually and number of Yukon wildland fires

Dramatic fluctuations in area burned occur annually. Fires greater than 200 hectares usually represent a small percentage of all fires but account for most of the overall area burned.

Fire ignition points

Human caused fires are clustered near settlements and roads; in most cases, the area burned by human caused fires is small in relation to the area burned by naturally occurring fires.

Forest health

The most significant disturbance detected in the 2015 Forest Health Survey was caused by large aspen tortrix—a moth that defoliates trembling aspen.

WETLANDS

Wetlands

There have been a number of wetland initiatives carried out by the Government of Yukon over the last 15 years, including wetland classification, best practices, environmental assessment, inventory, management planning for specific wetlands, and monitoring of environmental change.

ALIEN AND INTRODUCED SPECIES

Presence of alien and introduced species

As of November 2016, an estimated 166 alien plant species have been identified in Yukon. Twenty of these are considered invasive. Other species that have been introduced to Yukon include three mammal, four bird, and two fish species.

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PLANNING

POPULATION OF YUKON

> SIGNIFICANCE > WHAT IS HAPPENING?

Significance

Human population can have an impact on the state of the environment based on:

- how many people there are (population growth);
- where those people live (population distribution); and
- how close in proximity they live (population density).

Keeping track of these three population indicators can help in analyzing and predicting the impact that human activities can have on the environment.

The distribution and density of Yukon's population may have an impact on where land use activities take place; however, land use is also determined by opportunities for development. For information on Yukon's economy, visit the Yukon Bureau of Statistics. Land use activities in Yukon are managed through environmental assessments, permitting and land use planning.

People enjoying the Dawson City Music Festival.

What is happening?

Overall, Yukon's population density is very low. On the 2011 census, there were 0.1 people for every square kilometer in Yukon.

Table 1: 2017 Population, growth, and density of Yukon communities.

	2017 population	Population growth from 2017 (per cent change)	2011 Population density (people per square kilometer)
BEAVER CREEK	109	-0%	3.8
BURWASH LANDING	108	-4.4%	3.2
CARCROSS	499	-2.9%	20.3
CARMACKS	551	1.3%	13.6
DAWSON CITY	2,226	3.2%	40.7
DESTRUCTION BAY	55	12.2%	2.6
FARO	397	0.8%	1.7
HAINES JUNCTION	909	0.4%	17.2
MAYO	449	-7.0%	213.2
OLD CROW	257	0.0%	17.3
PELLY CROSSING	395	2.3%	10.4
ROSS RIVER	401	-1.0%	17.1
TAGISH	263	2.7%	8.6
TESLIN	514	1.4%	65.7
WATSON LAKE	1,464	0.3%	131.3
WHITEHORSE / MARSH LAKE	29,758	1.7%	7.5
YUKON TOTAL	38,355	0.1%	0.1

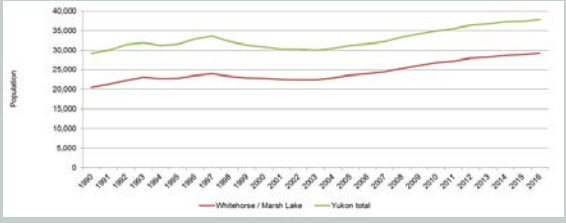
Yukon's population is not distributed evenly across the territory. There are many more people residing in southern Yukon, with approximately 77 per cent living in the Whitehorse/Marsh Lake area. The population density of this area, however, is still low at 7.5 people per square kilometer because the population totals incorporate Whitehorse and all surrounding areas (e.g., Ibex Valley, McPherson/Grizzly Valley, Marsh Lake and Mount Lorne).

Over the past 10 years (June 2007 to June 2017), the population increased by 6,243 people, or 19.4 per cent. Over the past year (June 2016 to June 2017), the total Yukon population increased by 597 people, or 1.6 per cent. The increase in population is mostly due to growth in the Whitehorse/Marsh Lake area. Population density is only 0.1 people per square kilometre.

Yukon's community populations have been fairly stable since 1990. One exception is Faro, as the population was tied to the operation of the Faro mine that closed in April 1993, reopened in August 1995 and then closed permanently in January 1998.

For more information on Yukon community socio-economics visit the Government of Yukon Socio-Economic Web Portal.

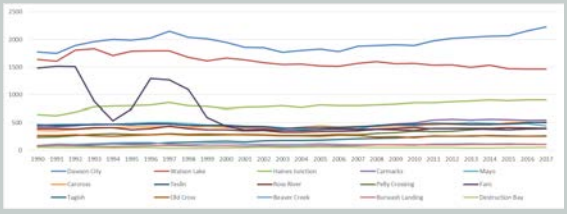
FIGURE 1: Population of Whitehorse compared to total population in Yukon.



* Due to a change in methodology in 2015, revised figures for the period from April 2011 to December 2014 are not strictly comparable to figures prior to that period.

Haines Junction.

FIGURE 2: Yukon community populations, 1990-2017.



* Due to a change in methodology in 2015, revised figures for the period from April 2011 to December 2014 are not strictly comparable to figures prior to that period.

Data quality

Population density is calculated during the Statistics Canada census; therefore, the most current data is from 2011. For the census, Statistics Canada divides data into 37 geographic census subdivisions that are different from the community divisions that Yukon Bureau of Statistics uses for population estimates. For this reason, use population density information with care.

Street fair in Whitehorse.

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PLANNING

REGIONAL LAND USE PLANS

> SIGNIFICANCE > WHAT IS HAPPENING?

Significance

Developing long-term land use plans through public processes helps governments recognize and balance competing views about how lands and natural resources should be used.

Plans support effective land and resource management and are important obligations arising from Yukon First Nation Final Agreements. Chapter 11 of the Yukon First Nation Final Agreements established the regional land use planning process and represents a commitment by the governments to conduct regional land use planning in Yukon. Through land use planning, a regional commission appointed by Yukon and First Nation governments prepares a regional land use plan in consultation with First Nations, stakeholders and residents. The plans are approved by Yukon and First Nation governments and guide the future use and sustainable development of land in the planning region.

Regional planning is intended to reflect the traditional knowledge, experience and recommendations of residents, as well as incorporate science and broad socio-economic and environmental interests.

What is happening?

The Yukon Land Use Planning Council has proposed seven planning regions in Yukon. See interactive map and table below.

- One regional plan, the North Yukon Regional Land Use Plan, has been completed in 2009 and is being implemented.
- No other regional land use planning processes are currently underway in Yukon. Various projects by the Yukon Land Use Planning Council are underway to lend clarity to how regional land use planning will be conducted in the future.

Regional Land Use Plans	Status	
Dawson	On Hold	The Dawson Planning Commission produced and consulted on a Resource Assessment Report and Plan Alternatives. In December 2014, the Yukon government, Vuntut Gwitchin First Nation, and Tr'ondek Hwech'in (the Parties) agreed to pause the Dawson planning process until the litigation regarding the Peel Watershed regional land use plan has concluded, and the Parties agree to a path forward for planning in the Dawson region.
North Yukon	Current 2009	In 2009, the Vuntut Gwitchin First Nation and Yukon government approved the North Yukon Regional Land Use Plan. It provides a sustainable development framework for land management, while addressing the key issues of oil and gas development in Porcupine caribou herd habitat and development impacts in wetlands. The plan also recommends protected area status for the Whitefish Wetlands and the Summit Lake-Bell River area. It identifies important traditional use and wildlife areas that were mapped from local and traditional knowledge.
Peel Watershed	On Hold	Land use planning began for the Peel watershed in 2004 and the planning commission produced a recommended land use plan in 2011. The process is currently on hold while awaiting the outcome of a supreme court hearing on the plan. A staking moratorium across the Peel Watershed regional land use planning Region has been in place since during the planning process, which expires on January 1, 2018. Land use planning will continue for the Peel Watershed region once the final outcome from the Peel court challenge is known and the Parties agree on a path forward.

Teslin	On Hold	A previous planning process for the Teslin region was suspended in 2004 before a Draft Plan was produced. In September 2011, the Yukon Land Use Planning Council recommended the Teslin Region as a priority planning region and work has begun on a Terms of Reference for a planning commission but is on hold until the outcome of the Peel watershed case is known.
Northern Tutchone	Not Started	Planning in this region has not been initiated.
Kluane	On Hold	In September 2011, the Yukon Land Use Planning Council recommended the Kluane Region as a priority planning region and preliminary work has begun on a Terms of Reference for a planning commission but is on hold until the outcome of the Peel watershed case is known.
Whitehorse	Not Started	Planning in this region has not been initiated.
White River	N/A	Regional planning as envisioned under the Umbrella Final Agreement does not apply to White River as White River First Nation does not have a Final Agreement.
North Slope	N/A	The Yukon North Slope is part of the Inuvialuit Settlement Region. As such, the provisions set out in the *Inuvialuit Final Agreement* speak to how land use planning processes are to be undertaken. The Final Agreement provides for the Inuvialuit to be effectively involved in all bodies, functions, and decisions pertaining to land and wildlife management in the Inuvialuit Settlement Region.
Kaska	N/A	Regional planning as envisioned under the Umbrella Final Agreement does not apply to asserted Kaska traditional territory, as Kaska does not have a Final Agreement.

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PLANNING

FOREST RESOURCES MANAGEMENT PLANNING

> SIGNIFICANCE > WHAT IS HAPPENING?

Significance

Forest resources management, as defined in the *Forest Resources Act*, means:

> The practical application of scientific, biological, social, cultural and economic information and traditional knowledge of first nations to the management, use and conservation of forests to meet specific public interest goals and objectives, while maintaining the productivity and health of the forest.

The *Forest Resources Act* outlines the planning process, purpose, and scope of forest resources management plans in accordance with Chapter 17 of First Nations Final Agreements.

The completion of a forest resources management plan is the first step in ensuring certainty for a timber harvesting land base. In following with the principles of these strategic level plans, a new annual allowable cut is to be determined using the information from a timber supply analysis. The timber supply analysis is a technical process that considers what sustainable harvest levels and economic opportunities may look like within the planning area while integrating ecological, traditional, heritage and other community values. The determination of an annual allowable cut for public lands within a planning region sets the amount of timber that can be harvested according to the results of the timber supply analysis, strategic direction in the forest resources management plan and community input

There are three levels of Yukon forest planning: forest resources management plans, timber harvest plans and site plans. These plans are part of the suite of forest management tools available under the Forest Resources Act in order to promote sustainable use of forest resources.

PROFILE

DO FOREST HARVESTING TECHNIQUES IMPACT CARIBOU HABITAT?

Bull caribou.

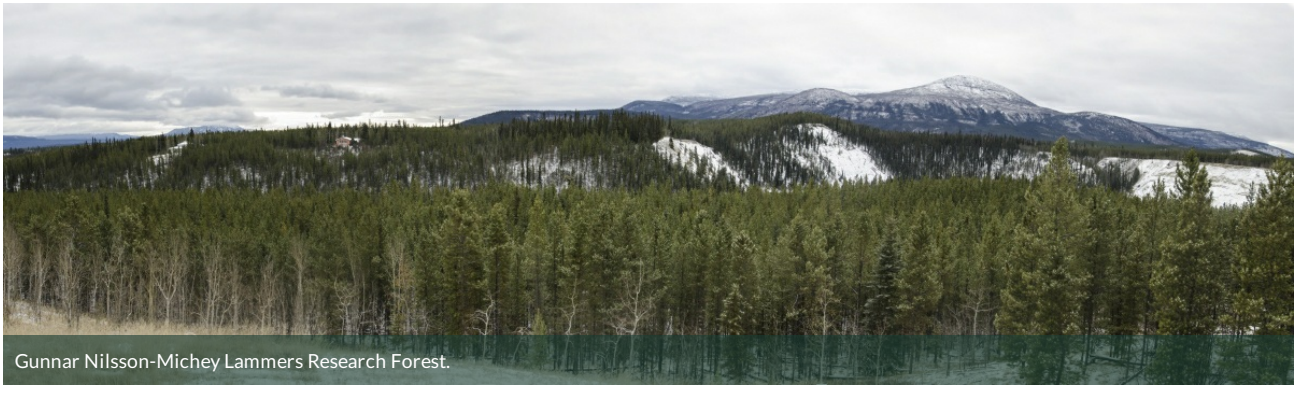
traditional, heritage and other community values. The determination of an annual allowable cut for public lands within a planning region sets the amount of timber that can be harvested according to the results of the timber supply analysis, strategic direction in the forest resources management plan and community input.

There are three levels of Yukon forest planning: forest resources management plans, timber harvest plans and site plans. These plans are part of the suite of forest management tools available under the *Forest Resources Act* in order to promote sustainable use of forest resources.

What is happening?

- Plans have been completed for the Tr'ondëk Hwëch'in, Teslin Tlingit Council, and Champagne and Aishihik First Nations Traditional Territories.
- In 2013, the Champagne and Aishihik First Nations and the Government of Yukon signed a renewed three-year implementation agreement that enables the parties to continue working collaboratively under the *Strategic Forest Management Plan for the Champagne and Aishihik Traditional Territory* (2004).
- The Government of Yukon and Tr'ondëk Hwëch'in have been working collaboratively under a memorandum of understanding since 2014 for implementation of the Dawson forest resources management plan.
- Work is underway to produce a forest management plan in the Whitehorse/ Southern Lakes planning area. The process includes participation from the Carcross/Tagish First Nation, the Kwanlin Dün First Nation and the Ta'an Kwäch'än Council.
- Timber supply analysis processes are nearing completion in the Haines Junction and Dawson planning regions. A new forest vegetation inventory and detailed aerial photography are available for Haines Junction and Whitehorse.

Forest Resources Management Plans	Status
Strategic Forest Management Plan for the Champagne and Aishihik Traditional Territory	Current 2004
Dawson Forest Resources Management Plan	Current 2013
Forest Management Plan for the Teslin Tlingit Traditional Territory	Current 2007
Integrated Landscape Plan for the Champagne and Aishihik Traditional Territory	Current 2007
Southern Lakes Forest Resources Management Plan	Underway
Southeast Forest Resources Management Plan	On hold



Gunnar Nilsson-Michey Lammers Research Forest.

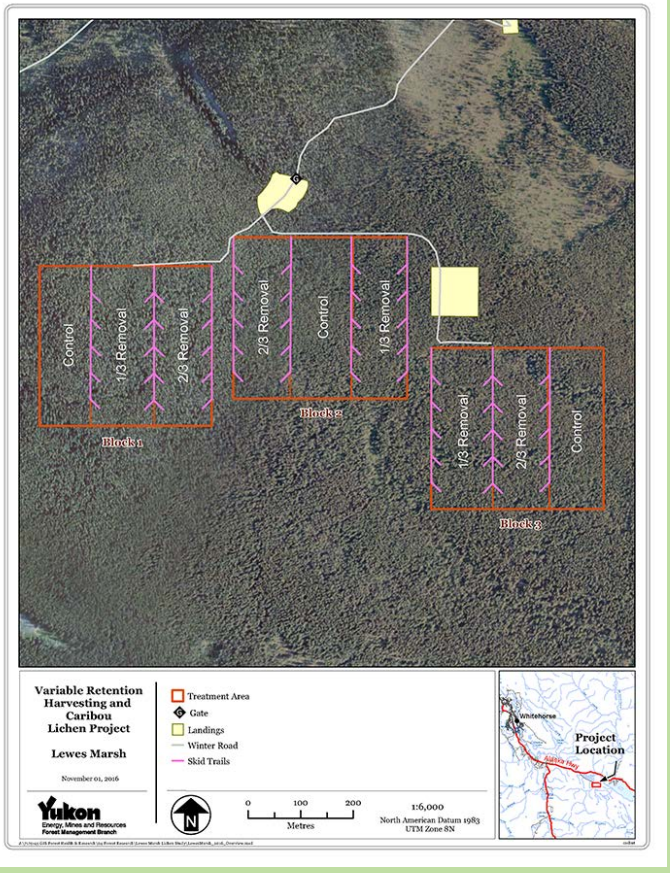
DO FOREST HARVESTING TECHNIQUES IMPACT CARIBOU HABITAT?

Since 2009, the departments of Energy, Mines and Resources and Environment have been working on a long-term study identifying the effects that forest harvesting has on caribou habitat, specifically the abundance of terrestrial lichen in the Lewes Marsh area.

During the winters of 2014-15 and 2015-16, variable retention harvesting was completed in three-9 ha blocks that were divided into three treatment units (1/3 basal area removal, 2/3 basal area removal and 100 per cent retention– non-harvested controls).

Post-harvest vegetation assessments were conducted in the summer of 2016. Baseline data was gathered and will be used to measure the relationship between canopy closure and lichen abundance in response to forest harvesting.

A video was prepared in cooperation with staff from Forest Management branch and Yukon Environment. Please click on this link to view: https://www.youtube.com/user/emryukongovernment



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PLANNING

COMMUNITY AND LOCAL AREA PLANNING

> SIGNIFICANCE > WHAT IS HAPPENING?

Significance

Long-term planning helps to define a community's vision for the future and how it can move forward in that direction. Plans provide guidelines and policies to balance competing views for land use, and make sure that future development and growth occur in an orderly manner.

Planning provides property owners and local residents with the opportunity to influence the decisions about the use of land in their community while ensuring that broader public interests are taken into consideration, such as those identified through Yukon and First Nation government legislation and policies.

Yukon has eight municipalities that are required by the *Municipal Act* to develop official community plans. These documents guide land use and development within their boundaries. A local area plan is a similar document that is prepared for areas outside of municipalities. While there is no legislative requirement for developing these, the governments of Yukon and First Nations have been working on developing local area plans to ensure the orderly development of unincorporated communities in Yukon.

What is happening?

Official Community Plans

- All eight Yukon municipalities have official community plans.


Carcross.

Table 1: Status of planning for municipalities in 2017

Official Community Plans	Approved
Faro	2014
Carmacks	2013
Haines Junction	2013
Dawson	2016 (Amendment to original plan)
Teslin	2010
Watson Lake	2016 (Amendment to original plan)
Whitehorse	2016 (Amendment to original plan)
Mayo	2016 (Amendment to original plan)

Local Area Plans

Local area planning is done for unincorporated communities and typically includes private lands, Yukon public lands, and Settlement Lands. As official community plans, local area plans include policies and maps that designate (or "zone") areas for different uses, such as Residential, Recreational or Industrial.

With the exception of the Carcross/Tagish First Nation Self-Government Agreement, local area plans are not required by law. However, once a plan has been developed, plan provisions can be enforced through legislation and policies, such as the *Subdivision Act* and the *Area Development Act*.

The *Subdivision Act* requires any subdivision to conform to a local area plan. The *Area Development Act* stipulates the development of development area (zoning) regulations that are based on the policies of an applicable local area plan. Besides dividing areas into specific classes of land use such as Downtown Residential, Public Use or Light Industrial, zoning regulations also state how a parcel can be developed, such as the number of dwellings, their height, use and setback from property lines. Zoning regulations are enforced through development permits.

In the past, zoning regulations have been developed without first developing a local area plan. Today, governments strive to develop local area plans before developing zoning regulations in order to ensure that local residents' and First Nations' perspectives are integrated into the planning process and resulting plan.

- In 2016, eight local area plans were in place.
- Local area planning processes are currently underway for three areas: Marsh Lake, Fox Lake and Tagish (Table 2).
- For up-to-date information about local area plans and to access completed plans, visit the Department of Energy, Mines and Resources website.

Table 2: Status of local area plans and development area (zoning) regulations for unincorporated communities in 2017

Development Area	Local Area Plan (date of approval)	Zoning Regulation (date of approval or last comprehensive update)
Carcross	2014	1976
West Dawson/Sunnydale	2013	1990
Golden Horn	2004	2011
Watsíx Eetí	Part of Golden Horn Local Area Plan	2011
Hotsprings Road	2002	2005
Deep Creek	2001	2011
Hamlet of Ibex Valley	2001	2010
Hamlet of Mount Lorne	1995	2006
Marsh Lake	Underway	None
M'Clintock Place	Part of future Marsh Lake Local Area Plan	1996
Fox Lake	Underway	None
Tagish	Underway	None
Remote Recreational Lots (Lake Bennett and Tagish Lake)		2014

Fox Lake Local Area Plan, public meeting.

Dutch Harbour Remote Recreational Lots		2016
Mayo Road		2013
Little Teslin Lake Recreation		2010
Jackfish Bay		2000
Grizzly Valley		1996
Klondike Valley		1992
Mendenhall		1990
Pine Lake		1990
Bear Creek		1983
Destruction Bay		1980
Dempster Highway		1979
Ross River		1978
Whitehorse Periphery		1978

NOTE: Bolded areas indicate where area plans have been or are being developed between the governments of Yukon and First Nations.

References

Yukon Department of Energy, Mines and Resources. 1988-2016. Local area plans [modified 2015 Dec 29; cited 2016 Mar 3]. Available from: http://www.emr.gov.yk.ca/landplanning/local-area-plans.html.

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PLANNING

STATUS OF PARKS AND PROTECTED AREAS

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Protecting parts of the land base provides a foundation for protecting biodiversity, and ecological and cultural heritage. In 1992, Canada and 167 other countries signed the *Convention on Biological Diversity*. Part of this agreement includes establishing networks of protected areas to conserve biodiversity.

The International Union for the Conservation of Nature defines a protected area as "A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values" (Dudley 2008). Canada has indicated its support for this definition.

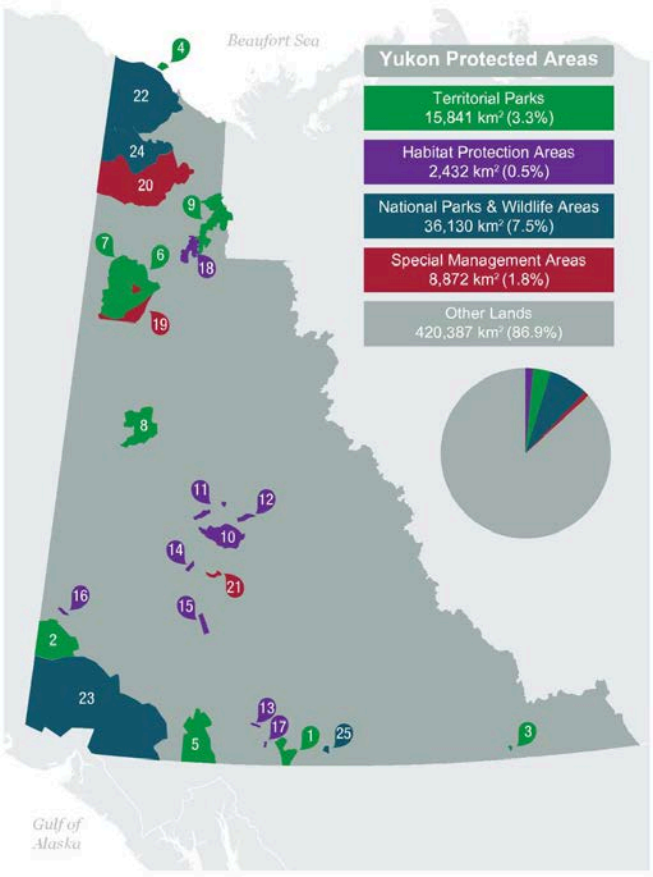
A protected area is land that has been withdrawn from resource and industrial development—mining, oil and gas, logging, dams and land dispositions—and where conservation is the primary objective within the area.

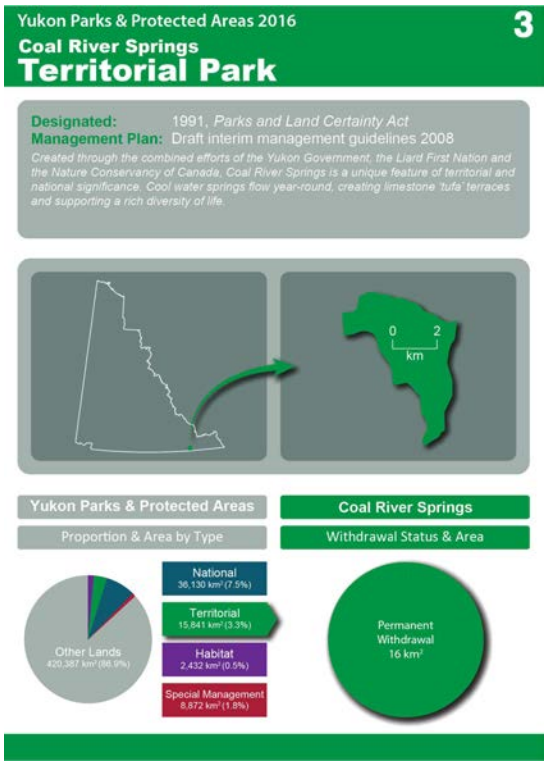
Many protected areas in Yukon were first recognized as special management areas in First Nation Final Agreements. More recently, protected areas are being identified through the regional land use planning process. Yukon has several types of protected areas: national parks and reserves, national wildlife areas, territorial parks, habitat protection areas and special management areas.

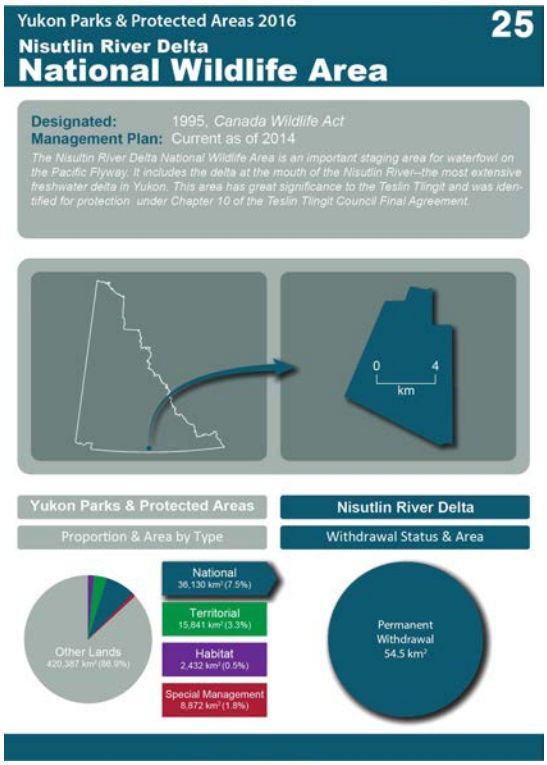
Lewes Marsh Habitat Protection Area.

What is happening?

Currently, Yukon has 63,275 km^2 of land identified for conservation purposes—just over 13 per cent of Yukon's total area. Of that, 61,486 km^2 are protected lands, which include territorial parks, habitat protection areas, national parks, national wildlife areas, and special management areas.







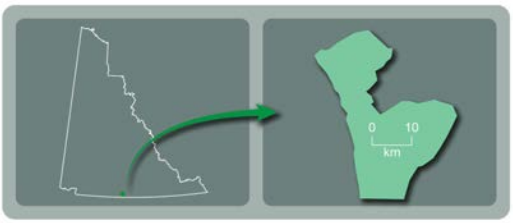
Yukon Parks & Protected Areas 2016

Agay Mene
Territorial Park

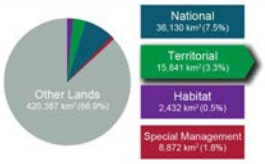
1

Designated: Awaiting designation
Management Plan: Planning on hold

Agay Mene Park's system of lakes and waterways support traditional activities of hunting, fishing and trapping and is popular for paddling and camping. It was identified under Chapter 10 of the Carcross/Tagish First Nation Final Agreement.



Yukon Parks & Protected Areas
Proportion & Area by Type



Agay Mene
Withdrawal Status & Area

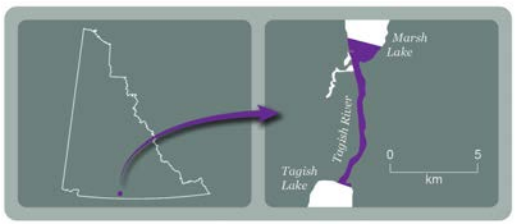
Yukon Parks & Protected Areas 2016

Tagish River
Habitat Protection Area

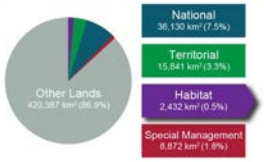
17

Designated: Awaiting designation
Management Plan: Planning underway

Tagish River was identified under the Carcross/Tagish First Nation Final Agreement. This area is an important channel connecting Tagish Lake to Marsh Lake, on the upper Yukon River drainage system. The Tagish River is one of the most important ecological areas in Yukon for waterfowl migration.



Yukon Parks & Protected Areas
Proportion & Area by Type



Tagish River
Withdrawal Status & Area

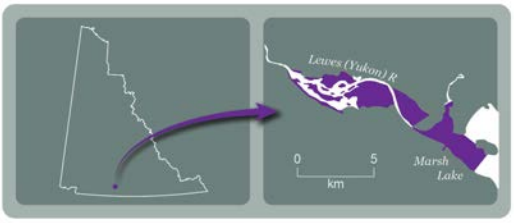
Yukon Parks & Protected Areas 2016

Lewes Marsh
Habitat Protection Area

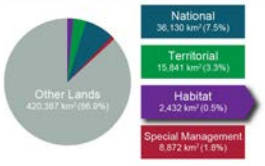
13

Designated: Awaiting designation
Management Plan: Planning not started

Lewes Marsh was identified under the Kwanlin Dün First Nation and Carcross/Tagish First Nation Final Agreements. Lewes Marsh is a wetland of national significance.



Yukon Parks & Protected Areas
Proportion & Area by Type



Lewes Marsh
Withdrawal Status & Area

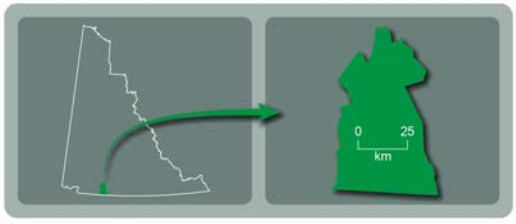
Yukon Parks & Protected Areas 2016

Kusawa
Territorial Park

5

Designated: Awaiting designation
Management Plan: Planning underway

Identified under Chapter 10 of the Carcross/Tagish and Kwanlin Dün First Nations Final Agreements, Kusawa is also within the traditional territory of Champaign and Aishihik First Nation. The park showcases diverse natural landscapes and rich culture, history and traditions. The park was a significant historic trade route for both Alaskan and Yukon First Nations.



Yukon Parks & Protected Areas
Proportion & Area by Type

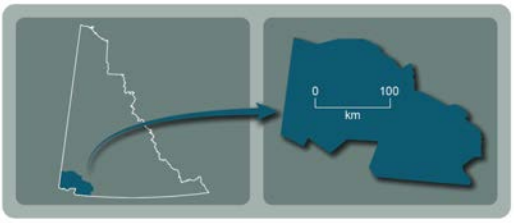
Kusawa
Withdrawal Status & Area

Yukon Parks & Protected Areas 2016

23 Kluane National Park

Designated: 1972, *Canada National Parks Act*
Management Plan: Current as of 2010

Established as a game sanctuary in 1943; park planning began soon afterwards. The park is home to Canada's highest peak (5,959-metre Mount Logan), its largest ice field and North America's most genetically diverse grizzly population.



Yukon Parks & Protected Areas — Proportion & Area by Type

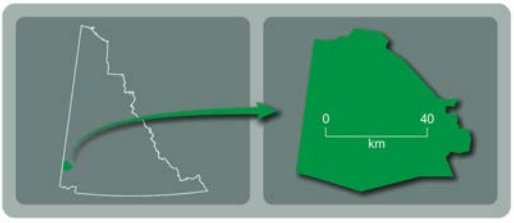
Kluane — Withdrawal Status & Area

Yukon Parks & Protected Areas 2016

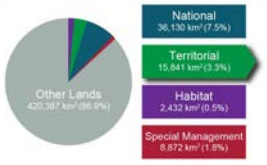
2 Asi Keyi Territorial Park

Designated: Awaiting designation
Management Plan: Planning underway

Asi Keyi Park was identified under Chapter 10 of the Kluane First Nation Final Agreement and is also part of White River First Nation Traditional Territory. Asi Keyi Park is known for its vast ice fields and high St. Elias Mountains.



Yukon Parks & Protected Areas — Proportion & Area by Type



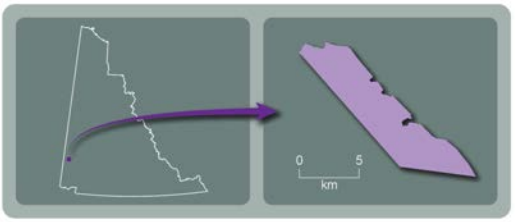
Asi Keyi — Withdrawal Status & Area

Yukon Parks & Protected Areas 2016

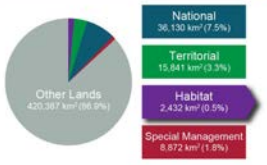
16 Chetthyel Chi (Pickhandle Lakes) Habitat Protection Area

Designated: Awaiting designation
Management Plan: Planning underway

Chetthyel Chi (Pickhandle Lakes) was identified under the Kluane First Nation Final Agreement and is found with the traditional territories of both Kluane First Nation and White River First Nation. The Pickhandle Lakes area is a diverse complex of small lakes, pothole lakes, marshes and bogs. It is located within the Shakwak Trench, which is an important flyway for migratory birds traveling to and from Central Yukon and Alaska.



Yukon Parks & Protected Areas — Proportion & Area by Type



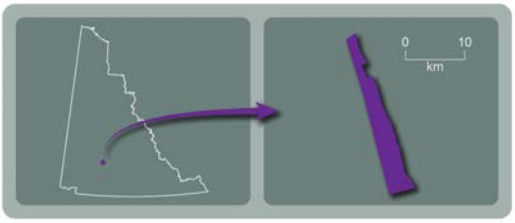
Pickhandle Lakes — Withdrawal Status & Area

Yukon Parks & Protected Areas 2016

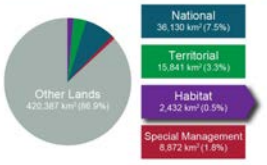
15 Nordenskiold (Tsâwnjik Chu) Habitat Protection Area

Designated: 2010, *Wildlife Act*
Management Plan: Current as of 2010

Nordenskiold/Tsâwnjik Chu was identified as a Habitat Protection Area under the Little Salmon/Carmacks First Nation Final Agreement. This area is Category B Settlement Land. The Nordenskiold River valley is south of Carmacks and is a major wetland complex and important waterfowl staging and nesting area.



Yukon Parks & Protected Areas — Proportion & Area by Type



Tsâwnjik Chu — Withdrawal Status & Area

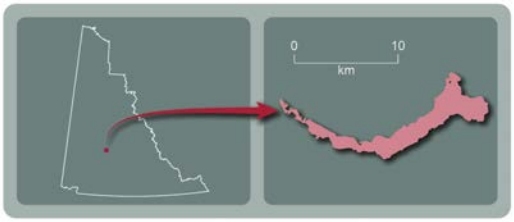
Yukon Parks & Protected Areas 2016

21

Ta'Tla Mun
Special Management Area

Designated: Awaiting designation
Management Plan: Current as of 2013

The Ta'tla Mun Special Management Area became established with the signing of the Selkirk First Nation Final Agreement. The plan ensures conservation in management and use of freshwater fish resources and their habitat. The area includes all surface waters within the high water mark of the lake locally referred to as "Ta'tla Mun" or "Tatlmain Lake".



Yukon Parks & Protected Areas

Proportion & Area by Type

Ta Tla Mun

Withdrawal Status & Area

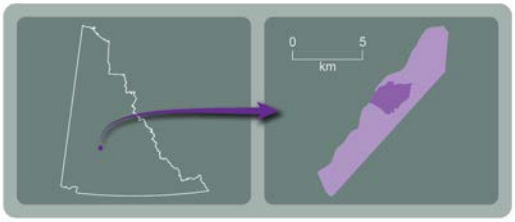
Yukon Parks & Protected Areas 2016

14

Lútsäw Wetland
Habitat Protection Area

Designated: 2006, *Wildlife Act*
Management Plan: Current as of 2013

Lútsäw Wetlands was identified under the Selkirk First Nation Final Agreement. Lútsäw Wetlands is an important wetland complex for shorebirds, duck staging, nesting and moulting along the Klondike Highway.



Yukon Parks & Protected Areas

Proportion & Area by Type

Lútsäw Wetland

Withdrawal Status & Area

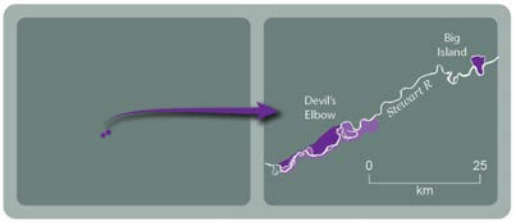
Yukon Parks & Protected Areas 2016

10

Devil's Elbow & Big Island
Habitat Protection Area

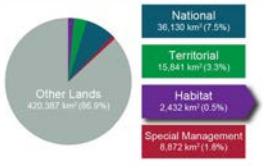
Designated: 2011, *Wildlife Act*
Management Plan: Current as of 2012

The Mayo District Renewable Resources Council proposed Devil's Elbow & Big Island as a Habitat Protection Area. Together with the First Nation of Na-Cho Nyäk Dun and the Government of Yukon, they agreed to protect this area during community-based fish and wildlife work planning. The two distinct land parcels identified along the Stewart River are important moose calving grounds.



Yukon Parks & Protected Areas

Proportion & Area by Type



Devil's Elbow & Big Island

Withdrawal Status & Area

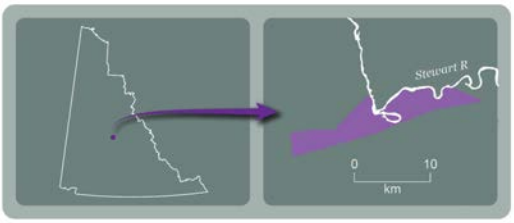
Yukon Parks & Protected Areas 2016

12

Horseshoe Slough
Habitat Protection Area

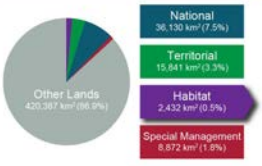
Designated: 2011, *Wildlife Act*
Management Plan: Current as of 2007

Horseshoe Slough is an oxbow lake that was identified as a habitat protection area under the First Nation of Na-Cho Nyäk Dun Final Agreement. Horseshoe Slough wetland is located on the Pacific Flyway and is considered regionally significant for waterfowl.



Yukon Parks & Protected Areas

Proportion & Area by Type



Horseshoe Slough

Withdrawal Status & Area

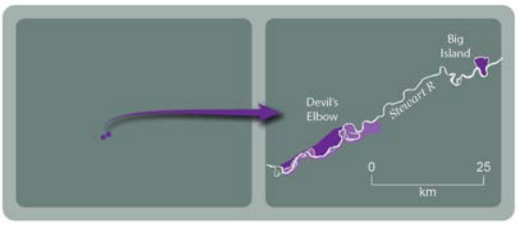
Yukon Parks & Protected Areas 2016

11

Devil's Elbow & Big Island
Habitat Protection Area

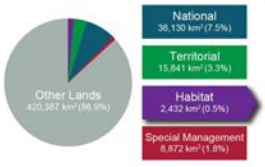
Designated: 2011, *Wildlife Act*
Management Plan: Current as of 2012

The Mayo District Renewable Resources Council proposed Devil's Elbow & Big Island as a Habitat Protection Area. Together with the First Nation of Na-Cho Nyäk Dun and the Government of Yukon, they agreed to protect this area during community-based fish and wildlife work planning. The two distinct land parcels identified along the Stewart River are important moose calving grounds.



Yukon Parks & Protected Areas

Proportion & Area by Type



Devil's Elbow & Big Island

Withdrawal Status & Area

Yukon Parks & Protected Areas 2016

8

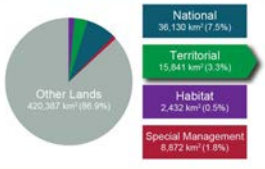
Tombstone
Territorial Park

Designated: 2004, *Parks and Land Certainty Act*
Management Plan: Current as of 2009

Tombstone Park protects a unique wilderness of rugged peaks, permafrost landforms and abundant wildlife, all reflected in a rich First Nations culture. It was identified under Chapter 10 of the Tr'ondëk Hwëch'in Final Agreement.

Yukon Parks & Protected Areas

Proportion & Area by Type



Tombstone

Withdrawal Status & Area

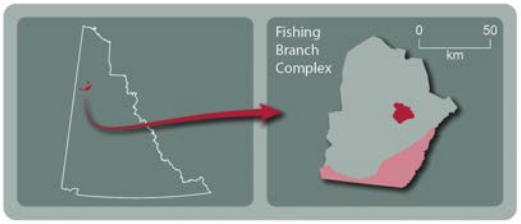
Yukon Parks & Protected Areas 2016

19

Ni'iinlii Njik (Fishing Branch)
Special Management Area

Designated: 2004, *Wildlife Act*
Management Plan: Current as of 2010

This complex of Habitat Protection Area (HPA) and Settlement Lands, together with the Territorial Park, are a legacy of the Vuntut Gwitchin Land Claim Agreement and are collaboratively managed by Yukon Government and Vuntut Gwitchin Government.



Yukon Parks & Protected Areas

Proportion & Area by Type

Fishing Branch HPA & Settlement Lands

Withdrawal Status & Area

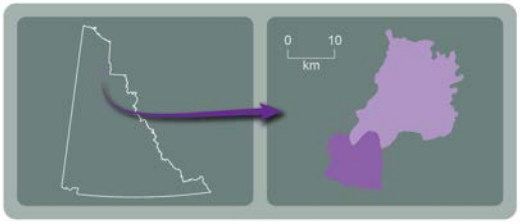
Yukon Parks & Protected Areas 2016

18

Ch'ihilii Chik (Whitefish Wetlands)
Habitat Protection Area

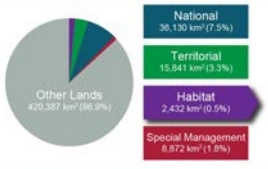
Designated: Awaiting designation
Management Plan: Planning underway

Ch'ihilii Chik (Whitefish Wetlands) was identified in the 2009 North Yukon Regional Land Use Plan. The Vuntut Gwitchin Government and Government of Yukon agreed to proceed with a management plan for the area as a Habitat Protection Area. Ch'ihilii Chik is an important wetland complex well known for abundant whitefish, beaver and muskrat trapping, and caribou hunting. The area is the most significant wetland complex in the region outside of Van Tat K'atr'anahtii (Old Crow Flats).



Yukon Parks & Protected Areas

Proportion & Area by Type



Whitefish Wetlands

Withdrawal Status & Area

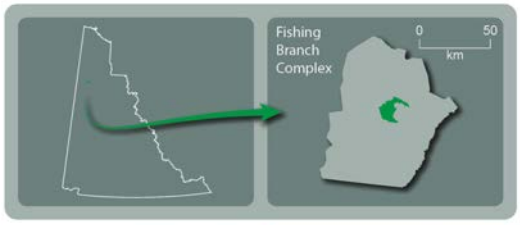
Yukon Parks & Protected Areas 2016

6

Ni'iinlii Njik (Fishing Branch) - Ecological Reserve
Territorial Park

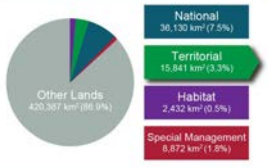
Designated: 2003, *Parks and Land Certainty Act*
Management Plan: Current as of 2010

Ni'iinlii Njik (Fishing Branch) Territorial Park is made up of two areas, designated as an Ecological Reserve and a Wilderness Preserve. This complex of Territorial Park, adjacent Habitat Protection Area and Settlement Lands are a legacy of the Vuntut Gwitchin Land Claim Agreement and are collaboratively managed by Yukon Government and Vuntut Gwitchin Government.



Yukon Parks & Protected Areas

Proportion & Area by Type



Fishing Branch Ecological Reserve

Withdrawal Status & Area

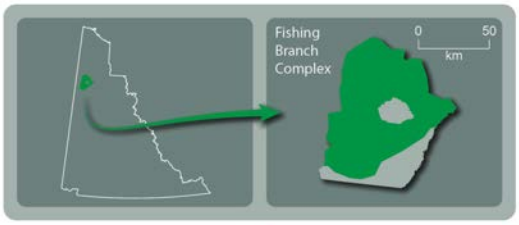
Yukon Parks & Protected Areas 2016

7

Ni'iinlii Njik (Fishing Branch) - Wilderness Preserve
Territorial Park

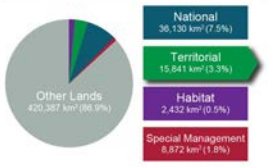
Designated: 2003, *Parks and Land Certainty Act*
Management Plan: Current as of 2010

Ni'iinlii Njik (Fishing Branch) Territorial Park is made up of two areas, designated as an Ecological Reserve and a Wilderness Preserve. This complex of Territorial Park, adjacent Habitat Protection Area and Settlement Lands are a legacy of the Vuntut Gwitchin Land Claim Agreement and are collaboratively managed by Yukon Government and Vuntut Gwitchin Government.



Yukon Parks & Protected Areas

Proportion & Area by Type



Fishing Branch Wilderness Preserve

Withdrawal Status & Area

Yukon Parks & Protected Areas 2016

9

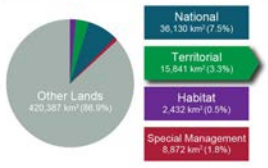
Dàadzàii Vàn (Summit Lake/Bell River)
Territorial Park

Designated: Awaiting designation
Management Plan: Planning underway

Dàadzàii Vàn was identified in the 2009 North Yukon Regional Land Use Plan; the park is important to both the Vuntut Gwitchin and the Tetlit Gwich'in. Stories reveal a colourful human history, memorable wilderness experiences, and important habitat for wildlife such as the Porcupine Caribou Herd.

Yukon Parks & Protected Areas

Proportion & Area by Type



Summit Lake/Bell River

Withdrawal Status & Area

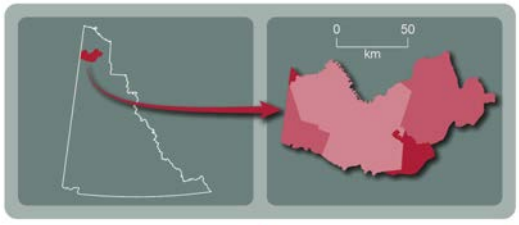
Yukon Parks & Protected Areas 2016

20

Van Tat K'atr'anahtii (Old Crow Flats)
Special Management Area

Designated: 2009, *Wildlife Act*
Management Plan: Current as of 2006

Van Tat K'atr'anahtii (Old Crow Flats) is one of the most important wetland and lake complexes in Canada and was identified for protection under Chapter 10 of the Vuntut Gwitchin Land Claim Agreement. It is protected in the north by the Vuntut National Park, in the south by Vuntut Guitchin Category A Settlement lands, and in the east and west by the Habitat Protection Area.

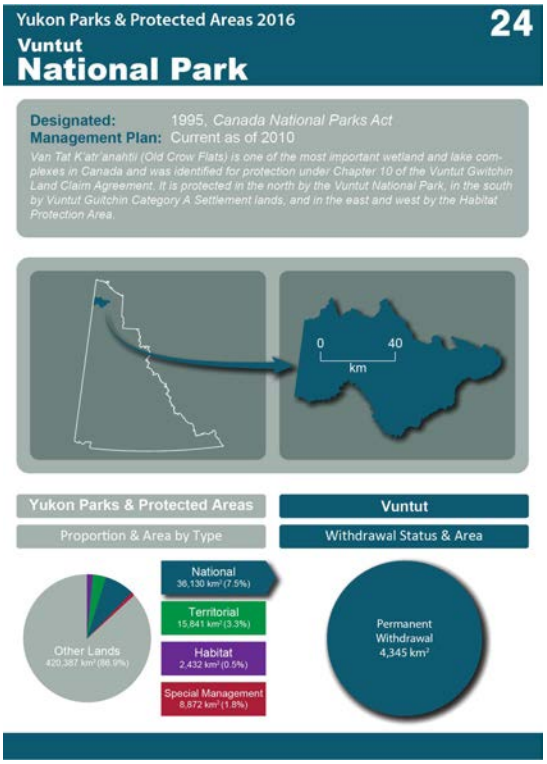


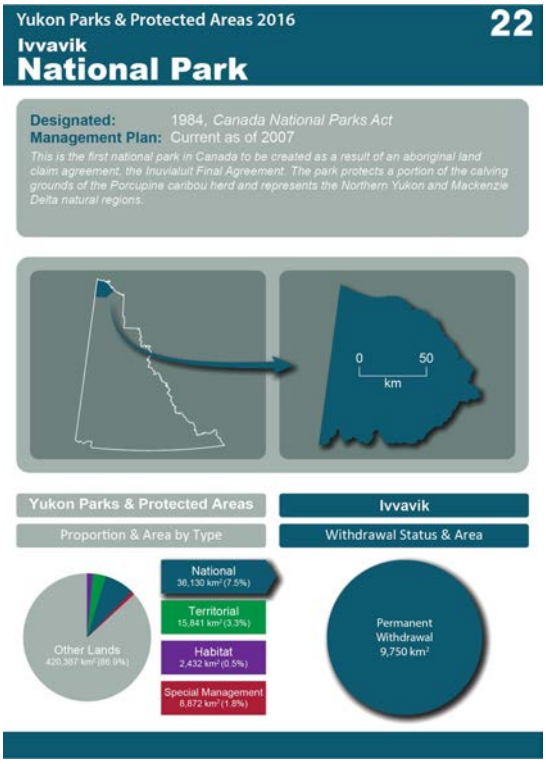
Yukon Parks & Protected Areas

Proportion & Area by Type

Old Crow Flats

Withdrawal Status & Area



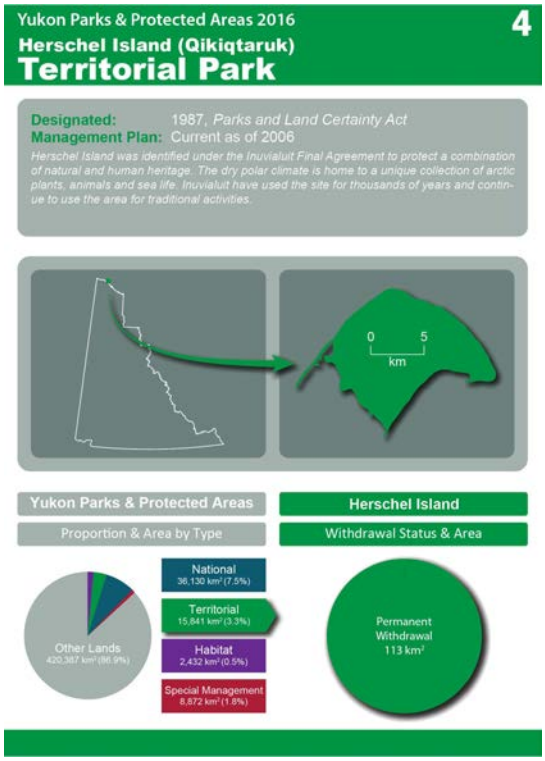


Territorial parks

- All parks, with the exception of Agay Mene, have interim or permanent withdrawals from mining, oil and gas and surface dispositions. For Agay Mene, the Carcross/Tagish First Nation Final Agreement indicates that land use decisions will be determined through park management planning.
- A Kusawa Park management plan was recommended to the parties in 2016.
- Management planning for Asi Keyi began in summer 2015 and planning for Dàadzàii Vàn (Summit Lake-Bell River) began in early 2016.

Habitat protection areas and special management areas

- Habitat protection areas and special management areas are created to maintain important features of Yukon's natural or cultural environment for the benefit of residents and visitors, while respecting the rights of First Nations.
- Habitat protection areas may be established through First Nation final agreements, regional land use planning, or the submission of a proposal to the Minister subject to criteria identified in the *Wildlife Act*.
- Yukon has twelve habitat protection areas, identified or **established.**



Established	Horseshoe Slough, Nordenskiold (Tsâwnjik Chu) Devil's Elbow and Big Island Fishing Branch (Ni'iinlii Njik) Van Tat K'atr'ananhtii (Old Crow Flats) Lhutsaw Wetland Ta'tla Mun Mandanna Lake
Underway	Pickhandle Lakes Tagish River Ddhaw Ghro Ch'ihilii Chik (Whitefish Wetlands)
Anticipated	Lewes Marsh

- Ch'ihilii Chik is the first Habitat Protection Area identified through the regional land use planning process.

National parks and reserves and national wildlife areas

- There are three national parks and one national wildlife area in Yukon.
- Ivvavik National Park was established through the Inuvialuit Final Agreement and was the first national park in Canada to be created as a result of an aboriginal land claim agreement. Parks Canada and the Inuvialuit cooperatively manage Ivvavik.
- Kluane National Park and Reserve was declared a World Heritage Site in 1979. Together with Alaska's Wrangell-St. Elias National Park and Preserve, Glacier Bay National Park and Preserve, and British Columbia's Tatshenshini-Alsek Park, it forms part of the largest international UNESCO World Heritage Site. Parks Canada, Champagne and Aishihik First Nations, and Kluane First Nation manage Kluane National Park and Reserve in partnership.

Canadian heritage rivers

- Designation as a Canadian heritage river recognizes rivers or river segments for their natural or cultural heritage and recreational values. This does not provide legal protection for the area. Management of Yukon Canadian heritage rivers is described in each respective approved management plan.
- Yukon has four designated Canadian heritage rivers:
  - Alsek (within Kluane National Park),
  - Bonnet Plume,
  - Thirty Mile Section of the Yukon River, and
  - Tatshenshini.

Peel Watershed

On December 16, 2015, a second two-year withdrawal from resource development was placed across the Peel Watershed regional land use planning region until January 1, 2018; a portion of this area was previously reported as protected in the 2014 *State of the Environment Report*. Land use planning will continue for the Peel Watershed region once the Supreme Court of Canada decision is known and the parties agree on a path forward.

Bonnet Plume Canadian Heritage River.

Data quality

The total area of Yukon is 483,662 km^2 including all land and freshwater based on the best available geospatial representation of the Yukon border and off-shore islands. The management plans for each area provide the specific details of land ownership and withdrawal from resource development or equivalent status.

The areas reported as protected are confirmed by the following methods:

1. If the area is subject to an interim or permanent withdrawal under the *Lands Act* or a prohibition order under the *Quartz Mining Act* and *Placer Mining Act*, or if it is designated as a protected area under the *Parks and Land Certainty Act* or the *Wildlife Act*:
   - the area stated as protected in the relevant legislation is reported, or

References

Dudley, N. (Editor). 2008. Guidelines for Applying Protected Area Management Categories. Best Practice Protected Area Guidelines Series No. 21, Gland, Switzerland: IUCN. Available from: http://cmsdata.iucn.org/downloads/iucn_assignment_1.pdf.

    - if no area is stated, the area from the administrative plan map referenced by the relevant legislation is repoted as protected.
    -
2. If there is no area or administrative plan referenced in legislation as protected, or there is no legislation in place, the management plan area or area recorded in a Final Agreement is reported.

Ivvavik National Park. M. Berkman.

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Yukon State of the Environment

Reporting on environmental indicators - 2018

LAND USE ACTIVITIES

NUMBER, TYPE, AND LOCATION OF ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENTS

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Environmental and socio-economic assessment is a process that identifies the potential environmental and socio-economic effects of proposed activities before they are carried out. The Yukon Environmental and Socio-economic Assessment Board (YESAB) carries out assessments in Yukon.

When a potential effect is identified and deemed substantial (referred to as a significant adverse effect) assessors recommend mitigations to reduce, control or eliminate those effects. If the significant adverse effects of a project cannot be mitigated, the Board makes a "do not proceed" recommendation. The appropriate government or regulatory body makes the final decision, which can accept, reject, or vary the recommendation.

The number, type, complexity and location of projects assessed by YESAB can indicate development pressures on environmental and socio-economic values, such as:

- impacts on wildlife and their habitat,
- impacts on air and water quality,
- impacts on fish and fish habitat, and
- permanent land conversion.

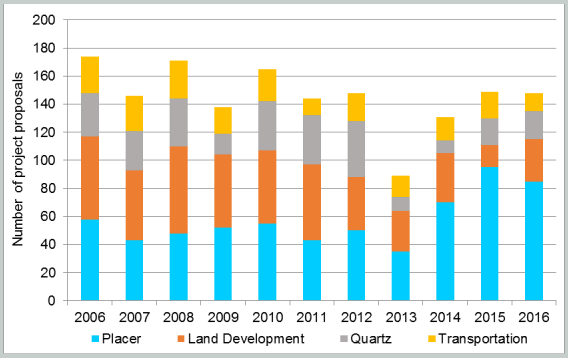
However, the assessment of a project does not mean a proponent carries out the project. Many proposed projects may never move into development and therefore have no environmental impact. Other project activities may not trigger an environmental and socio-economic assessment.

What is happening?

In 2016, 205 project proposals were submitted to YESAB for assessment.

Four common sectors that submit project proposals for assessment are placer mining, land development, quartz mining, and transportation (Figure 1).

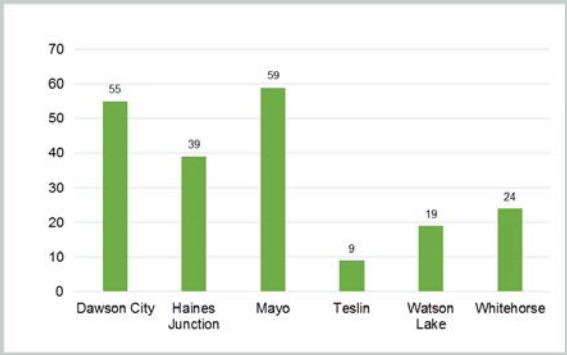
FIGURE 1: Number of project proposals for the four common sectors, 2006-2016.



Source: YESAB, 2016

- The projects proposed in each of these sectors may impact the environment in varying degrees, depending on the individual project activities and its location.

FIGURE 3: YESAB, project proposal submissions by designated office, 2016.



Source: YESAB, 2016

FIGURE 4: Project submissions by month (2014-2016)

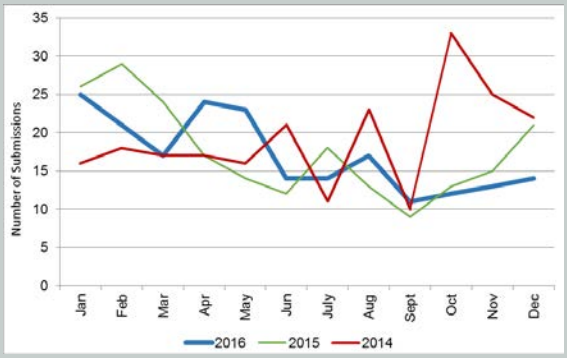
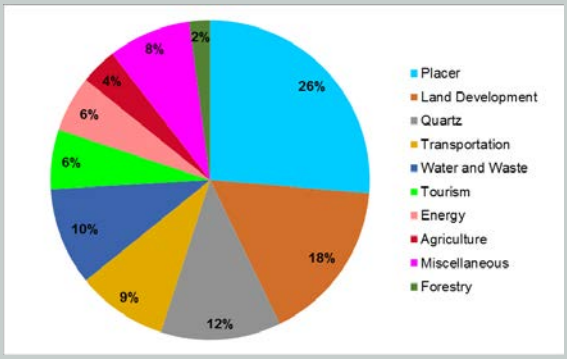


FIGURE 2: YESAB percentage of projects assessed by sector



Source: YESAB, 2016

- In 2016, the majority of project proposals were received in the Mayo and Dawson City areas (Figure 3).
  - Whitehorse has the highest population density in Yukon. This results in a large number of project submissions for residential and commercial activities such as access roads, subdivisions, road upgrades and lot enlargements.
  - Dawson City is a well-known mining district with a long history of placer mining. A significant number of assessable project activities related to placer mining take place within the district. In 2014, 37 per cent of YESAB's project submissions came from the placer mining sector.
- The number of project proposals submitted to Designated Office districts (Figure 3) include:
  - 55 projects submitted to the Dawson City Designated Office
  - 59 projects submitted to the Mayo Designated Office
  - 24 projects submitted to the Whitehorse Designated Office
  - 39 projects submitted to the Haines Junction Designated Office
  - 19 projects submitted to the Watson Lake Designated Office
  - 9 projects submitted to the Teslin Designated Office
- Whitehorse has the highest population density in Yukon. This results in a large number of project submissions for residential and commercial activities such as access roads, subdivisions, road upgrades and lot enlargements.
- Dawson City is a well-known mining district with a long history of placer mining. A significant number of assessable project activities related to placer mining take place within the district. In 2016, 20 per cent of YESAB's project submissions came from the placer mining sector in Dawson City.
  Mayo had the second highest number of placer project submissions totaling 31 projects or 15 percent of the total projects submitted to YESAB.
  Overall, placer mining projects made up 42 percent of the total projects submitted to YESAB in 2016.

Data quality

- Access YESAB's full assessment statistics on its website.
- This section does not include information on the projects reviewed by the Executive Committee of YESAB. There have been seven Executive Committee level screenings completed since 2005. Information about those projects and the associated timelines is available on the YESAB website.

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Yukon State of the Environment

Reporting on environmental indicators - 2018

LAND USE ACTIVITIES

RECREATIONAL LAND USE

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

The Government of Yukon operates and maintains roadside campgrounds. These provide outdoor recreation opportunities such as fishing, hiking, boating and wildlife viewing. Recreational land use may have a negative impact on the environment "when the level of visitor use is greater than the local environment's ability to cope with this use within the acceptable limits of change" (United Nations Environmental Programme (UNEP), n.d.).

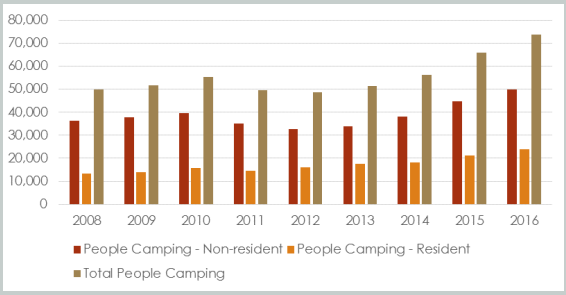
For statistical purposes, the Government of Yukon tracks the number of people using Government of Yukon campsites.

Talus Lake backcountry camp site after storm.

What is happening?

- In 2016, the Government of Yukon's campgrounds included:
  - 42 campgrounds including the new Conrad Campground on Tagish Lake; and
  - 12 day-use recreation sites.
- There are more than twice as many non-resident campers as Yukoners camping in the territorial campgrounds (Figure 1).
- Since 2012, there has been an increasing use of campgrounds by both resident and non-residents.

FIGURE 1: Number of people camping, 2008-2016.



Taking action

The Government of Yukon has worked to increase the number of campsites available to visitors and residents. Between 2015 and 2016, 82 new campsites were added across the territory, including additional campsites at the Marsh Lake, Wolf Creek, Twin Lakes and Tombstone Mountain campgrounds, along with the new Conrad Campground on Tagish Lake. This has resulted in a 20 per cent increase in the number of campsites within 200 km of Whitehorse (and four per cent across the territory).

View from the Conrad Campground.

Data quality

- The Department of Environment's Parks Branch track the level of use through campground registrations.
- Registered visitors are calculated by: number of recorded visitors + (number of unrecorded registered parties × average number of visitors per party). This number includes repeat users.
- Learn more about Government of Yukon campgrounds.
- There are other campsites operated throughout the territory including Kathleen Lake Campground in Kluane National Park and Reserve and several private RV campgrounds. Data from these sites are not included.

References

United Nations Environmental Programme (UNEP). n.d. Tourism's Three Main Impact Areas [cited 2016 Mar 3]. Available from: http://www.unep.org/resourceefficiency/Business/SectoralActivities/Tourism/FactsandFiguresaboutTourism/ImpactsofTourism/EnvironmentalImpacts/TourismsThreeMainImpactAreas/tabid/78776/Default.aspx

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SOLID WASTE

WASTE HANDLED AT THE WHITEHORSE WASTE MANAGEMENT FACILITY

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Solid waste disposal in landfills can pose environmental and health risks as well as land use planning challenges. Waste is costly to manage, whether it is sent to landfills, diverted through recycling and composting, or shipped outside the territory for treatment.

Landfill closure liability is a new Public Sector Accounting Board principle that requires owners of landfills to account for the full costs of the closure and post-closure of a landfill. In Yukon, this has put financial pressure on municipalities to incorporate the new liability, but has also provided an incentive for waste diversion as a means of lengthening the life of a landfill.

PROFILE

LONG-TERM STUDY OF SOIL AMENDMENTS IN NORTHERN SOILS

Yukon agricultural test plots.

LONG-TERM STUDY OF SOIL AMENDMENTS IN NORTHERN SOILS

Beets being grown at the Agriculture branch research and demonstrations site as part of the Soil Amendment Evaluation.

In partnership with the City of Whitehorse, the Government of Yukon's Agriculture Branch initiated a long-term trial at the Yukon Government Research Farm in 2010 to test the effectiveness of soil amendments in northern soils.

Soil amendments are added to improve soil properties (such as nutrients, fauna/flora, or carbon) to improve vegetable and other crop production. Common soil amendments include fertilizers, manures and compost. Producers must decide which amendments to use and consider the transportation and application of products, the availability of local products, and the varying costs of shipping, using and buying amendments. Local soil amendments are limited; one of the products readily available is compost from the City of Whitehorse.

The soil amendment trial being conducted at the research farm evaluates the city compost alongside synthetic fertilizer and organic fertilizer. Other amendments were added in combination with the main treatments including calcium, biochar and humic acid. Different vegetables were grown in rotation each year starting with beets in 2010, carrots in 2011, kale in 2012, and snap peas in 2013, repeating the rotation in 2014 with beets, followed by carrots, and again kale in 2016.

Other Canadian research concluded that organic fertilizer amended plots usually lag behind synthetic plots until the third year. Yukon growing conditions followed this trend. As expected, the synthetic fertilizer plots had the highest yields in the first two years and the organic fertilizer plots yielded similar results by the third year. The compost plots yielded substantially less than the other treatments in the first few years of the trial.

In 2014, the fifth year of the research, the compost amended plots started to achieve production levels approximately 20 per cent less than synthetic fertilizer treatments. In 2015, the compost treatment had equal yields to both the synthetic and organically amended plots, indicating that the addition of city compost over time is a valuable soil amendment. Last year indicated that compost is on par with other amendments, but in 2016, using a crop that has a higher nutrient demand such as kale, the yields in compost treatments lag behind compared to synthetic and organic amendment treatments. Although there was a decrease in the yield in 2016, the productivity from treatments using compost provide good in-territory options for amending the soil. The addition of lime, humic acid or biochar does not have any impact on yields based on this research.

The trial will continue to evaluate compost and commercial soil amendments to add to our understanding of northern soil amendments.

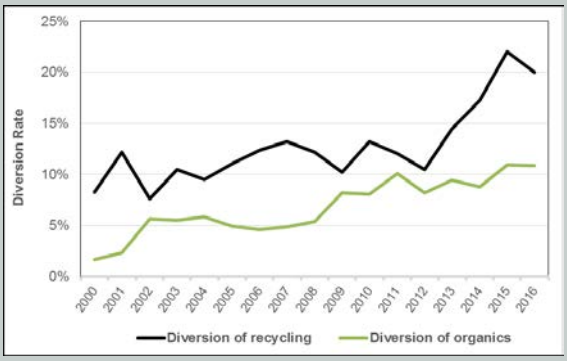
What is happening?

The City of Whitehorse monitors the amount of waste handled by the waste management facility. This includes waste that enters the landfill and waste that is diverted away from the landfill through composting or recycling (Figure 1).

Waste that enters the landfill come from three major sources:

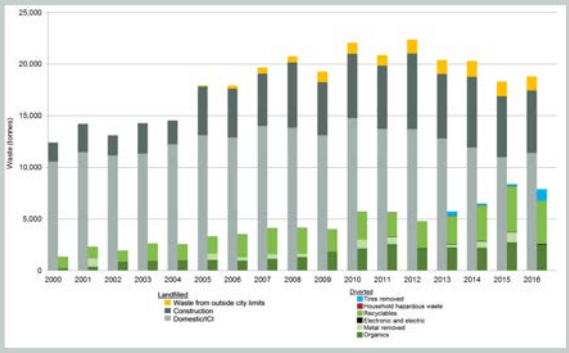
- domestic or household waste and the industrial, commercial, and institutional (ICI) sector;
- construction and demolition; and
- waste from outside city limits. Since 2006, the City of Whitehorse has accepted waste from outlying communities on a fee-for-service basis in order to lessen the landfill burden on those communities.

FIGURE 2: Diversion rate of organic and recycling materials from the City of Whitehorse Waste Management Facility



- Increases in the diversion rate can be attributed to the City's 2013 *Solid Waste Action Plan*, which focused on the diversion of cardboard and organics from the commercial sector in 2014/15.

FIGURE 1: Type and amount of waste handled at the City of Whitehorse Waste Management Facility



- **610 kg**—the total average, annual amount of waste per person landfilled in Whitehorse in 2016.
- **31 per cent**—the percentage of waste diverted from the Whitehorse landfill through recycling and composting efforts.
- The most recent information for Canada-wide waste per person is from 2012, when the amount of waste landfilled was 0.72 tonnes (Statistics Canada, 2015b). Comparatively, Whitehorse waste per person in 2012 was 0.77 tonnes and is now 0.61 tonnes.

PROFILE

TERRITORY-WIDE WASTE MANAGEMENT

Marsh Lake waste transfer station.

TERRITORY-WIDE WASTE MANAGEMENT

The Yukon government is responsible for 16 public solid waste facilities located in the rural communities. These facilities are operated by the Department of Community Services. There are also three highway camp solid waste facilities that provide some access for public use; these are operated by the Department of Highways and Public Works.

In 2016, Yukon government advanced responsible solid waste management across the territory. Some of the key actions were:

- Implementing a "continuous improvement model" for solid waste management, including specific capital improvements at the solid waste facilities near Carcross, Marsh Lake and Pelly Crossing, such as:
  - Installing solar panels at the Mount Lorne Transfer Station, providing power to run the recycling baler and solid waste compactor, and directing excess energy into the connected grid.
  - Improving the Marsh Lake facility to increase its expected life-span by:
- Completing earth work to properly manage surface water and increase storage capacity for landfilling construction/ demolition waste.
- Collecting tires in bins to free up space and keep dirt from entering tires.
- Establishing a traffic loop to enable the disposal of various forms of waste before approaching the "garbage" dumpster/ compactor.
- Improving the receiving station for household hazardous waste.
- Pursuing the purchase of recycling balers to allow more recyclable materials to be compacted in the communities, allowing for more efficient hauling to Whitehorse.
- Maintaining rional solid waste agreements with the Town of Watson Lake and the City of Dawson establishing municipal landfills as regional facilities. (The agreement in Southeast Yukon enabled the closure of the Upper Liard Solid Waste Facility where construction and demolition waste was previously landfilled.) The shift to regional facilities lightened the environmental footprint of landfill activities in the region.
- Completing site reclamation at previously closed landfills near Burwash Landing and Horsecamp Hill. Yukon government completed closure plans for other solid waste sites that have been converted from landfills to transfer stations.
- Updating the landfills liability report. This report assesses the remaining lifespan of each landfill in the territory and identifies an estimate of the costs associated with site closure and reclamation, as well as the costs associated with groundwater monitoring for a projected 25 years post-closure.
- Conducting a review which lead to amending the Beverage Container Regulation and the Designated Materials Regulation (targeted implementation date of August 1, 2017). The amendments include adding more materials to each regulation (milk and milk substitute beverage containers, electrical, electronic and larger sized tires).

- Conducting groundwater monitoring at all solid waste facilities, including those that have been closed to public access.
- Establishing gates, site attendants and operational hours at community solid waste facilities in Destruction Bay, Champagne and Ross River, to increase control at rural transfer stations, mitigate the potential for inappropriate dumping and promote proper use of the facilities. Community meetings ensured local engagement in the development and implementation of these improved systems. Similar discussions are being initiated in the community of Pelly Crossing.
- Partnering with local champions and non-government organizations in the unincorporated communities to create a successful compost pilot project with the Marsh Lake Solid Waste Society and the Mt. Lorne Solid Waste Society which reported a greater than 50 per cent increase in waste diversion.

In 2015, Yukon government allocated $333,000 over three years to assist outlying communities with the cost of groundwater monitoring at municipal landfills. This fund is in addition to operational funding already used for similar monitoring programs at Yukon government's solid waste facilities in unincorporated communities.

Financial support for recycling was increased in 2016. At the request of processors, Yukon government increased the 'per tonne' rates for various recyclable materials and allocated over $700,000 for diversion credit payments. Diversion credit payments are product-specific rates based on commodity values as described by the processors. They are one part of a comprehensive, territory-wide recycling program as Yukon government also pays for the transportation of recyclable materials from unincorporated communities, to the processors. This is in addition to the core funding made available to community recycling depots, providing greater opportunities to divert all forms of recyclable materials from a number of rural transfer stations.

Yukon government also supported a 10 per cent increase to the processing fee payments to recycling processors. These payments are provided to recycling processors who collect, bale and send beverage containers to recycling facilities out of the territory.

Taking action

- In 2014, the City of Whitehorse launched a pilot program for organics collection from multi-unit residential buildings and businesses. Five out of the six major grocery stores are now having organics collected and diverted.
- Other initiatives include offering one-on-one assistance to businesses to identify waste diversion options and the creation of a waste-sorting app called "What Goes Where?"
- Organics from food service providers, cardboard and clean wood have become controlled waste under the City of Whitehorse's *Waste Management Bylaw*, which means that they are no longer welcome in the landfill and must be sorted.
- The composting facility at the City of Whitehorse Waste Management Facility was upgraded between 2012 and 2015 with the help of Build Canada Fund and Gas Tax. The City is now applying for organic status of its compost product and had record sales (roughly $50,000) in 2016.


Whitehorse landfill.

Data quality

- The Whitehorse population estimates are based on total Whitehorse area (excluding Marsh Lake but including people residing outside city limits) and were obtained from the Yukon Bureau of Statistics.
- The 2012 population for calculating the Canada-wide waste per person is an average of the four quarter estimates from Statistics Canada (2015a). The quarterly estimates are based on the 2011 census.

References

Statistics Canada (2015a). Table 051-0005 - Estimates of population, Canada, provinces and territories, quarterly (persons). CANSIM [modified 2015 Jun 9; cited 2016 Jan 19]. Available from: http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=0510005&tabMode=dataTable&srchLan=-1&p1=-1&p2=9.

Statistics Canada (2015b). Table 153-0041 - Disposal of waste, by source, Canada, provinces and territories, every 2 years (tonnes), CANSIM [modified 2015 Jun 9; cited 2016 Jan 19]. Available from: http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=1530041&tabMode=dataTable&srchLan=-1&p1=-1&p2=9.

PROFILE

OCCURRENCE AND FATE OF PHARMACEUTICAL AND PERSONAL CARE PRODUCT IN WHITEHORSE

Hundreds of ducks using the long-term storage pond.

OCCURRENCE AND FATE OF PHARMACEUTICAL AND PERSONAL CARE PRODUCT IN WHITEHORSE

The Whitehorse sewage lagoon has a significant bird population. In 2015, Devon Yacura conducted an assessment of pharmaceutical and personal care products (PPCPs) to measure the effect on the environment at Whitehorse's wastewater treatment centre–the Livingstone Trail Environmental Control Facility. This research is a first for Yukon wastewater treatment plants.

Tests performed on samples of water, sludge, aquatic invertebrates and algae revealed what chemicals were present, when they were present and how they were absorbed into the environment.

The PPCPs with the highest concentrations in the water were:

- acetaminophen (150 µg/L);
- caffeine (100 µg/L); and
- ibuprofen (10 µg/L).

The PPCPs with the highest concentrations in sludge, aquatic invertebrates and algae were two antimicrobials:

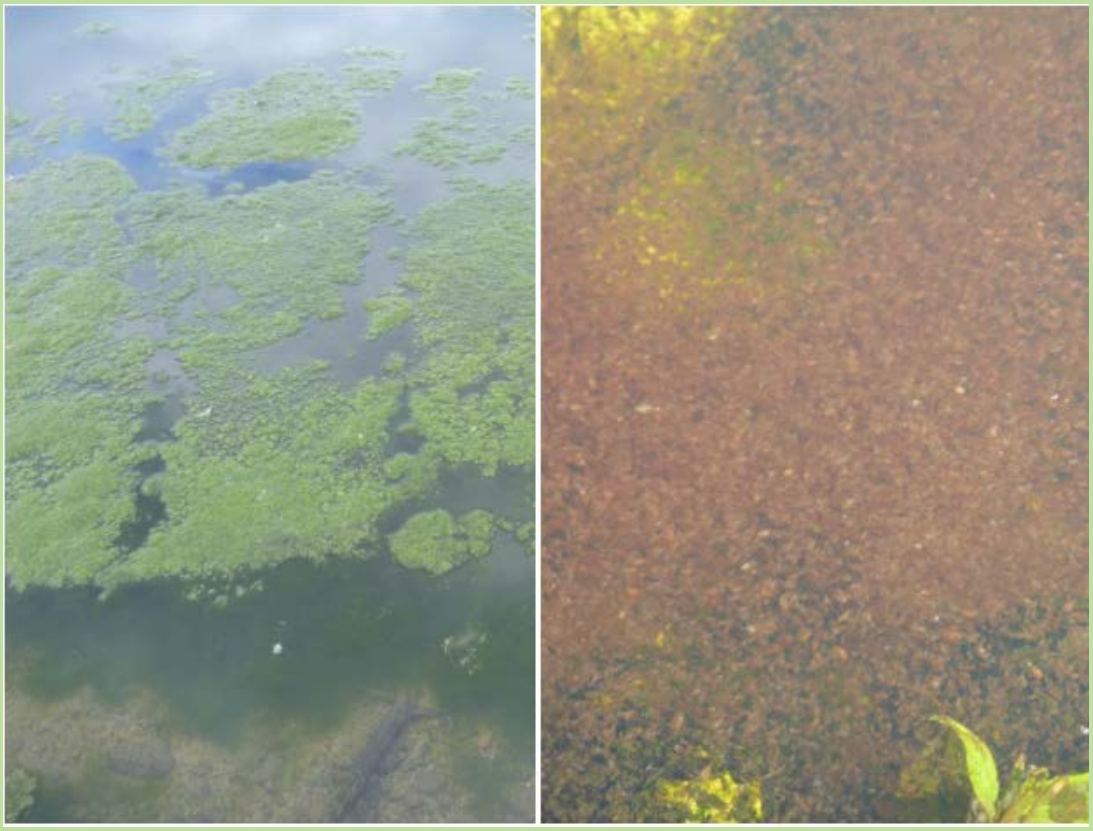
- triclosan (93 µg/g in sludge; 36 ng/g in aquatic invertebrates; 210 ng/g in algae); and
- triclocarban (31 µg/g in sludge; 29 µg/g in aquatic invertebrates; 47 ng/g in algae).

These chemicals are ubiquitous and are found in many household products including soaps, toothpaste, deodorants, cosmetics, detergents, and many plastic products. Estrogens and synthetic perfumes also had low concentrations in all of the samples.

At the Whitehorse lagoon, PPCPs are removed very efficiently—either equalling or exceeding standards from other facilities. The study also found that PPCP concentrations were significantly lower in spring than in summer and fall. Triclocarban was the only PPCP found to bioaccumulate in living organisms.

The baseline information from this study can be used for future monitoring and identification of trends at the treatment facility, positioning Yukon as a leader in the field of pharma-ecology.

Devon Yacura, Master's Candidate, University of Alberta/Yukon College, Department of Renewable Resources



(L) Algae, heavily fed on by dabbling ducks. (R) High concentrations of Daphnia, an invertebrate.

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FORESTS

YUKON WILDLAND FIRES GREATER THAN 200 HECTARES

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Wildland fire is a natural and necessary phenomenon in Yukon. Under the right conditions, such as hot weather and low forest fuel moisture, Yukon's forests can support high-intensity wildland fires on the landscape. These fires often occur naturally and have the potential to spread quickly, covering large areas. The plant and wildlife communities of Yukon are well adapted to periodic wildland fire disturbances. For example, the life cycle of lodgepole pine forests, whose cones open up after exposed to significant heat from fire, usually starts and ends with a crown fire. Wildland fires help maintain healthy ecosystems and create forest mosaics that enhance biodiversity.

Fire management agencies across Canada monitor both the number of fires and the area impacted by wildland fires. Dramatic fluctuations in the area burned occur annually. Nationally, wildland fires greater than 200 hectares in final size represent a small percentage of the total yearly number of fire ignitions; however, fires greater than 200 hectares also account for most of the area burned and as such are an indicator of environmental change. Monitoring wildland fire trends in the Yukon is essential to understanding forest health and ensuring there are appropriate resources in place to protect human life and values at risk to fire.

Campaign fire near Watson Lake.

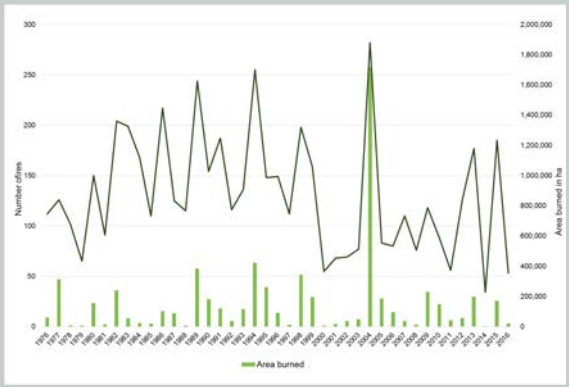
The frequency and intensity of fires is expected to change with a changing climate (Wotton et al. 2010, Flannigan et al. 2009). Climate change factors, such as projected longer fire seasons, changes in precipitation and temperature , and additional stresses to forest and vegetation (e.g., drought, flooding, insects and disease) reinforce the importance of monitoring wildland fires.

Ensuring accurate baseline information is necessary to monitor environmental change. Monitoring trends in wildland fires also helps wildland fire management agencies to be prepared and have appropriate resources in place and ready to respond to wildland fires as necessary.

What is happening?

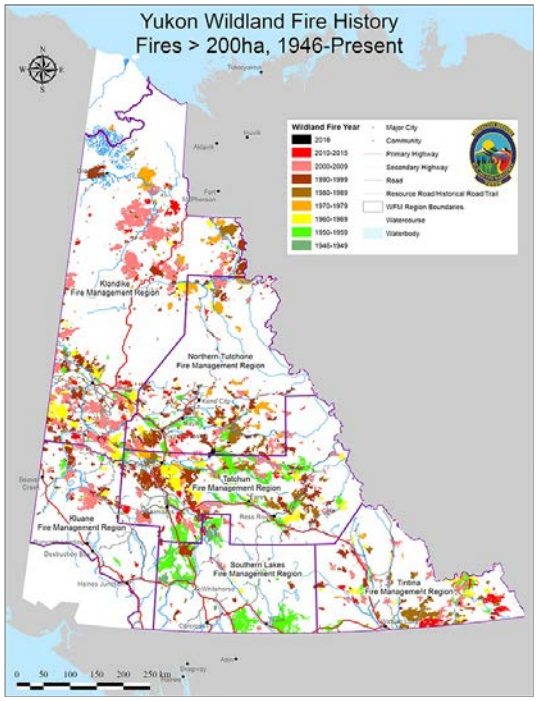
Fires greater than 200 hectares in final size represent a small percentage of all fires, but account for most of the area burned (Figure 1).

FIGURE 1: Yukon number of fires greater than 200ha and area burned, 1975-2016



- Since 1985, Yukon has had an average of 137 fire starts, which have burned an average of 171,840 ha every year. The total number of yearly ignitions and area burned varies significantly by year.
- The 2004 forest fire season in Yukon saw unprecedented temperatures, unusual lightning storms and lack of rainfall over a prolonged period, which resulted in a record-breaking number of fires and area burned. Read a review of the 2004 wildland fire season.
- In 2016, there were 53 fires that burned just over 20,000 ha. The fire season was marked by frequent and wide spread shower events that subdued fire danger. The 2016 fire season was less active than would be expected normally.

FIGURE 2: Yukon wildland fires greater than 200ha, 1946-2016



- Figure 2 demonstrates that the vast majority of Yukon has been affected by fire since 1946. In fact, all conifer forests in Yukon are a result of a previous wildland fire.
- Fire distribution across the landscape in any given year is dependent upon availability of forest fuels and appropriate burning conditions.

Taking action

To help balance the necessary role fire plays in maintaining healthly forests and reduce the unwanted negative consequences associated with wildland fires, Yukon has adopted FireSmart principles.

FireSmart provides a systematic approach for homeowners and communities to identify and reduce the risk of loss due to wildland fire. As we choose to extend our lifestyle and communities further into forested areas, we become more exposed to the danger of wildland fire.

For further information on FireSmart visit:

- FireSmart Canada
- Yukon FireSmart Program

After a fire.

Data quality

There are two online data repositories for the area of wildland fires:

- Canadian Wildland Fire Information System
- Canadian Interagency Forest Fire Centre daily situation report

Yukon's Wildland Fire Management Branch collects data on reported fires during the fire season, which extends from April 1 to September 30, yearly. The data is compiled daily during the fire season and finalized by the following January.

- The final fire perimeters are either collected by staff using GPSs or they are established using remote sensing technologies (i.e., satellite mapping). Capturing appropriate satellite images (e.g., cloud-free) of the area impacted by the wildland fire can take up to a year.
- Minor gaps can occur as not all fires are detected and reported.
- One limitation of using final fire perimeters for fire size is that it does not exclude islands of unburned vegetation residing within the final fire perimeter, nor bodies of water.
- Using the 200 ha size threshold minimizes these data gaps, as fires greater than 200 ha occurring in remote wilderness areas are more likely to be detected. Fires smaller than this threshold do not significantly contribute to the total annual area burned.

References

Wotton, B.M., Nock, C.A. and Flannigan, M.D. 2010. Forest fire occurrence and climate change in Canada. International Journal of Wildland Fire 19:253-271.

Flannigan, M.D., B.J. Stocks, M.R. Turetsky, and B.M. Wotton. 2009. Impact of climate change on fire activity and fire management in the circumboreal forest. Global Change Biology 15: 549-560.

Fireweed often thrives after an area has burned.

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FORESTS

FIRE IGNITION POINTS

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

This indicator shows the spatial distribution of forest fire ignition points and whether the ignition was the result of natural (lightning) or anthropogenic (person) causes.

Spatially displaying fire-cause ignition points can illustrate distribution patterns that can be used to identify areas that are likely to experience more frequent wildland events.

The area burned by anthropogenic fires is small in relation to the area burned by lightning fire ignitions. This is because anthropogenic fires generally occur near settlements and roads where they are quickly detected and easily extinguished. The outline of the Alaska Highway is easily traceable on a map of points of ignition for forest fires. Tracking this indicator is an important communication tool used to demonstrate public responsibility in fire prevention.

With a changing climate and an expanding human footprint, it is reasonable to expect that the frequency of ignitions will increase. If ignitions occur during periods of elevated fire danger, due to temperature or precipitation considerations, the severity and extent of wildland fires across the Yukon could change.

Lightening caused fire in Dawson District. Sonny Parker.

What is happening?

FIGURE 1: Yukon wildland fire history: Anthropogenic caused fires 1946-2016

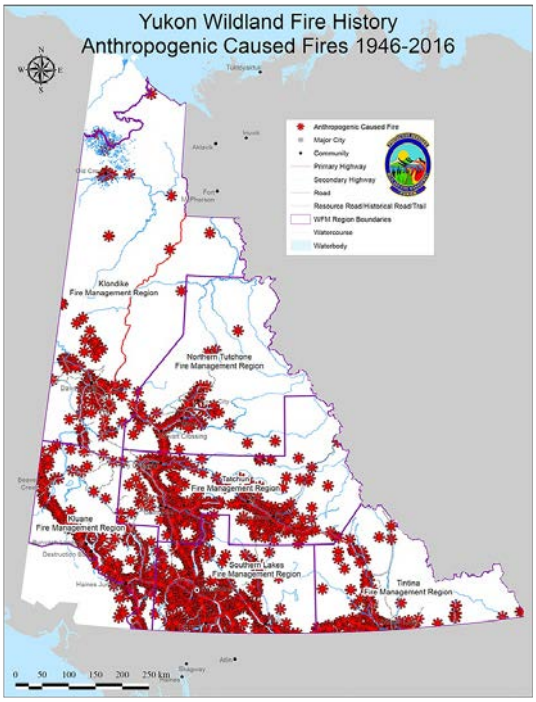
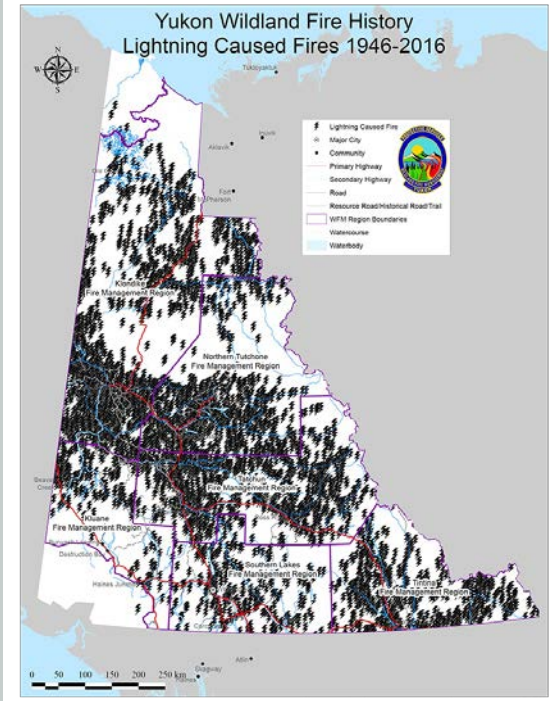


FIGURE 2: Title: Yukon wildland fire history: lightning caused fires 1946-2016



- There are dramatic variations in the number and location of wildland fire ignitions that occur annually. Generally speaking, anthropogenic fires occur along transportation corridors or near communities (Figure 1).
- Lightning ignited wildland fires are biased towards forested areas and show a wider distribution across Yukon (Figure 2).
- In 2016, 45 per cent of the fires that started were anthropogenic, resulting from escaped campfires, open burning, equipment use, and so on.
- The other 55 per cent of the fires ignited in 2016 had lightning origins.

Taking action

Yukon's Wildland Fire Management Branch investigates the cause of every reported fire in Yukon. The point of ignition in latitude and longitude and the cause of the fire are recorded by staff and form a fire record for Yukon. This information helps guide wildland fire prevention activities, continuous improvement of the fire detection program and complements our understanding of Yukon's fire regimes.

Watson Lake 2015. Aerial ignition to remove volatile forest fuels.

Data quality

- Yukon's Wildland Fire Management Branch collects data on reported fires during the fire season, which extends from April 1 to September 30 each year. The data is compiled daily during the fire season and finalized by the following January.
- Wildland fire ignitions occurring in Yukon are reported publically each day via the Canadian Interagency Forest Fire Centre website
- Minor gaps can occur as not all wildland fires are detected and reported.
- The fire environment (e.g., type of forest), seasonality (at what point during the fire season does the fire occur) and fuel moisture codes (e.g. long-term drought) can and will impact the fire size and severity.

Whitehorse district fire, 2009.

Further information

- Yukon Wildland Fire Management website
- Energy, Mines and Resources Forestry website
- Canadian Wildland Fire Information System
- Canadian Interagency Forest Fire Centre daily situation report

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FORESTS

FOREST HEALTH

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Native forest insects and diseases are generally of little concern when they exist at non-damaging population levels. It is when populations of these native species increase beyond an acceptable threshold, or when alien or native species behave invasively that concerns arise. If ecological or economic damage results in measurable impacts – such as a decline in ecosystem health or large reduction in the available wood fibre – then the insect or disease outbreak is seen as being a disturbance and active management intervention may be considered (*Natural Resources Canada*, n.d.).

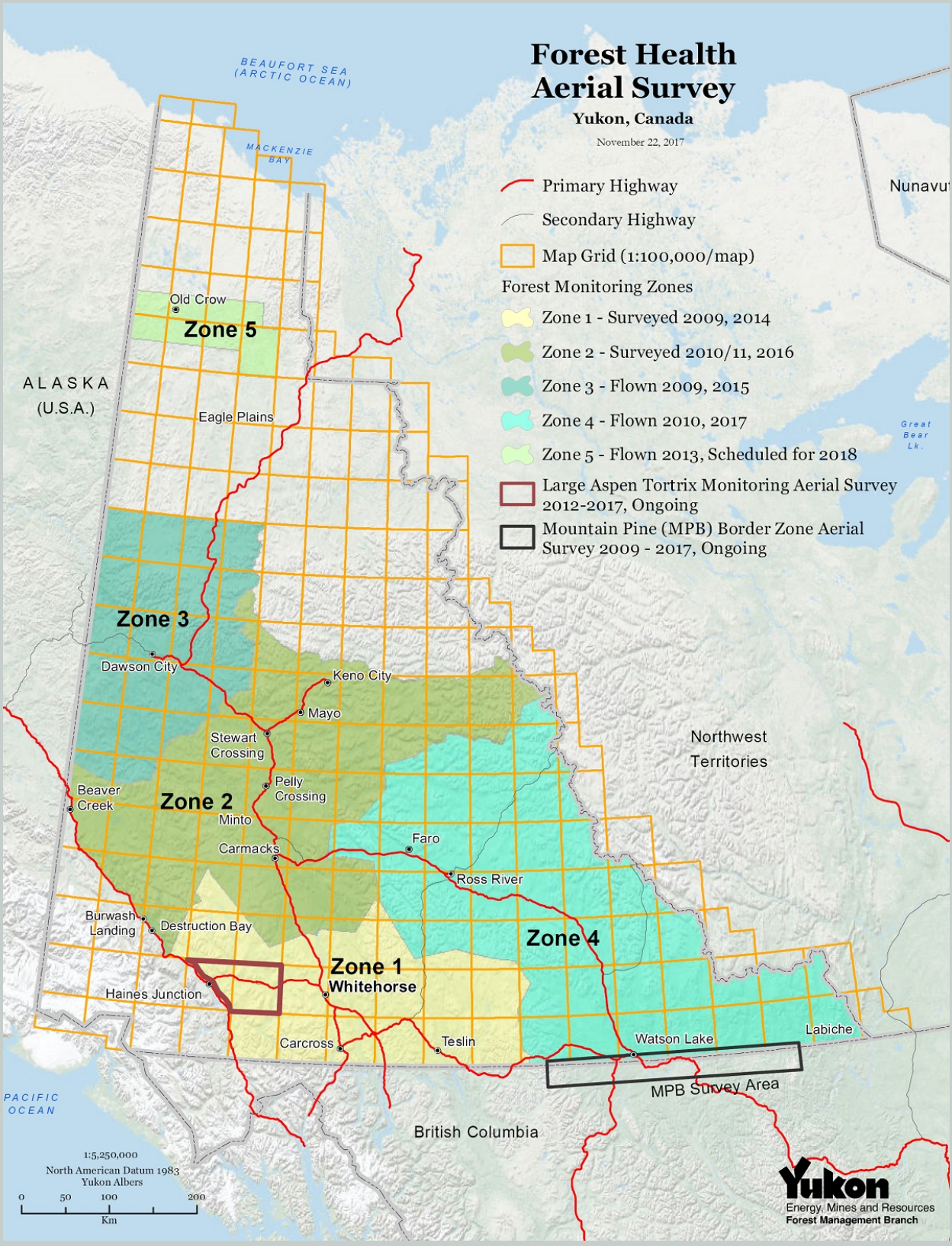
In 2009, the Yukon Forest Management Branch (FMB) implemented a risk-based approach to forest health monitoring that is consistent with the Canadian Council of Forest Ministers *National Forest Pest Strategy* (NFPS). The objectives of the approach are:

- to provide a Yukon-wide overview of forest health issues;
- to focus monitoring activities on high-risk forest health agents in high value forest regions; and
- to contribute to the NFPS goals, one of which is developing early detection and reporting capacity of forest health pests.

Additionally, the FMB produces an annual forest health report which presents the biotic and abiotic disturbance(s) detected by the annual forest health survey. The survey is performed in a different area (forest health management zone) each year.

For a full assessment of Yukon forest health issues, see the Yukon Forest Health Reports. The 2017 report is anticipated to be available in Spring 2018.

MAP 1: Forest Health Zone Map Shows areas flown from 2009-2017 and planned surveys for 2018 and 2019.



What is happening?

- As a part of FMB's risk based forest health monitoring program. The following activities were conducted in 2017:
  - aerial overview surveys;
  - monitoring of the Yukon/ BC border zone for mountain pine beetle (MPB);
  - MPB pheromone bait deployment;
  - follow up on the 2016 blowdown event in Watson lake; and
  - risk assessment of decked green spruce in Haines Junction.
- Aerial overview surveys were conducted over forest health zone (FHZ) 4 and parts of FHZ 1 (Refer to Map 1). Portions of FHZ 1 have been specifically targeted annually since 2012 to map the ongoing large aspen tortrix outbreak.

Forest health disturbances

FMB maps both biotic and abiotic disturbances. Biotic refers to living, such as native and invasive insects and diseases, whereas abiotic are non-living disturbances caused by weather or wildfires. Declines and pest complexes are generally a combination of both biotic and abiotic factors.

Biotic disturbances

Western balsam bark beetle

- A recently new bark beetle to Yukon sub-alpine fir forests with northern spread and expansion occurring over the last 20 years.
- Areas infested in FHZ 1 in 2010 have expanded significantly in the last seven years.
- Endemic populations can cause single tree mortality; however, outbreak populations can cause extensive group tree or stand-level mortality over successive years of attack.
- Retained red foliage for up to five years, making it difficult to determine trends.

Typical signature of western balsam bark beetle, e.g., scattered spots of red trees, in Southeast Yukon.

Eastern spruce budworm

- A small amount of spruce defoliation by eastern spruce budworm was recorded in areas previously defoliated by this cyclical pest in Southeast Yukon and the LaBiche River area. The last known outbreak in this area was from the mid-1990s to early 2000s.

Moderate eastern spruce budworm defoliation on hillsides near Pool Creek, west of Beaver River, in Southeast Yukon.

Aspen serpentine leafminer

- The area infested by aspen leafminer was highly variable, with increases in some areas and decreases in others.
- Ongoing defoliation has been recorded since early 1990s in Yukon aspen stands.
- In 2017, the area affected by leafminer increased in FHZ 4 from 2010 survey results in the same zone.
- Very slight decrease in areas infested by aspen leaf miner in FHZ 1 compared to the same area assessed in 2016.

Light to moderate aspen serpentine leafminer southwest of Ross River in FHZ 4 along the Robert Campbell Highway and Pelly River.

Large aspen tortrix

- In FHZ 4, this cyclical defoliator of trembling aspen caused defoliation to over 7,000 hectares near the Yukon/BC border. This defoliator has not been previously recorded in Southeast Yukon. However several outbreaks have recently occurred just to the south in British Columbia.
- In FHZ 1, the outbreak that began in 2012 is collapsing with only small scattered spots still remaining.
- Stand-level decline symptoms increased in FHZ 1, and are associated with the severity and longevity of the large aspen tortrix outbreak.

Moderate defoliation of hillside trembling aspen by large aspen tortrix, northeast of Tuchitua and west of Hyland River.

Willow leaf miner

- This common leaf miner was first recorded in Yukon in 2007 adjacent to the Stewart River at Stewart Crossing. In 2017, this defoliator was mapped in both the southern and northern sections of FHZ 4.

Foliar disease

- Foliar diseases, including rusts, occur on virtually every tree and shrub species in Yukon, with higher incidence generally associated with increases in precipitation.
- Many foliar diseases require alternate hosts to complete their life cycles.
- In FHZ 4, both conifer-cottonwood leaf rust and willow leaf rust were recorded, with a higher incidence of the latter in 2017.

Stand-level willow leaf rust near Tillei Lake, northeast of Francis Lake (left), and tree-level in Whitehorse (right).

Abiotic disturbances

Winter wind desiccation

- Commonly referred to as “red belt”, this is thought to result from temperature inversions in late winter and early spring. This is a temporary condition resulting in the loss of some foliage, but trees normally recover quickly.
- Landscape level damage occurred in higher elevation spruce stands near Moraine Lake and Aishihik Creek in FHZ 1.

Winter wind desiccation on white spruce near Moraine Lake in FHZ 1.

Windthrow

- Shallow rooted tree species, such as spruce, are more prone to windthrow.
- Small pockets of windthrow occurred in 2017, with the majority occurring east of Pelly Lakes in white spruce.

Flooding

- High water levels caused damage to riparian zones and forested fluvial areas, with over 238 hectares in FHZ 4 flooding. The largest was southwest of Watson Lake near the BC border at 41 hectares.
- In FHZ 1, damage due to high water levels was noted on the north side of Pine Lake, and near Aishihik Creek.

Dead and dying trees along riparian zones near Aishihik Creek, due to high water levels.

Pest complexes

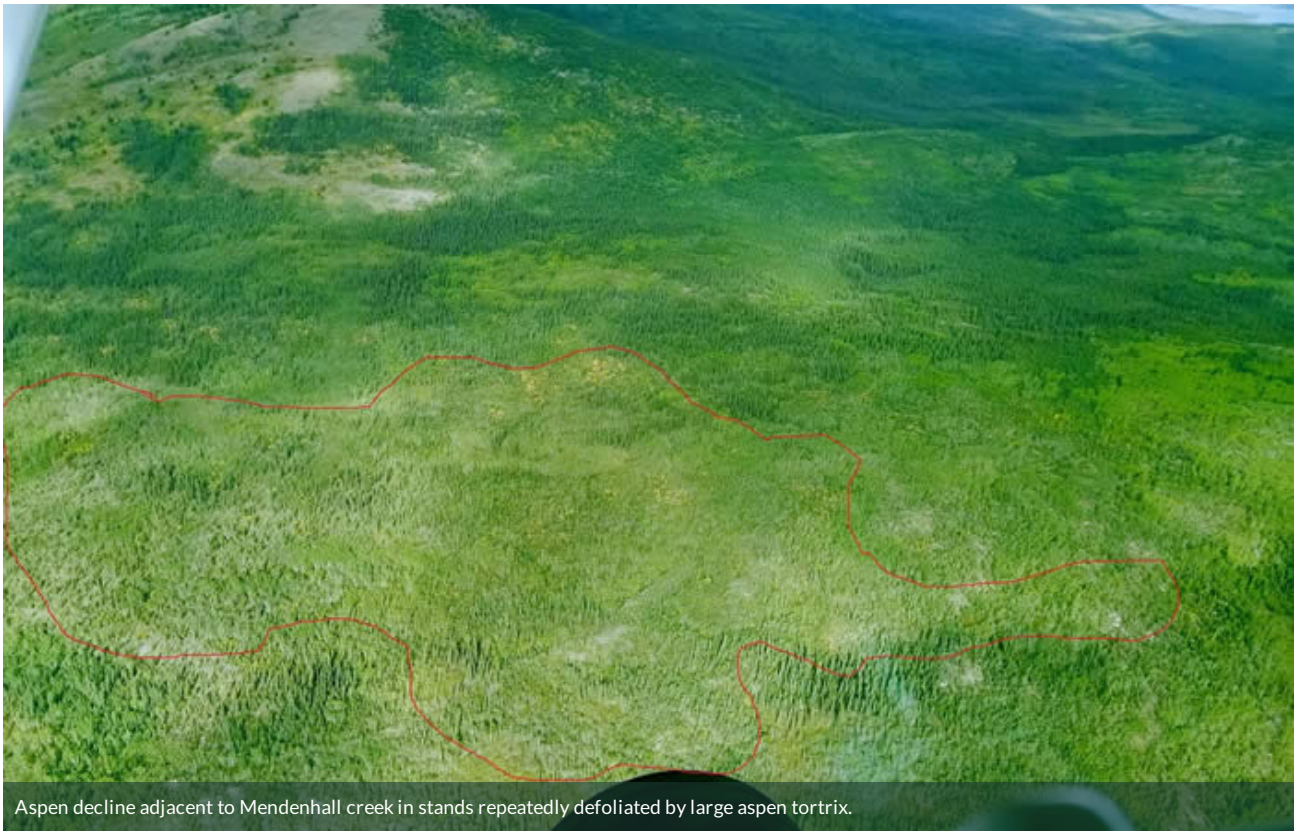
Wildfire scorching and secondary beetles

- Tree and basal scorching by wildfire weakens trees such that secondary beetles are capable of overcoming a tree's resistance.
- Infested lodgepole pine on the perimeter of wildfires were mapped in Southeast Yukon with the likely causal agent as pine engraver beetle, *Ips pini*, but other secondary beetles may also be involved.
- Ground checks in 2010 of similar damage found both pine engraver beetle and another engraver beetle, *Ips latidens.*

Secondary beetle activity in association with the previous year's wildfires, near Coal Creek in FHZ 4.

Aspen decline

- Aspen decline or dieback refers to mortality or damage to forests due to unknown causes, including a possible combination of biotic and abiotic factors.
- Spatial analysis and ground checks have found a relationship between aspen decline symptoms and frequency and the severity of defoliator outbreaks.
- Aspen decline is not common in FHZ 4, likely due to the lack of large aspen tortrix outbreaks. In 2017, a total of 62 Ha was affected; an increase from 2010 when a total of 11 ha was identified.
- In FHZ 1, the area with symptoms of aspen decline doubled to 4,618 hectares, up from 2,380 hectares in 2016. This increase in area is partially due to higher visibility of affected stands in the absence of defoliation, and is indicative of the longevity and severity of the large aspen tortrix outbreak.
- The largest area with aspen decline along Mendenhall Creek also had the highest levels of cumulative large aspen tortrix feeding damage.



Aspen decline adjacent to Mendenhall creek in stands repeatedly defoliated by large aspen tortrix.

Thinning aspen crowns likely due to frost damage and defoliation, north of Whitehorse.

Animal damage

- Young lodgepole pine stands were damaged by both porcupines and bears, with the vast majority occurring south of Francis Lake in FHZ 4.
- Bear damage often causes tree mortality, while porcupine damage generally leads to top or branch kill depending upon the location of the damage.

Table 1: Summary of the comparison of recorded forest health disturbances in FHZ 4 from 2010 and 2017, and only areas within the recent large aspen tortrix outbreak in FHZ 1.

	Zone 4		Zone 1		
Disturbance Type	**2010**	**2017**	**2015**	**2016**	**2017**
Biotic					
Western Balsam Bark Beetle	607	10,265	-	-	-
Eastern Spruce Budworm	-	369	-	-	-
Aspen Leaf Miner	53,085	94,390	-	172	135
Large Aspen Tortrix	-	7,106	15,690	1,237	452
Cottonwood Leaf Rust	-	187	-		-
Willow Leaf Rust	-	1,075	-		-
Willow Blotch Miner	-	442	-	13	-
Abiotic					
Winter wind desiccation	873	-	-	-	1,320
Windthrow	51	661	-	-	-
Flooding	506	238	-	-	399
Pest Complexes					
Wildfire scorch and secondary beetles	469	322	-	-	-
Aspen decline	11	62	-	2, 630	4,618
Animal Damage					
Porcupine	1	18	-	-	-
Bear	-	46	-	-	-

Taking action

In addition to the annual aerial survey monitoring of the forest health zones:

- *Proactive management of mountain pine beetle (MPB):*
  This marks the eighth consecutive year that FMB has been conducting aerial surveys in northern BC. In 2010, when aerial surveys were initiated, MPB populations and subsequent pine mortality within the Rocky Mountain Trench of BC were very high (within 150 kilometres of Yukon border). Since that time, severe winter cold has killed beetle broods within the trees. That combined with no large feeder population in northern BC has slowed significant northward movement of MPB populations. FMB continues to monitor the border zone as per our MPB monitoring strategy (See Map 1)

Since 2009, FMB has been setting up and monitoring 15 pheromone bait tree stations in southern Yukon and northern BC to detect the presence of MPB (Map 2). These pheromone baits do not attract MPB over long distances, but will draw them to the baits if they are already in the area. They also do not attract other species of bark beetles. No presence of MPB was found in 2017.

MAP 2: Location of pheromone baiting sites in southern Yukon.

Main body of Mountain Pine Beetle infestation 150 km south of Yukon border. This was observed at its peak of infestation in Rocky Mountain Trench BC in 2011.

Blowdown monitoring:

In spring of 2016 there was a wind event east of Watson Lake that resulted in blowdown in both aspen and spruce stands. As part of proactive management, the spruce beetle risk was assessed by conducting aerial surveys to delineate the blowdown, and ground surveys to determine if spruce beetle is present. In total, 108 ha of spruce-leading and 350 ha of aspen-leading windthrow was mapped; patches ranged from 2 – 25 ha in size. Ground assessments found no evidence of spruce beetle. Only one spruce engraver beetle (Ips pertubatus) was found in the windthrow, as well as wood boring beetles. Access however was hampered by steep slopes, hence not all sites were accessed. FMB will continue to monitor this area in 2018.

Ground assessments of white spruce windthrow (left), and windthrow example (right).

- *Risk assessment of decked green spruce in Haines Junction*:
  Proactive risk assessment of decked green spruce in area with history of spruce bark beetle near Haines Junction.

  Given spruce beetle history and the adjacent hazard, it was recommended that piles be removed. Piles were subsequently burnt and destroyed.

Burnt deck of white spruce near Haines Junction; proactive management via risk removal.

Data quality

- From 1950 to 1995, the Forest Insect and Disease Survey (FIDS) was conducted by the Canadian Forest Service (CFS). From 1995, both CFS and FMB conducted aerial surveys monitoring Spruce Bark Beetle near Haines Junction.
- In 2009, with National Forest Pest Strategy funding, FMB adopted the aerial overview survey program and has been conducting annual aerial surveys since then. FMB has conducted forest health aerial surveys at a landscape level since 2009 to identify both biotic and abiotic disturbances.
- Aerial overview surveys and ground field checks are a relatively simple and low-cost method for effectively monitoring forest health over large areas (Ciesla, 2000; Mitton and Grant, 1980). Aerial overview surveys are also adequate for regional and provincial summaries and to meet national requirements for the Forest Health Network (BC Ministry of Forests, Lands and Mines and CFS, 2000).
- As a result, aerial overview surveys are the primary tool for monitoring forest health in Yukon. The forest health aerial overview survey standards used by the BC Ministry of Forests, Lands and Natural Resource Operations are also used in Yukon, which ensures continuity across shared boundaries. Field checks are important for validating the data collected from the aerial surveys. Researchers check a portion of surveyed areas to confirm the identity and severity of the pest or disease disturbance.
- As of 2013, all five forest health zones in Yukon were monitored by aerial overview survey. Baseline data has been collected from each forest health zone. Hence, from 2014 on, mapping resolution moved from 8 kilometre gridlines to 12 kilometre gridlines. During the monitoring of the forest health zones, researchers may select disturbances for further monitoring in the same year. If necessary, these disturbances are identified as ongoing monitoring areas to be included along with the forest health zones scheduled for aerial surveys during the current year.
- FMB's forest health program contains ground survey protocols to predict insect population trends, as well as evaluate the potential risk from various insect pests.

References

Forest Management Branch Website: http://www.forestry.gov.yk.ca/

Forest Health Brochures featuring main pests and pathogens of Yukon: http://www.emr.gov.yk.ca/forestry/insects_disease.html

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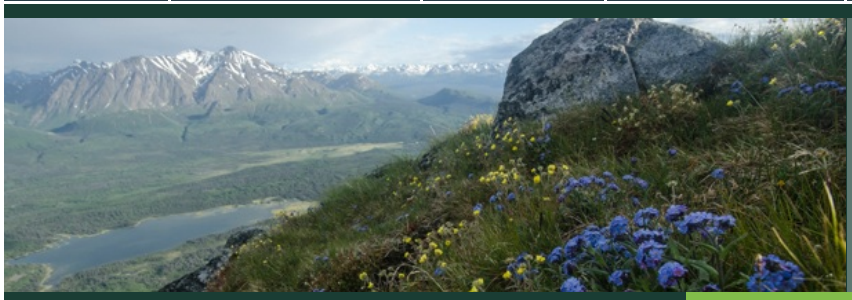

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WETLANDS

WETLANDS

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Wetlands can be essential for maintaining water flows, flood protection, purifying water, recharging/discharging groundwater, and providing habitat for fish and wildlife. Some wetlands support traditional subsistence and cultural activities and provide for recreation. Wetlands also provide a number of additional valuable functions including:

- slowing the flow of water, thereby reducing erosion;
- providing habitat for plants that help stabilize stream banks and shorelines;
- creating and fertilizing floodplains;
- supporting the food chain;
- enhancing aesthetics; and
- serving as a rich arena for education.

The Government of Yukon uses the Canadian Wetlands Classification System (1997) that includes five classes of wetlands: bogs, fens, swamps, marshes and shallow open water. These classes are determined by soil, vegetation, water and other ecological characteristics. The classification system provides a practical and consistent framework for the characterization and description of wetlands throughout Yukon and Canada that can be used by specialists and non-specialists alike. Wetland classification can be used by proponents to communicate with assessors and by land managers to identify habitat that may warrant special consideration in planning).

The Canadian Wetland Classification System is a scientific classification and does not address environmental, social or economic importance of a wetland. It is used for naming and describing various kinds of wetlands for use during environmental assessments, regulatory applications, conservation area planning and planning of infrastructure projects.

For more information on the classes of wetland, refer to these factsheets produced by Ducks Unlimited Canada.

The largest concentrations of wetlands in Yukon are located in areas underlain by continuous permafrost from central to northern Yukon. Smaller wetlands and wetland complexes are scattered throughout the territory. Wetland mapping has not been carried out in Yukon and the full extent of wetlands is not known, in particular the extent of peatlands. Wetlands are important for a disproportionally high number of species compared to many other habitats (Environment and Climate Change Canada, n.d.) which is reflected in the number of protected areas in Yukon that include wetlands.

Ice wedge polygons caused by freezing and thawing, Yukon North Slope.

What is happening?

- As needed, wetland inventory is conducted to support various governments and non-government projects and planning processes.
- There are a number of important wetlands identified as “significant” in the Government of Yukon’s key wildlife area database held within the on-line Lands Viewer map tool.
- Many of our existing protected areas include important wetland habitat.
- There are bird monitoring programs in place in a number of wetland complexes recognised for their value to migratory birds which can provide an indication of wetland ecological health (i.e., waterfowl monitoring.)

Mendenhall swamp and marsh wetland complex. Cameron Eckert.

Taking action

The Government of Yukon's Wetland Policy

One of the recommendations in the *Yukon Water Strategy and Action Plan* (2014) is to develop a wetland policy for Yukon. A number of wetland initiatives carried out by the Government of Yukon over the last 15 years include: wetland classification, best practices, environmental assessment, inventory, management planning for specific wetlands, and monitoring of environmental change.

The Government of Yukon, led by the Department of Environment and an interdepartmental working group, is in the initial stages of developing a wetland policy. A consistent approach to, and understanding of, wetlands will enable governments to better manage wetlands and consider their functions and values in planning and decision-making.

Wetland Reclamation Guide

The Government of Yukon, led by the Department of Energy, Mines and Resources, is developing a guide for wetland reclamation for the placer mining industry.

The wetland reclamation guidance document is intended to provide assistance to placer miners who are required to develop a wetland reclamation plan in accordance with an approval and/or licence. However, this guidance document may also provide useful information to all placer miners working in wetland areas who are undertaking progressive wetland reclamation activities.

This guidance is also intended to assist assessors and regulators to provide consistent advice and direction during the assessment and licensing of placer mining operations in wetland areas.

The Government of Yukon has partnered with Ducks Unlimited Canada and the Klondike Placer Miners’ Association to develop best management practices for wetland reclamation of open water ponds to increase the value of settling ponds for waterfowl.

Aishihik Lake wetland complex.

References

Ducks Unlimited Canada. n.d. Yukon Wetlands. Ducks Unlimited Canada, Stonewall, Manitoba, Canada. Available from: http://www.env.gov.yk.ca/animals-habitat/documents/ducks_unlimited_wetland_factsheet.pdf

Environment and Climate Change Canada. n.d. Extent of Canada's Wetlands [modified 2016 Feb 17; cited 2016 Mar 3]. Available from: https://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=69E2D25B-1

National Wetlands Working Group. 1997. The Canadian Wetland Classification System, Second Edition. University of Waterloo, Waterloo, Ontario. Available from: http://www.env.gov.yk.ca/animals-habitat/documents/canadian_wetland_classification_system.pdf

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ALIEN AND INTRODUCED SPECIES

PRESENCE OF ALIEN AND INTRODUCED SPECIES

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Plants, animals and microorganisms introduced outside their normal range by humans are considered introduced alien species. Not all alien species are harmful to an ecosystem, and some are introduced on purpose (e.g., for conservation, in gardens, to increase hunting or fishing opportunities, etc.).

Invasive species are alien species whose introduction has an environmental, economic or social cost. (CBD Secretariat n.d.). The impacts of invasive species include loss of biodiversity, reduced property value or reduced quality and abundance of resources to humans, including loss of plants traditionally used by First Nations.

Increases in resource exploration and development and increases in backcountry pursuits will likely increase the range and number of invasive species. A changing climate is also a factor in the increase and spread of alien and invasive species (Streicker 2016).

PROFILE

EARLIEST AND MOST RECENT INTRODUCTIONS

Common Plantain. Bruce Bennett.

EARLIEST AND MOST RECENT INTRODUCTIONS

Common Plantain. Bruce Bennett.

The earliest report of an introduced species was a collection made by William Healey Dall in about 1868 along the Yukon River. He collected Common Plantain (Plantago major), a species known for its medicinal properties that could have been introduced by early traders.

In 2016, several species are newly reported and have been added to the list of exotic species. These include Ground-ivy (Glechoma hederacea), a garden weed, and two species Creeping Bellflower (Campanula rapunculoides) and the berry-producing shrub Cotoneaster sp. that have escaped gardens and are establishing wild populations.

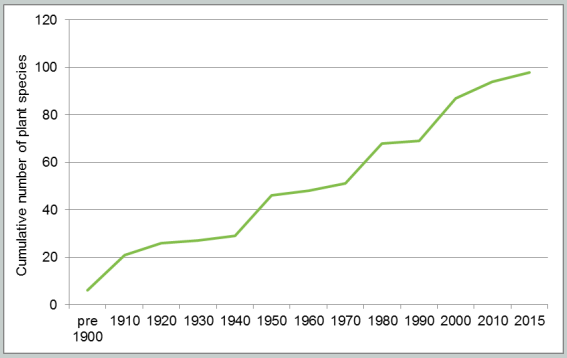
New introductions come from gardens.

What is happening?

Plants

- As of November 2016, an estimated 166 alien plant species have been identified in Yukon. Of these, 99 are currently believed to be present, 32 are believed to be absent, and the presence of 37 additional species is unknown (Figure 1).
- Twenty of these plant species are considered invasive in Yukon (Yukon Invasive Species Council n.d.)
- Since 2015, a number of vascular plant species once thought to be introduced are now considered to be expanding their range and are therefore considered native. Changing species range is natural and the rate of expansion appears to be increasing. This phenomenon has been more clearly documented with vertebrate animals sure as Mule Deer, Cougar, and Moose which have expanded their range northwards. Several species are newly reported and have been added to the list of exotic species. These include Ground-ivy (*Glechoma hederacea*), a garden weed, and two species Creeping Bellflower (*Campanula rapunculoides*) and the berry-producing shrub Cotoneaster sp. that have escaped gardens and are establishing wild populations.
- Since the late 1800's, botanists have searched communities collecting and identifying plants. With few exceptions, introduced plant species are associated with human disturbance. By looking at the results of surveys in the communities (particularly Dawson City and Whitehorse), along major highways (particularly the Alaska and Klondike highways), and along major rivers (such as the Yukon and Teslin river), a trend in the number of introduced species naturalized is shown (Figure 1).

FIGURE 1: Introduced plant species persisting in Yukon



Source: Yukon Conservation Data Centre, 2015.

Mammals

- There are 72 regularly occurring mammal species in Yukon; of these, three are introduced beyond their native range.
- No mammals are considered invasive in Yukon.
- The House Mouse is an alien species from Europe that was introduced accidentally or has spread from southern populations. Feral horses are known to be present in Yukon at the time of this
- report.
  Elk, though native to southeast Yukon, were introduced to south-
- central Yukon in the late 1940s, to reduce hunting pressure on moose and caribou.

Elk. J Bergold.

Birds

- There are four introduced bird species out of the 240 bird species that regularly occur in Yukon: Rock Pigeon, House Sparrow, Eurasian Collared Dove, and European Starling. These species
- were introduced accidentally or have spread from southern populations.
- These four species occur in low numbers and are not expected to have a large impact on native species (Yukon Invasive Species Council n.d.).

House Sparrow. Cameron Eckert.

Freshwater fishes

- Most Yukon lakes and waterways appear to be free of invasive or introduced species.
- Out of the 38 regularly occurring species of freshwater fish, two are introduced:
    - Goldfish is an alien species that occurs in Yukon and was either introduced accidentally or spread from southern populations.
    - Threespine Stickleback is native in B.C. and Alaska but was accidentally introduced into two pothole lakes with fish stocking programs in the 1970s.
- Several fish species, though native in some rivers or lakes in Yukon, were intentionally released in other areas to enhance fishing opportunities (Table 1).

Table 1: Native Yukon fish species introduced to other places in Yukon

Species:	Native to:	Introduced in:
Arctic Char	Two lakes in Ivvavik, northern Yukon	Southern Yukon
Bull Trout / Dolly Varden	Yukon and Liard drainages	Pothole Lakes
Kokanee	Alsek drainage	Scout Lake
Rainbow Trout	Alsek drainage	Yukon River

Invertebrates

- Less is known about alien invertebrates in Yukon.
- The Conservation Data Centre currently has about 3,000 invertebrate species recorded in their database; 26 are known to be introduced and believed to be present. It is likely that more introduced species are present but not detected.
- There are several alien earthworms that are believed to live year round in Yukon (i.e., the night crawler or dew worm). The Red Wiggler is commonly used for composting, but is not known to overwinter in Yukon outside cultivation.
- The Seven-spotted Lady Beetle is commonly used to control aphids in greenhouses and has been found in remote places such as Keno Hill. It is now believed to be persisting in the wild.

Seven spotted lady beetle. Kelcy Tousignant.

Taking action

The Yukon Invasive Species Council works 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.

The Fisheries Program at the Department of Environment asks Yukoners to report aquatic invasive species. They actively promote information at boat launches throughout the Yukon.

Threespine Stickleback. NOAA Fisheries, Auke Bay Laboratories.

Data quality

- Through the Spotter's Network, there is a formal protocol for invasive alien species data collection within Yukon.
- The Yukon Conservation Data Centre makes data publicly available to anyone wishing to access information on species or ecosystems of conservation concern. This includes lists of species, range maps and identification guides.
- The Department of Environment provides additional information about Yukon's aquatic invasive species and invasive plants.

References

Convention on Biological Diversity (CBD) Secretariat. n.d. Invasive species [cited 2016 Mar 3]. Available from www.cbd.int/invasive

Streiker, J. 2016. Yukon Climate Change Indicators and Key Findings 2015. Northern Climate ExChange, Yukon Research Centre, Yukon College, Whitehorse, Yukon, Canada. Available from: https://www.yukoncollege.yk.ca/research/abstracts/indicators.

Yukon Conservation Data Centre. n.d. Rare species database [modified 2015 Dec 23; cited 2016 Mar 3]. Available from: www.env.gov.yk.ca/cdc

Yukon Invasive Species Council. n.d. Yukon Invasive Species [modified 2016 Feb 20; cited 2016 Mar 3]. Available from: http://www.yukoninvasives.com/index.html

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PLANNING

Species-based management plans

Species-based management plans address conservation or population management concerns for an animal, fish, or bird population.

Community-based fish and wildlife work plans

Community-based fish and wildlife work plans are developed to address local fish and wildlife management concerns in a coordinated manner within a Traditional Territory.

MAMMALS

Caribou population and distribution

Both of the barren-ground caribou herds that occur in Yukon are increasing in size. Of the 26 woodland caribou herds in Yukon, two are increasing in size, 11 are relatively stable and three are declining.

Caribou mercury levels

Monitoring shows that the concentration of mercury in the kidneys of the Porcupine caribou herd continues to be low.

Density of snowshoe hares

The snowshoe hare is a keystone species in the boreal forest; changes in hare population cycles can be an early warning system for ecosystem changes due to climate change.

Winter tick surveillance

Winter ticks have not caused serious problems for Yukon wildlife. However, given they have been identified on several Yukon species, they are likely here to stay.

FISH

Number of spawning Chinook salmon

The spawning escapement target for Canadian-origin Yukon River Chinook salmon was met in 2016.

Sustainability of lake trout fisheries

Healthy lake trout populations reflect the general health of an aquatic ecosystem. Lake trout harvest in most Yukon lakes continues to be sustainable; catch and possession limits will be reduced in April 2017 for one lake to maintain a sustainable fishery, and for for three to allow depleted populations to rebuild.

Fish mercury levels

There is a correlation between the length of a fish and its mercury concentration. Most fish from Yukon's lakes have mercury levels well below Health Canada's maximum limit.

BIRDS

Monitoring breeding waterfowl

Monitoring waterfowl presence and abundance gives a good indication of the ecological health of the area, as waterfowl depend on wetland areas for food, nesting areas and safety.

Trumpeter Swan population monitoring

Trumpeter swans were considered endangered in the 1970s. Monitoring efforts shows that their numbers continue to increase in Yukon.

Lead surveillance in wild birds

Scavenging birds and waterfowl may ingest sources of lead—like bullets, shot and lead fragments—because of their feeding behaviours. The Government of Yukon is gathering information to better understand how birds are being affected by lead and how it varies by species.

SPECIES AT RISK

Number of species at risk in Yukon

Yukon's healthy ecosystems are a refuge to many species that are considered at risk nationally due to declines outside the territory.

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PLANNING

SPECIES MANAGEMENT PLANS

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Species management plans address conservation or population management concerns for fish or wildlife populations. They are used to help to develop or revise approaches to managing a population and regulating human interaction with these species.

Management plans are developed in response to local or territorial population management needs or as required through the federal species at risk legislation. Tracking the implementation of management plans helps to demonstrate commitment to continued action on managing species.

Aishihik wood bison.

What is happening?

The Yukon government has the following species management plans in place or in progress:

Plan	Approved	Status	Summary
Management Plan for Elk in Yukon	2016	Current	This plan provides an adaptive framework to guide the management of the Takhini and Braeburn elk herds.
Mandanna Lake Management Plan	2013	Current	This plan was approved in 2003 as a requirement from the Little Salmon/Carmacks First Nation Final Agreement. The plan was reviewed and updated in 2013. The plan guides the conservation of freshwater fish and the respect for traditional and current uses of the lake.
Management Plan for Yukon Amphibians	2013	Current	This plan provides a broad framework guiding the management of amphibians in Yukon. The Western Toad is listed as a Species of Special Concern under the federal *Species at Risk Act*.
Management Plan for the Aishihik Wood Bison Herd in Southwestern Yukon	2012	Current	This plan provides a broad framework guiding the management of the herd in a manner consistent with recovery of a species at risk, while addressing local concerns and interests.
Yukon Wolf Conservation and Management Plan	2012	Current	This plan guides wolf conservation and management throughout Yukon, ensuring that the roles of wolves and their prey species are respected.
Dezadeash Lake Management Plan	No	Underway	This plan guides management of fish populations and their habitat at Dezadeash Lakes. The plan is being developed in partnership with Champagne and Aishihik First Nations, Alsek Renewable Resource Council, and the Government of Yukon.
Grizzly Bear Conservation and Management Plan	No	Underway	The Government of Yukon and the Yukon Fish and Wildlife Management Board are working in partnership to develop this plan to address local management issues and to meet federal and international obligations.

The federal government has the following recovery strategies and management plans in place or in progress:

Recovery Strategy (in place) Baikal Sedge Eskimo Curlew Northern Mountain Caribou Wood Bison Little Brown Myotis and Northern Myotis	**Management Plan (in place)** Short Eared Owl Rusty Blackbird Peregrine Falcon
Recovery Strategy (in progress) Common Nighthawk Olive Sided Flycatcher Red Knot roselaari type	**Management Plan (in progress)** Polar Bear

The *Management Plan for Yukon Amphibians*, *Management Plan for the Aishihik Wood Bison Herd in Southwestern Yukon*, and the *Grizzly Bear Conservation and Management Plan* were developed in part to address the national requirements under the federal *Species at Risk Act*.

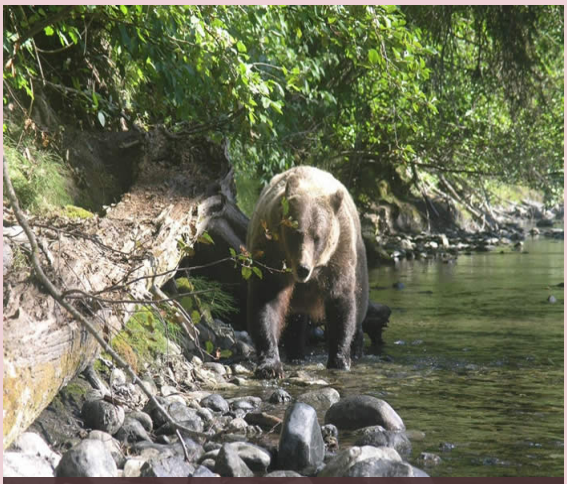
Taking action

View the species management plans.

Wolves play an important role in Yukon's ecosystems.

PROFILE

GRIZZLY BEAR CONSERVATION AND MANAGEMENT PLAN



Female grizzly. Angela Milani.

GRIZZLY BEAR CONSERVATION AND MANAGEMENT PLAN

The Yukon government is working in partnership with the Yukon Fish and Wildlife Management Board to develop a Grizzly Bear Conservation and Management Plan for Yukon.
Grizzly bears are nationally assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Special Concern. Once listed in the federal Species at Risk Act, a management plan for the species across Canada will be required. The Yukon Grizzly Bear Conservation and Management Plan will provide important Yukon-specific context and guidance to support the development of a national plan for grizzly bears and it will inform decisions related to grizzly bear conservation and management in Yukon.

The management plan will consider all aspects of grizzly bear conservation and management with particular focus on habitat and land use issues, hunting and harvest management (including hunting of grizzly bears along roadsides), reducing conflicts between grizzly bears and humans, wildlife viewing and tourism values, and improving our understanding of grizzly bear populations and ecology.

The management plan will provide overarching strategic direction for addressing the range of values and issues related to grizzly bear conservation and management across Yukon. Although local or regulatory issues will not be specifically addressed in the plan, it may contain related recommendations.

The working group is engaging First Nations, Inuvialuit, boards and councils, non-governmental organizations, interest groups, and the public to gather Yukon's collective knowledge and wisdom about grizzly bears, and will integrate use local, traditional and scientific knowledge to develop the management plan.

Female grizzly with cubs. Angela Milani.

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PLANNING

COMMUNITY-BASED FISH AND WILDLIFE WORK PLANS

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Strategic work planning helps to identify long-term and cooperative management solutions to help support healthy fish and wildlife populations.

Community-based fish and wildlife work plans are one way that the Government of Yukon, First Nation governments, and renewable resources councils work together to decide the priority fish and wildlife management issues for an area and propose cooperative approaches for addressing these issues. Tracking the implementation of these work plans is one measure of effective fish and wildlife management.

Cow moose with two calves.

What is happening?

- There are four community-based fish and wildlife work plans currently in place.
- Science, traditional and local knowledge is considered in the development and implementation of these plans.
- The *Southern Lakes Regional Wildlife Assessment and Recommendations* was developed by governments (First Nations, Yukon, Canada, and British Columbia) to recover and conserve wildlife populations and their habitat in the Southern Lakes area.

Taking action

- Many fish and wildlife surveys and habitat mapping initiatives have been completed in traditional territories because of issues identified through community based planning.
- Opportunities for working with different agencies to address fish and wildlife management concerns in communities are often identified through these work plans.
- Art work done by youth in the communities have been featured in the completed plans.

PROFILE

RECOVERY OF MOOSE IN ALSEK

Moose.

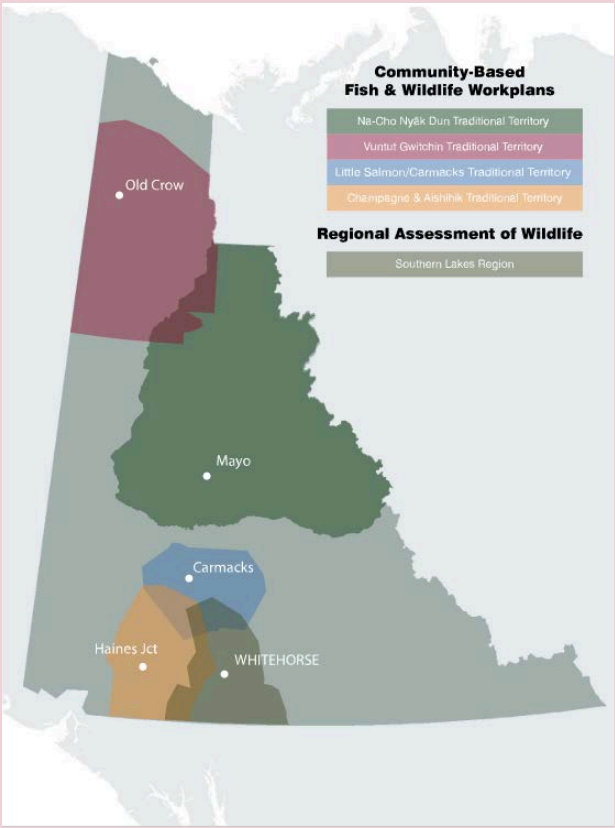
RECOVERY OF MOOSE IN ALSEK

Environment Yukon, Champagne and Aishihik First Nations, and the Alsek Renewable Resources Council are collaborating on a community-based project to recover the Alsek moose population, located west of Kusawa Lake.

This management action is intended to stabilize and recover the Alsek moose population because it has declined and there were concerns about the sustainability of harvest. It responds to concerns raised through the community fish and wildlife work planning for the Champagne and Aishihik Traditional Territory.

The pilot program has three important components:

- **A harvest management strategy t**o support sustainable harvest levels by First Nation and licenced hunters.
- **A trapping initiative** to promote community members being on the land, encourage stewardship of wildlife resources, increase education and trapping skills and assist the moose recovery effort by increasing wolf harvest in the Alsek region.
- **Enhanced monitoring of moose and wolf numbers t**o evaluate management efforts. Yukon government conducted a moose census in November 2015, in collaboration with the Government of BC and Parks Canada. A wolf survey was completed in February 2016 to better understand wolf distribution and abundance in the area. Additional monitoring work is planned throughout the duration of the project.



Na-Cho Nyäk Dun Traditional Territory
Community-based Fish and Wildlife Work Plan

Approved: 2014

Status: Current

Summary:

This work plan addresses issues related to habitat, moose, freshwater fish, caribou, and monitoring and stewardship in the Na-Cho Nyäk Dun Traditional Territory.

Workplan:

Vuntut Gwitchin Traditional Territory
Community-based Fish and Wildlife Work Plan

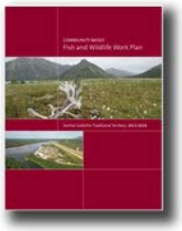
Approved: 2013

Status: Current

Summary:

This work plan addresses issues related to fish and wildlife populations and monitoring, managing human-wildlife conflicts, harvest and education, and habitat in the Vuntut Gwitchin Traditional Territory.

Workplan:



Little Salmon/Carmacks Traditional Territory
Community-based Fish and Wildlife Work Plan

Approved: 2012

Status: Current

Summary:

This work plan addresses issues related to fish and wildlife populations, habitat, harvest and information gaps in the Little Salmon/Carmacks Traditional Territory.

Workplan:

Champagne & Aishihik Traditional Territory
Community-based Fish and Wildlife Work Plan

Approved: N/A

Status: In Progress

Summary:

Work planning is currently underway for the Champagne & Aishihik Traditional Territory.

Yukon
Southern Lakes Area
Regional Assessment of Wildlife

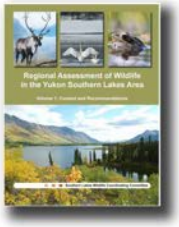
Approved: 2012

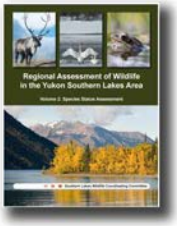
Status: Current

Summary:

The *Southern Lakes Regional Wildlife Assessment and Recommendations* is the first joint effort by governments (Canada, British Columbia, and First Nations) to recover and conserve wildlife populations and their habitat in the Southern Lakes area.

Reports:





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MAMMALS

CARIBOU POPULATION AND DISTRIBUTION

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Caribou are important ecologically and culturally. Many people in Yukon rely on caribou for subsistence and spiritual well-being. Conserving and protecting key caribou habitat – rutting areas, migration corridors and winter range – is important for herd health and abundance.

Caribou herds that cross jurisdictional boundaries require a coordinated approach to their management. For example, the Porcupine caribou herd has a range which covers Yukon, Alaska, and the Northwest Territories.

Woodland caribou. Cameron Eckert.

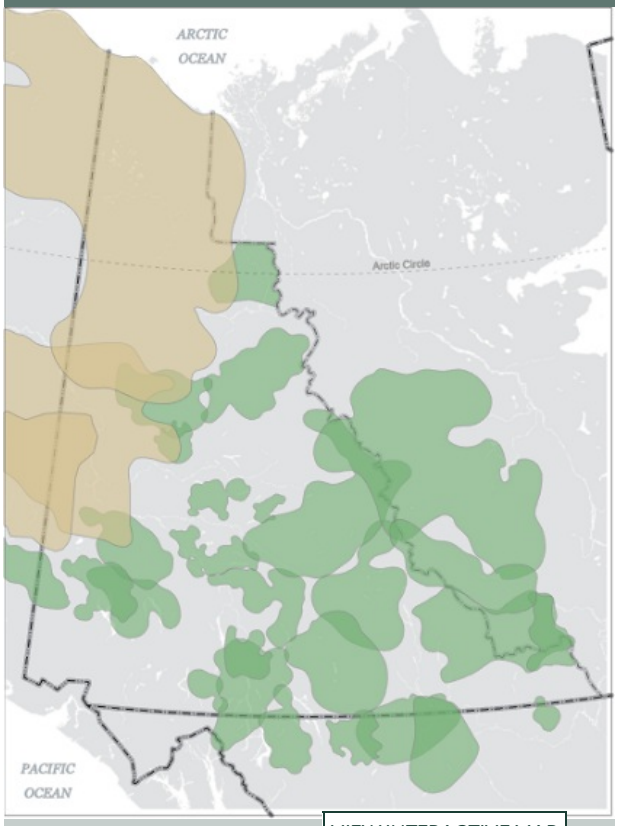
What is happening?

There are two subspecies of caribou in Yukon, *Rangifer tarandus granti* and *Rangifer tarandus caribou*, which represent large migratory (Porcupine, Fortymile and Nelchina) and more sedentary woodland (Northern Mountain and boreal) herds, respectively.

Woodland caribou herds

- In 2014, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) re-assessed all Northern Mountain woodland caribou in Canada as a Species of Special Concern. These caribou are designated as such under Canada's *Species at Risk Act*.
- Across Canada, boreal woodland caribou are designated as a Threatened Species under Canada's *Species at Risk Act*.
- Of the 26 Northern Mountain woodland caribou herds present in Yukon, four are increasing in size, seven are considered relatively stable and three are declining.
- The declines in Yukon herds and across the circumpolar north may be due to environmental changes, natural population cycles, or human influences such as harvest and development.
- Population trends are unknown for 12 of the woodland caribou herds.
- The Ibex caribou herd is expanding its range to the north, south and west. Information collected by the Department of Environment and by members of the public indicates that this herd is now being seen in areas where it has not been observed for many decades, particularly west of Kusawa Lake.
- Based on the area of mapped disturbances (human-caused and fire-related), Yukon's boreal caribou are considered "self-sustaining" (i.e., at least stable), under Environment and Climate Change Canada's boreal caribou recovery guidelines. Yukon's boreal caribou are small in number and represent a small fraction of the overall boreal caribou population in Canada and are contiguous with boreal caribou in the Northwest Territories.

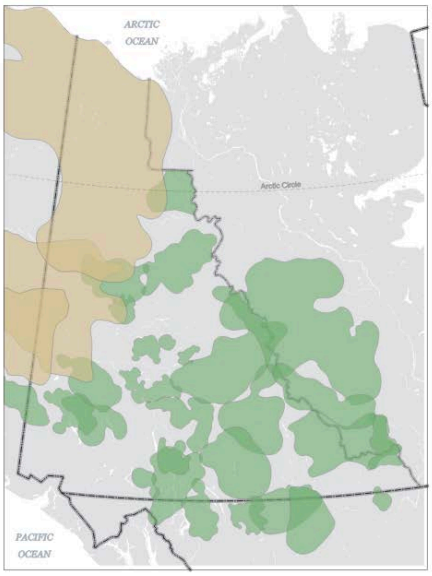
FIGURE 1: Distribution of caribou herds in Yukon, 2017



VIEW INTERACTIVE MAP

YUKON CARIBOU HERD RANGES 2017

Move cursor over the map or table to explore ranges and statistics



CARIBOU HERD	POPULATION ESTIMATE	SURVEY TECHNIQUE*	LAST SURVEYED	TREND
LARGE MIGRATORY CARIBOU				
Fortymile	71,500	Estimate (4)	2017	Increasing
Porcupine	218,000	Estimate (4)	2017	Increasing
Nelchina	46,500	Estimate (4)	2016	Increasing
WOODLAND CARIBOU				
Aishihik	2,050	Estimate (5)	2009	Unknown
Atlin	800	Estimate (2)	2007	Unknown
Bonnet Plume	5,000	Expert Opinion	1982	Unknown
Boreal	unknown	n/a	n/a	Stable**
Carcross	800	Estimate (2)	2008	Stable
Chisana	700	Estimate (5)	2013	Stable
Clear Creek	900	Estimate (2)	2001	Unknown
Coal River	450-700	Estimate (1)	2008	Unknown
Ethel Lake	450	Estimate (1)	2017	Increasing
Finlayson	2,700	Estimate (2)	2017	Declining
Hart River	2,660	Estimate (5)	2015	Stable
Horseranch, Little Rancheria	1,750	Estimate (2)	1999	Declining
Ibex	1100	Estimate (1)	2017	Increasing
Klaza	1180	Estimate (5)	2012	Stable
Kluane	470	Estimate (5)	2015	Increasing
Laberge	100-300	Estimate (2)	2003	Unknown
Labiche	450-700	Estimate (1)	1993	Unknown
Liard Plateau	150	Estimate (1)	2011	Stable
Moose Lake	300	Estimate (2)	1991	Unknown
Pelly Herds	1000	Estimate (3)	2002	Unknown
Redstone	10,000	Estimate (1)	2012	Stable
South Nahanni	2,100	Estimate (5)	2009	Stable
Swan Lake	600-800	Estimate (2)	2007	Unknown
Tatchun	500	Estimate (1)	2000	Increasing
Tay River	3,750	Estimate (2)	1991	Unknown
Wolf Lake	1,500	Estimate (2)	1998	Unknown

* (1) Total Minimum Count (2) Stratified Random Quadrat (3) Extrapolation (4) Direct Photocount (5) Mark/Resight
** Based on 2015 Environment and Climate Change Canada assessment of habitat disturbance in the herd's range

Large migratory caribou herds

- In 2016, COSEWIC assessed all "barren-ground" caribou in Canada as a Threatened Species. Yukon's Porcupine caribou herd is included in this assessment.
- The Fortymile and Nelchina herds are not considered "barren-ground" caribou under COSEWIC's barren-ground caribou assessment and their status has not been assessed.
- In Yukon, all of the large migratory caribou herds, Fortymile, Nelchina, and Porcupine, are increasing in size.
- Starting in the winter of 2013-14, the Fortymile caribou herd dramatically increased its presence in Yukon, expanding its recent range to the east and southeast, back to historic ranges last used in the 1960s. This movement of Fortymile caribou into Yukon was aided by conservation actions in Yukon and Alaska initiated in 1995. At roughly the same time, the Nelchina herd also began moving into Yukon during the winter months. Its range in Yukon overlaps substantively with the Fortymile herd.

Taking action

- The Department of Environment monitors several caribou herds each year to assess overall status and trends.
- Recovery plans for woodland caribou populations have been developed under the federal *Species at Risk Act*.
- Harvest management plans have been developed for the Fortymile and Porcupine caribou herds in collaboration with co-management partners.
- An international, multi-jurisdictional management plan for the Chisana herd has been developed

Data quality

- Caribou herd population status (size and trend) is typically determined through aerial surveys which estimate both herd size and the number of calves produced each year.
- The Government of Yukon has modified its approach over the past few years to use aerial surveys in combination with radio-collared animals to monitor Northern Mountain woodland caribou herds.
- This approach has increased the precision of population estimates as well as provided additional information on seasonal ranges and habitat use.
- The sizes of large migratory herds are estimated using aerial photocensus techniques. The Government of Yukon partners with the Government of Alaska, which leads these surveys.

Collared caribou are key for monitoring the Fortymile caribou herd. Scott Cameron.

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MAMMALS

CARIBOU MERCURY LEVELS

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Contaminants such as heavy metals can persist in the environment and can have serious health implications for wildlife and for people—especially those who depend on traditional foods. In Canada, mercury is a risk to Canadian ecosystems and human health (Environment and Climate Change Canada 2016).

Many contaminants found in the North were never used in the region but have been transported here by wind and water, as they tend to settle in areas with colder climates. Many contaminant sources have been banned or restricted for many years, but still persist in northern ecosystems.

Caribou feed on lichen that can directly absorb airborne contaminants, such as mercury. The annual changes in mercury in Porcupine caribou may reflect changes in atmospheric mercury levels or changes in the environment (e.g., temperature, precipitation and wind) that affect how mercury moves from the air to caribou forage.

Arctic Caribou Contaminant Program. Please note that moose are no longer being sampled under this program.

What is happening?

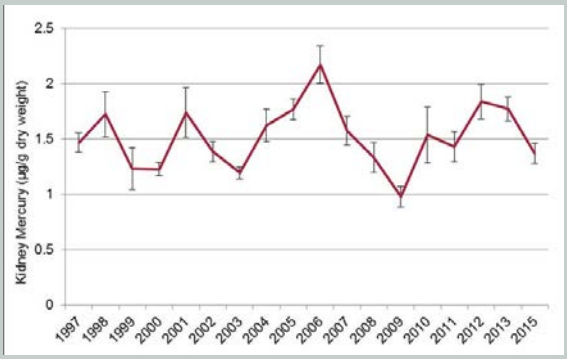
In 2016, samples were collected from 23 Porcupine caribou.

Mercury concentrations in liver are generally lower than in kidneys, averaging 1.8 mg/g dry weight. While mercury fluctuates over time in caribou organs, over the long term it has remained stable in the Porcupine caribou herd.

Yukon Health advisories:

- Meat (muscle) from Yukon caribou is a healthy food choice, as heavy metals are present in very low concentrations.
- Intake of kidney and liver from Yukon caribou should be restricted depending on the herd (e.g., a maximum of 25 kidneys or 12 livers from the Porcupine herd per year).

Figure 1: Average mercury concentrations found in kidneys of the Porcupine caribou bulls



Taking action

The federal Northern Contaminants Program has measured mercury levels in the Porcupine caribou herd since 1994 to determine if these populations remain healthy (in terms of contaminant loads) and whether they remain a safe and healthy food choice for northerners.

The Porcupine caribou data were part of a dataset submitted by the Northern Contaminant Program to the United Nations Environmental Programme. The data was provided to support the Minamata Convention—a global treaty to protect human health and the environment from the adverse effects of mercury. Signatories to the convention work towards controlling how much mercury humans release into the environment. The 50-ratification milestone was reached on May 18, 2017. This means that the Convention came into force on August 16, 2017.

The *AMAP Assessment 2015: Human Health in the Arctic* has now been released. This assessment of Arctic human health impacts of contaminants and other stressors was conducted between 2012 and 2014 by an international group of over 60 experts. Recommendations from the report were delivered to Arctic Council Ministers at their meeting in Iqaluit in April 2015.

Caribou along Dempster Highway. Mary Gamberg.

Data quality

- Data are available for kidneys and livers only. This does not reflect the amount of mercury in the muscle (meat) of the animal.
- Mercury concentrations can be affected by the gender of the animal as well as season of collection.
- Generally, this program collects samples in the fall.
- Annual variation in mercury concentrations is common.

References

AMAP 2015. AMAP Assessment 2015: Human Health in the Arctic. AMAP, Oslo. 2015. Available from: http://www.amap.no/documents/doc/AMAP-Assessment-2015-Human-Health-in-the-Arctic/1346

Environment and Climate Change Canada. 2016. Canadian Mercury Science Assessment [modified 2016 Mar 8; cited 2016 Mar 29]. Available from: http://ec.gc.ca/mercure-mercury/default.asp?lang=En&n=A2D7E54F-1#BR-Sec2.

Gamberg, M. 2013. Arctic caribou contaminant monitoring program. Pages 257-266 *in* Aboriginal Affairs and Northern Development Canada. Synopsis of Research Conducted under the 2012-2013 Northern Contaminants Program. Aboriginal Affairs and Northern Development Canada. Gatineau, Quebec, Canada. Available from: http://publications.gc.ca/collections/collection_2014/aadnc-aandc/R71-64-2013-eng.pdf

Northern Contaminants Program. 2015. Northern Contaminants Program [modified 2016 Jan 25; cited 2016 Mar 3]. Available from: http://www.science.gc.ca/default.asp?lang=En&n=7A463DBA-1.

United Nations Environmental Programme (UNEP). 2015. Minamata Convention on Mercury [cited 2016 Mar 3]. Available from: http://www.mercuryconvention.org/.

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MAMMALS

DENSITY OF SNOWSHOE HARES

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Snowshoe hare is a key component of the boreal ecosystem. In Yukon, hares make up almost 50 per cent of available food for predators (Figure 1). Their abundance regulates the predator populations that rely on them for food. They also have a significant impact on the plant communities that they eat, and other small mammals that predators eat when snowshoe hare numbers are low.

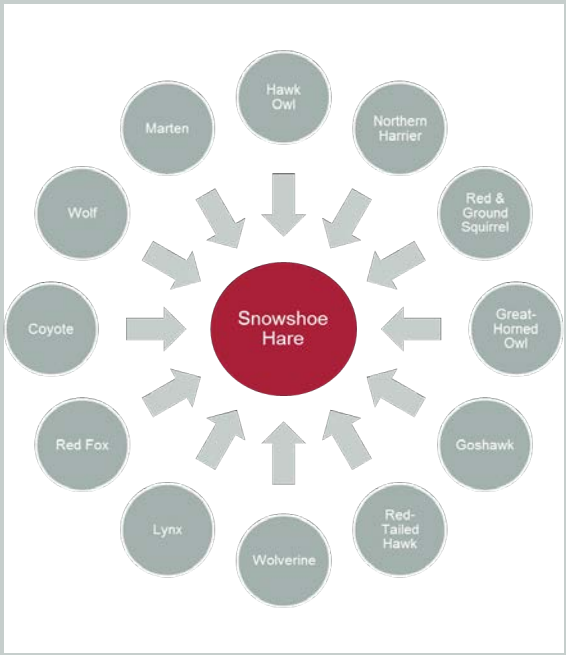
The number of snowshoe hares fluctuates in 9–10 year cycles throughout the boreal ecosystem. The dominant driver of this process is predation. The cycles appear to be in sync across Yukon.

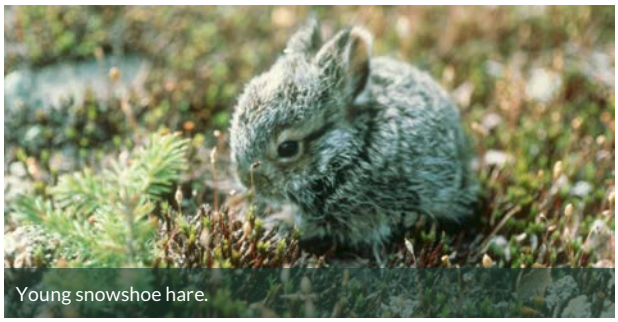
Because snowshoe hare are one of the most important components of boreal food webs, monitoring their numbers is valuable. Long-term data on their abundance can provide information on the population fluctuations of their key predators, such as lynx, which is a valued furbearer to trappers.

The timing and size of the snowshoe hare population peaks help biologists see where trends are headed when assessing potential changes in the boreal ecosystem, such as predator abundance, alternative prey abundance (e.g., arctic ground squirrels or grouse) or browse intensity (impact on shrubs). This information is valuable to research programs, park and forest management, and as baseline information for environmental assessments.

Monitoring of snowshoe hare numbers provides a continuous record of the response of this key ecosystem component to changes over time. The consequences of climate change on boreal ecosystem dynamics are difficult to predict, and biologists rely on long-term monitoring programs to detect and understand these responses.

FIGURE 1: Predators of snowshoe hare



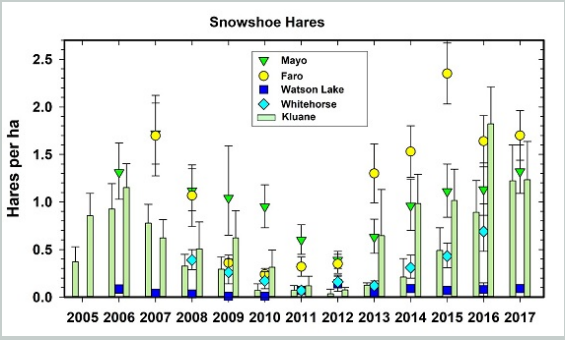


Young snowshoe hare.

What is happening?

The Keystone Boreal Species Trend (KBST) project monitors snowshoe hare density at undisturbed forested sites in different regions of Yukon.

FIGURE 2: Population density estimates for snowshoe hares in KBST areas, 2005–2017. Mark-recapture data from Kluane are given as histogram bars, and estimates from fecal pellet counts at other areas are given as points (95 per cent confidence limits). Note that the data from fecal pellet counts integrate hare density over the previous year. Whitehorse data for 2017 was unavailable at the time of publication.



2006 was the last peak in the snowshoe hare cycle; recent data suggests another peak occurred in 2016, but the hare numbers have remained relatively high in 2017.

The amplitude of the snowshoe hare cycle has been diminishing over the last 30 years in Yukon, demonstrated by research in the Kluane area going back to 1973 (Krebs et al. 2015).

The reason for this change is currently unknown. Because the snowshoe hare cycle is mostly driven by predation pressure, the answer may be related to changes in predation success. Snow conditions are likely to change with climate change and this may affect the hunting success of both avian and terrestrial predators of snowshoe hare.

KBST also monitors lynx abundance through winter track counts. Their abundance fluctuates with snowshoe hare abundance. Lynx numbers appear to be increasing in all areas as the hare numbers have increased in recent years. However, lynx abundance was higher than expected for the last low of the hare cycle in Kluane, indicating potential predation pressure on alternative prey populations.

Taking action

- The Keystone Boreal Species Trends project (KBST) has five stations for ongoing monitoring in Yukon's boreal forests. There are stations near Faro, Kluane, Mayo, Watson Lake and Whitehorse.
- An annual report on these trends is produced, and various researchers utilize these data to assist in understanding the dynamic food web of the boreal forest ecosystem. Access to this information is provided by the Department of Environment's Biodiversity Programs.

Snowshoe hare in winter.

Data quality

- KBST estimates the number of snowshoe hares by live trapping, marking and releasing individuals at the Kluane monitoring station. They also count fecal pellets yearly at all monitoring stations to come up with an estimate of how many hares are in each area.
- Hare density is calculated by dividing the number of hares by the number of hectares in the monitoring area.
- Data from most KBST areas are available from 2005 onwards. Monitoring has occurred in the Kluane area since 1973, but the protocols and additional areas were developed in 2004, so comparisons can only occur from 2005 onwards.

References

Krebs, C.J., R. Boonstra, S. Boutin, A.R.E. Sinclair, J.N.M. Smith, B.S. Gilbert, K. Martin, M. O'Donoghue, and R. Turkington. 2014. Trophic dynamics of the boreal forests of the Kluane Region. Arctic 67, Supplement 1:71-81.

Krebs, C., T. Powell, M. O'Donoghue, T. Jung, V. Loewen, S. Gilbert, S. Taylor, A. Fontaine, R. Boonstra, S. Boutin, A. Kenney. 2015. The Community Ecological Monitoring Program Annual Data Report 2015. Yukon Department of Environment, Whitehorse, Yukon, Canada.

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MAMMALS

WINTER TICK SURVEILLANCE

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Winter ticks (*Dermacentor albipictus*) are one-host external parasites that can be found on cervids such as elk, mule deer and moose in Yukon. These parasites can negatively affect host health when present in large numbers. Moose are especially vulnerable because they do not groom off larval stages of ticks. In some regions of Canada, winter ticks can be responsible for severe disease and mortality in moose.

To date, data suggests that winter ticks are not a major disease concern for Yukon cervids. By studying the distribution and occurrence of winter ticks in Yukon, we are monitoring how these parasites may affect Yukon's wild cervid populations and how their geographical distribution may change over time. This is especially important for species such as moose, which are a key harvest species in Yukon.

Winter ticks do not carry diseases of concern to humans or wildlife, nor do they negatively affect the meat of harvested animals. Winter ticks do not feed on people and are rarely found on domestic animals.

Mule deer. Cameron Eckert.

Weather may be an important factor in the tick-cervid relationship. Warmer temperatures in the summer and winter may support larger populations of cervids that carry ticks, and allow larval ticks to survive longer in the environment. A changing climate could influence vegetation patterns and winter temperatures, thereby influencing the distribution and presence of wildlife parasites like winter ticks.

What is happening?

Winter ticks affect different species in different ways.

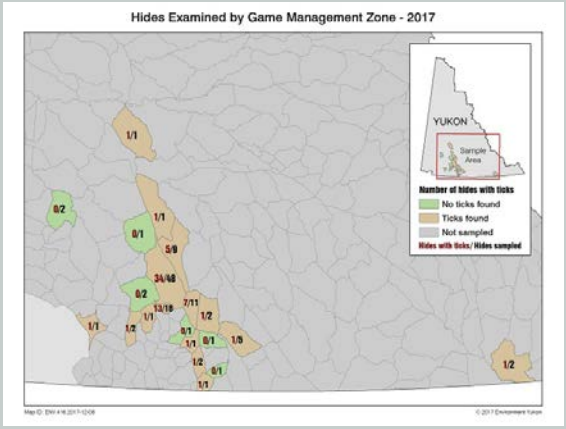
- In early autumn, elk and deer groom off larval ticks, which reduces tick numbers and minimizes negative health impacts.
- Moose only begin to groom off ticks once adult ticks are present (late winter), which can lead to high numbers of ticks on individual moose.
- Moose can experience severe disease associated with blood and hair loss from heavy tick burdens.

Since 2012, the Animal Health Unit has examined cervid hides to monitor winter tick geographical presence over time (Figure 1).

Hides examined for winter ticks between 2011 and 2017

Species	Number of samples	Hides found with winter ticks
Mule deer	48	60% (29)
Moose	6	16% (1)
Elk	51	73% (35)
Caribou	8	13% (1)

FIGURE 1: The known distribution of winter ticks based on hides examined to date (collected between 2011-2017)



- Winter ticks are established on elk in Yukon. Winter ticks likely originated in Yukon from translocation of elk from central Alberta, and/or by range expansion from northern British Columbia and Alberta (Leo et al. 2014).
- Winter ticks have been found on harvested cervids in 15 out of the 21 Game Management Zones where hides have been examined.
- The Animal Health Unit uses an index from 0 - 10 to describe the severity of winter tick burdens on the hides that are sampled. While the majority of hides have light burdens (indexed from 1 - 2) some have heavier burdens (indexed from 3 - 8), with one moose hide having 543 ticks, which corresponds to a burden ranging from 4,000 - 8,000 ticks (index of 8).

Taking action

The Animal Health Unit continues to monitor for winter ticks through assessment of cervid hides. Elk hides are a mandatory harvest submission, while deer, caribou and moose hides are submitted voluntarily.

So far, all of the hides examined have been from Southern Yukon (Figure 1), which has provided good baseline data on winter ticks in this region. In order to understand what is happening in other parts of Yukon, more hides from other areas are needed for this surveillance. Hunters from all over Yukon are encouraged to contact the Department of Environment to submit cervid hides for examination.

Adult winter tick on an elk.

Data quality

The Animal Health Unit uses a standardized hair transect method to evaluate the level or severity of tick burden. The method can be used on hides, unskinned animals or live animals, which increases the number of animals that can be examined. The Animal Health Unit has used the adapted hair transect protocol on hides collected since 2011.

References

Leo, S., W. Samuel, M. Pybus, and F. Sperling. 2014. Origin of Dermacentor Albipictus (Acari:Ixodidae) on Elk in the Yukon, Canada. Journal of Wildlife Diseases 50(3):544-551.

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FISH

NUMBER OF SPAWNING CHINOOK SALMON

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Chinook salmon are a key food source for bears, eagles and other predators and they bring nutrients from the ocean to freshwater and terrestrial ecosystems. Salmon are important culturally, socially and economically in Yukon.

Salmon in the Takhini River.

Chinook salmon returns vary considerably due to a number of factors, including:

- the strength of returning age classes,
- in-river harvest,
- offshore unintentional by-catch in the pollock fishery,
- predation,
- disease,
- water levels,
- temperature, and
- environmental variables, e.g., climatic events such as the Pacific Decadal Oscillation, El Niño, and La Niña.

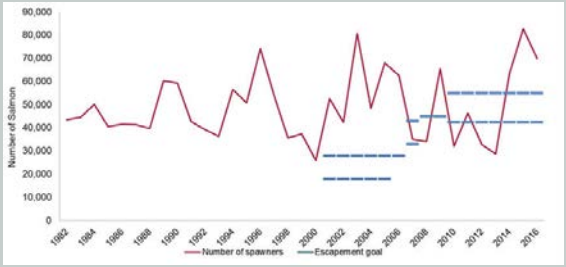
The international Yukon River Salmon Agreement has formally been in place since 2002 to help rebuild and conserve Canadian-origin salmon stocks and to define harvest allocations to Canadian and U.S. fisheries. The Yukon River Panel established a spawning conservation target for the number of Chinook salmon returning to spawn in the Canadian portion of the Yukon River.

The goal is for an escapement (number of fish reaching spawning grounds) of 42,500 to 55,000 fish; this is tracked by the federal government through Fisheries and Oceans Canada.

What is happening?

- In 2016, the spawning conservation target for Yukon River Chinook was met, with a preliminary estimate of approximately 70,000 fish reaching their spawning grounds in the Yukon (Figure 1).
- This was the fifth time in the last ten years that the spawning escapement target was met, and one of the highest escapements on record.
- The 2016 drainage-wide run size (i.e., the number of Chinook salmon that entered the river) was not particularly strong. As such, the high spawning escapement was only made possible through closures to the commercial, domestic and recreational fisheries, and significant harvest restrictions in subsistence and First Nation fisheries in Alaska and Yukon.

FIGURE 1: Number of Chinook salmon spawning in the Canadian portion of the Yukon River, excluding the Porcupine River drainage.



Source: *Yukon River Salmon Season Summary and Season Outlook*.

Taking action

To maintain a healthy number of spawning salmon even in this time of low productivity, fisheries managers in Yukon and Alaska have undertaken a range of actions, including:

- full or partial closures of commercial, domestic and recreational fisheries,
- closing key staging or salmon spawning areas to angling,
- decreasing mesh sizes, and
- reducing fishing times.

In addtion, Yukon First Nations have placed voluntary restrictions or avoided subsistence harvesting activities in years of low returns.

The Yukon River Panel, established by the Yukon River Salmon Agreement, recommends spawning goals, reviews management strategies and conservation objectives, and funds restoration and enhancement projects focusing on Canadian-origin salmon stocks.

Children releasing salmon into Wolf Creek.

Data quality

Estimates of the total number of salmon that return to their spawning grounds in Yukon are based on sonar passage estimates in Eagle, Alaska and harvest estimates from fisheries upstream of the sonar in both Alaska and Yukon.

In addition, a number of counting projects in the upper Yukon River watershed are used to monitor the number of adult salmon that reach specific spawning tributaries. These projects also evaluate the proportion of adult female to male salmon, and the size and age of fish returning to spawn.

References

The United States and Canada Yukon River Joint Technical Committee. 2001-2015. Yukon River Salmon Season Summary and Season Outlook. Alaska Department of Fish and Game, Anchorage, Alaska, U.S.A. [cited 2016 Mar 3]. Available from: http://yukonriverpanel.com/salmon/publications/joint-technical-committee-reports/.

Yukon River Panel. 2008. Salmon [cited 2016 Mar 3]. Available from: http://yukonriverpanel.com/salmon/.

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FISH

SUSTAINABILITY OF LAKE TROUT FISHERIES

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

The health of lake trout populations reflect the general health of an aquatic ecosystem due to the species's:

- slow growth,
- position at the top of the aquatic food chain, and
- reliance on healthy and clean habitats.

As an indicator species, monitoring the sustainability of lake trout populations can provide valuable information about the ecosystem. This species is also highly valued in Yukon fisheries. Monitoring the harvest data and calculating the optimal sustainable yield for each lake informs management decisions such as changes to catch and possession limits.

PROFILE

SEASONAL LAKE TROUT MOVEMENT – SOUTHERN LAKES

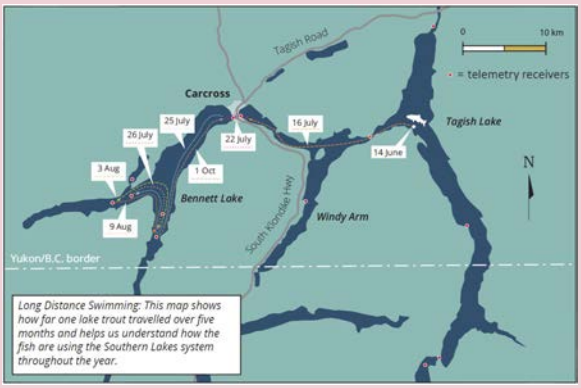
SEASONAL LAKE TROUT MOVEMENT – SOUTHERN LAKES

Lake trout move throughout the Southern Lakes system in Yukon and British Columbia. As trout are a very important species in an aquatic environment and many Yukoners rely on trout as a food source, the Government of Yukon's Department of Environment Fish and Wildlife Branch is working to understand how trout use these lakes.

Through this multi-year project, the department is studying annual migration patterns between each lake. By determining the origin, destination and timing of lake trout movements and linking this to genetic information, department biologists and managers can understand the effects of harvest on lake trout, allowing more effective harvest management within the region.

As of 2016, the third year of the project, researchers have placed 18 receiver stations around the lake system and have deployed 163 transmitters in lake trout. Additionally, six receivers and 1556 transmitters were deployed in Atlin Lake in collaboration with the B.C. Ministry of Forest, Lands and Natural Resource Operations and the Taku River Tlingit First Nation.

As of June 2016, the project had gathered approximately 7.2 million unique lake trout relocations, not including Atlin Lake. The department has also collected genetic samples from 971 lake trout throughout the Southern Lakes system through netting assessments, angler harvest surveys and volunteer angler submissions.



The data are revealing that lake trout move extensively between lakes in this system and can travel long distances in short periods of time. In one case, a lake trout moved from Bennett Lake to Tutshi Narrows—a distance of 80 km—in 3.5 days. The data are also showing that male lake trout are returning to spawning locations the year after they were captured. This movement pattern suggests these lake trout are using traditional spawning areas.

Work on lake trout movement and genetics in the Southern Lakes will continue for another few years and will contribute to the sustainable management of lake trout in this important lake system.

See the Fish and Wildlife Branch Highlights http://www.env.gov.yk.ca/publications-maps/plansreports.php#fw_branch for more information.

What is happening?

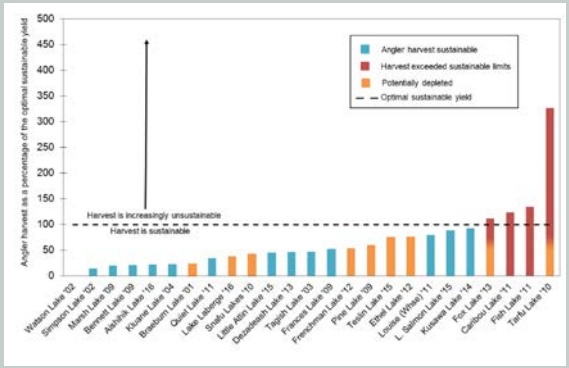
Recreational harvest data are available for the lakes in Yukon where the most intensive fishing activity takes place. Fisheries on other lakes are expected to be within sustainable levels, due to low fishing activity. Generally, small lakes are more vulnerable to overharvesting because of their smaller lake trout populations and lower sustainable yields.

Harvest of fish is considered to be unsustainable when it exceeds the "optimal sustainable yield." Overharvested populations will decline and fishing will become poor if no management action is taken.

In 2016,

- The majority of the recreational lake trout harvest in Yukon was sustainable, with most water bodies maintaining quality fisheries.
- Lake trout harvest in Fox, Caribou, Fish and Tarfu lakes exceeded sustainable limits according to most recent angler harvest data.
- In some cases, harvest may appear to be sustainable when, in fact, a lake trout population has been depleted. For example, while the lake trout harvest in Braeburn, Laberge, Snafu, Frenchman, Pine, Teslin and Ethel lakes is below the sustainable threshold, it may prove unsustainable because these lake trout populations appear to be depleted.

FIGURE 1: Sustainability of angler harvest on select Yukon lake trout populations based on most recent angler harvest data up to 2016.



Capturing lake trout in gill nets to estimate their density and abundance.

Source: Department of Environment

Taking action

- In 2016, the Yukon Fish and Wildlife Management Board recommended regulation changes for Fox, Frenchman, Kusawa, and Twin lakes to reduce catch and possession limits for lake trout in order to maintain a sustainable fishery in Kusawa Lake and to allow the depleted populations in Fox, Frenchman, and Twin lakes to recover. These changes came into effect on April 1, 2017. An evaluation of these changes is planned for future years.
- In 2017, the Department of Environment's Fish and Wildlife Branch performed lake trout and lake whitefish population assessments at four lakes; burbot population assessments at one lake; and performed Angler Harvest Surveys at nine lakes and rivers. Data from these surveys are currently being analyzed.

Data quality

- The optimal sustainable yield is derived from a model based on physical and chemical parameters of the lake, such as temperature and nutrient content.

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FISH

MERCURY LEVELS IN FISH FROM LABERGE AND KUSAWA LAKES

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Contaminants such as heavy metals can persist in the environment and can have serious health implications for wildlife and for people – especially those who depend on traditional foods. In Canada, mercury is a risk to Canadian ecosystems and human health (Environment and Climate Change Canada, 2016).

Most mercury in Yukon lakes and rivers comes from natural sources such as volcanoes, erosion and forest fires. Industrial sources and fuel burning can also release mercury that can travel to the north from industrial areas in the south through the movement of large air masses. Fish may absorb this mercury and pass it on to the humans who eat them (Environment and Climate Change Canada, 2016).

Climate change can influence mercury concentrations in some lakes. Yukon is experiencing increased runoff and precipitation, some from thawing permafrost. These changes influence how lakes naturally process mercury – either through adding mercury to the water or increasing food sources for the lake bacteria that process mercury (Chételat et al., 2015).

PROFILE

NOURISHING OUR FUTURE: BUILDING ON THE KLUANE FIRST NATION'S COMMUNITY FOOD SECURITY AND STRATEGY, YOUTH ENGAGEMENT IN FISHERIES, AND FISH HEALTH IN KLUANE LAKE

Lenita learns how to use a Direct Mercury Analyser. Photo credit: Western University.

NOURISHING OUR FUTURE: BUILDING ON THE KLUANE FIRST NATION'S COMMUNITY FOOD SECURITY AND STRATEGY, YOUTH ENGAGEMENT IN FISHERIES, AND FISH HEALTH IN KLUANE LAKE

Project significance

The overall goals of this project were: to promote the importance of consuming traditional foods; understand contaminant levels in fish from Kluane Lake; and provide base-line information for further monitoring efforts.

This project is a collaborative effort between the Kluane First Nation (KFN), Arctic Institute of Community Based Research (AICBR), University of Waterloo, Dan Keyi Renewable Resources Council (DKRRC), Kluane First Nation Traditional Territory area residents, Elders, and Youth. This multi-partner approach provided for a unique mix of scientific, community-based and Indigenous traditional knowledge collection.

The project assessed the nutrient values (omega-3 fatty acids, selenium, and zinc) as well as contaminant levels (mercury, organochlorine pesticides, and trace metals) in Lake Trout and Whitefish in Kluane Lake. Results from these assessments show that Kluane Lake fish are healthy and safe to eat. Compared to other lakes in Yukon, the Northwest Territories and Nunavut, concentrations of contaminants in Kluane fish are very low and the nutritional value of the fish is high.

Part of this research project included conducting interviews with Kluane First Nation citizens and traditional knowledge experts. The interviews solicited local observations of changes in quality, quantity and health of Kluane Lake fish, and whether there are concerns about contaminants in traditional foods. KFN youth involvement was essential throughout the project; three youth researchers traveled to the University of Waterloo and Western University (both in Ontario) to learn how to do contaminant and nutrient analysis in a research lab, analyzing fish from their own community.

Fish test results

None of the Lake Whitefish sampled exceed the Subsistence Consumption Guideline for mercury (0.2 ppm wet weight). Some of the larger Lake Trout (greater than 800 mm fork length) were found to have tissue mercury concentrations exceeding this guideline; however, the mean Lake Trout tissue mercury concentration (0.086 ± 0.091 ppm) did not. Larger trout (>~650 mm) are less likely to be consumed by the community (because smaller trout are considered tastier) and there are conservation measures on Kluane Lake that prohibit non-Aboriginal harvest of Lake Trout over 650 mm total length (Barker et al. 2014), reducing exposure to the higher levels of mercury in the larger Lake Trout. Mean tissue mercury concentrations in Kluane Lake Trout are significantly lower than mercury concentrations reported in other northern lakes (e.g. Lake Laberge and Kusawa Lake) (Stern et al. 2013).

Indigenous traditional knowledge results

Through the collection of community-based and indigenous traditional knowledge there was firm acknowledgement of the importance of fish as a dietary staple for Kluane First Nation (KFN) citizens and community members, historically, as well as in a modern-day context.

Many people have noticed changes in Kluane Lake fish, mostly related to climate change, and are becoming very concerned with the levels of contamination and pollution of the lake and its fish. Concerns surrounding climate change are: species decline, food security issues, warmer water temperatures, fluctuating water levels, and changing weather patterns.

Other changes observed were: where people are fishing, and the types of fish that are available. Changes in climate have affected harvesters' access to traditional fishing spots. Fluctuating ice quality can make it unsafe to get to common fishing areas that were once accessible. The areas that people fish now have also changed due to shifting fish behaviors. With the warming temperatures, fish are changing spawning behaviors. People reported noteworthy changes to the fish in Kluane Lake including the taste and quality of the fish being consumed and the quantity and species found in specific areas. Transportation modes, such as motorized boats and snowmobiles, and increased use of technology (such as fish finders) have also altered traditional harvesting methods. Fishing practices, including preparation and preservation techniques, differ from the past. Additionally, who fishes and how the fish are shared within a community has changed over time and circumstances.

Interviews with knowledge holders. Photo credit: Nelson Zabel.

Overall results

This project generated a renewed understanding, especially for youth, of the importance of long term stewardship and protection of the local fishery. The research outputs provide strong baseline data for future monitoring of fish health in Kluane Lake. It also provides reassurances to the Kluane First Nation, other area residents, and other fishers that Lake Trout and Lake Whitefish in Kluane Lake are nutritious and safe to eat.

What is happening?

Lake trout from Lake Laberge and Kusawa Lake, in southern Yukon, are monitored annually by the Northern Contaminants Program for mercury and other contaminants. The monitoring shows a correlation between fish length and mercury concentration, which is why consumption advisories are based on the length of the fish.

- The average mercury level in lake trout flesh since monitoring started is 0.47± 0.21 µg/g for Lake Laberge (N=131) and 0.42 ± 0.34 µg/g for Kusawa Lake (N=135).
- There is no clear trend over time in mercury concentrations in fish from these two lakes, and the length-adjusted concentrations fluctuate considerably from year to year (Figure 1 and 2).
- These trends in mercury concentrations may be influenced by environmental factors such as temperature and precipitation as well as industrial mercury emissions in eastern Asia and global wind patterns.

FIGURE 1: Length adjusted mercury concentrations in Lake Laberge trout (1993-2016).

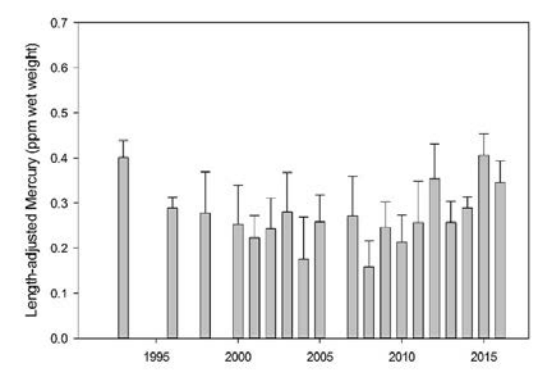
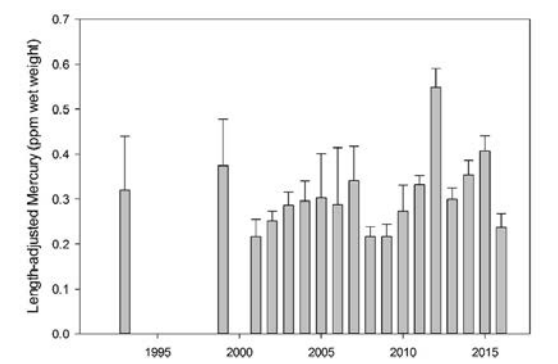


FIGURE 2: Length adjusted mercury concentrations in Kusawa Lake trout (1993-2016).



Taking action

The Northern Contaminants Program works towards reducing and, where possible, eliminating contaminants in traditional/country foods, while providing information that assists individuals and communities make informed decisions about their food use.

The Government of Yukon provides information in a variety of ways:

- The *Yukon Fish Health Handbook* provides information about the benefits of eating fish, food safety, mercury, and fish parasites (Yukon Department of Environment 2014).
- Up-to-date information is also published annually in the *Yukon Fishing Regulations Summary* to reach anglers directly (Yukon Department of Environment 2017).

Fish consumption advisories

- In general, Yukon adults do not need to limit consumption. However, eating lake trout or burbot that are less than 60 cm (24 inches) in length can help limit mercury intake.
- Women of childbearing age and children under 12 should limit their consumption of large Yukon lake trout and burbot according to the following guidelines:
    - Fish shorter than 40 cm (about 2 lbs): unlimited consumption.
    - Fish measuring between 40 and 60 cm (about 2 to 6 lbs): limit to three to four meals/week.
    - Fish longer than 60 cm (>6 lbs): limit to one or two meals/week.

Data quality

The Northern Contaminants Program has monitored fish for mercury and other contaminants since 1993 in lake trout from both Lake Laberge and Kusawa. This study is long-term, so annual sampling is projected well into the future. The data on mercury concentrations are adjusted for fish length to validly compare lakes and years. This accounts for differences in age among the fish.

Emerald Lake.

Twin Lakes campground.

References

Chételat, J., M. Amyot, P. Arp, J. Blais, D. Depew, C. Emmerton, M. Evans, M. Gamberg, N. Gantner, C. Girard, J. Graydon, J. Kirk, D. Lean, I. Lehnherr, D. Muir, M. Nasr, A. Poulain, M. Power, P. Roach, G. Stern, H. Swanson, and S. van der Veldon. 2015. Mercury in freshwater ecosystems of the Canadian Arctic: Recent advances on its cycling and fate. Science of the Total Environment 509-510: 41-66.

Environment and Climate Change Canada. 2016. Canadian Mercury Science Assessment [modified 2017 June 12; cited 2018 Jan 5]. Available from: http://ec.gc.ca/mercure-mercury/default.asp?lang=En&n=A2D7E54F-1#BR-Sec2.

Yukon Department of Environment. 2014. Yukon Fish Health Handbook. Yukon Department of Environment, Whitehorse, Yukon, Canada. Available from: http://www.env.gov.yk.ca/publications-maps/documents/FishHealthHandbook_2014_FNL.pdf.

Yukon Department of Environment. 2017. Yukon Fishing Regulations Summary. Yukon Department of Environment, Whitehorse, Yukon, Canada. Available from: http://www.env.gov.yk.ca/hunting-fishing-trapping/fishingregulations.php.

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BIRDS

MONITORING BREEDING WATERFOWL

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Yukon is the summer breeding home for more than 30 species of waterfowl and provides critical staging areas for birds migrating in the spring and fall seasons.

Specific threats to Yukon waterfowl include:

- Removal of standing dead wood (i.e., snags, standing dead trees) from areas along lake and river margins by commercial or small scale timber harvest removes potential nesting cavities and sheltering areas for waterfowl.
- Changes in water regimes due to climate change or human activities (e.g., hydroelectric projects) may change the timing of ice formation and/or spring break-up. This has the potential to alter migration stopover sites for waterfowl either by preventing access (no open water in spring time) or by changing the accessibility of food (if water is too deep, waterfowl may not be able to reach submerged vegetation).
- Disturbance of waterfowl due to increased human recreational activity (e.g., dogs running loose, boating, etc.) has detrimental effects on foraging efficiency and body fat acquisition. It is especially important during spring migration when there is often less time and less space (due to ice cover) for birds to acquire the resources they need to ensure successful reproduction.

Waterfowl and gulls in flight.

This indicator provides information about waterfowl through an example of a diving duck (Lesser/Greater Scaup) and a dabbling duck (Mallard) in two survey areas in Yukon.

Monitoring waterfowl presence and abundance gives a good indication of the ecological health of an area, as waterfowl depend on wetland areas for food, nesting areas, and cover from predators.

What is happening?

There are two long-term survey areas for Yukon waterfowl:

- Old Crow Flats is Yukon's largest wetland for waterfowl and is considered globally significant. This 12,122 km^2 area is almost completely free of development. It is used by the Vuntut Gwitchin First Nation for hunting, trapping and cultural activities.
- The Yukon Southern Lakes region features highly productive inlets and outlets of numerous large lakes that provide important waterfowl staging areas.

Overall, waterfowl populations in Old Crow Flats and the Southern Lakes region are stable, though there is annual variation in populations among species.

Mallard hen on Hidden Lakes. Jamie Kenyon.

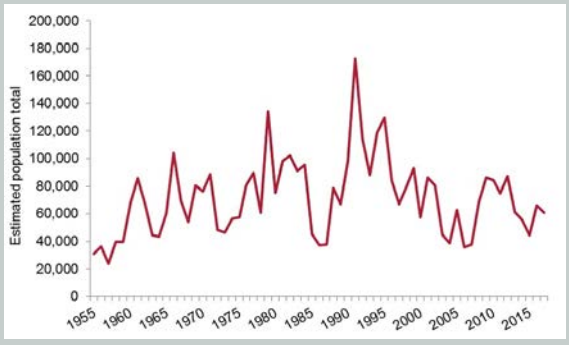
Diving ducks–Lesser and Greater Scaup

Diving ducks are named by their habit of diving for food. As well, they generally nest close to the water's edges. The presence and abundance of diving ducks are indicators of water health.

Lesser and Greater Scaup are two diving duck species that are grouped for the purpose of this monitoring analysis since they are almost impossible to distinguish during aerial surveys. Scaup are in decline across North America with estimated populations approximately 43 per cent below the *North American Waterfowl Management Plan* (2012) conservation goal of 6.3 million.

- At Old Crow Flats, the 2017 combined Lesser and Greater Scaup total adult population estimate was 71,307, nine per cent less than the estimate from 2016. This is also 17 per cent less than the long-term average (1955-2016) of Scaup in this area (Figure 1).

FIGURE 1: Adult population estimate for Lesser and Greater Scaup at Old Crow Flats



- The Southern Lakes ground surveys also show that Lesser and Greater Scaup are in decline. Although from 2012-2013 there was a 28 per cent increase in the breeding pairs of Scaup counted, since the start of the survey in 1991 there has been a decreasing trend.

Lesser Scaup. Cameron Eckert.

Dabbling ducks-Mallard

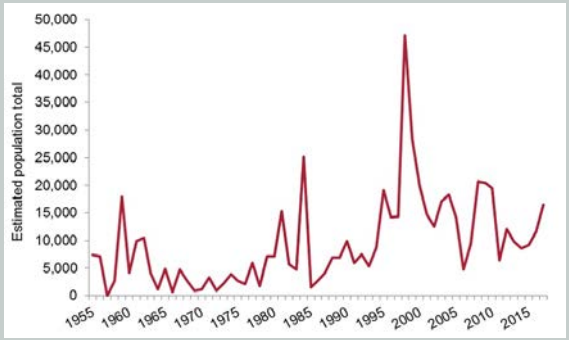
Dabbling ducks walk well on land and can nest far from the water's edge. They feed on grass and seeds on land, as well as algae, plants and insects in the water. The presence and abundance of dabbling ducks are indicators of the health of a wetland area.

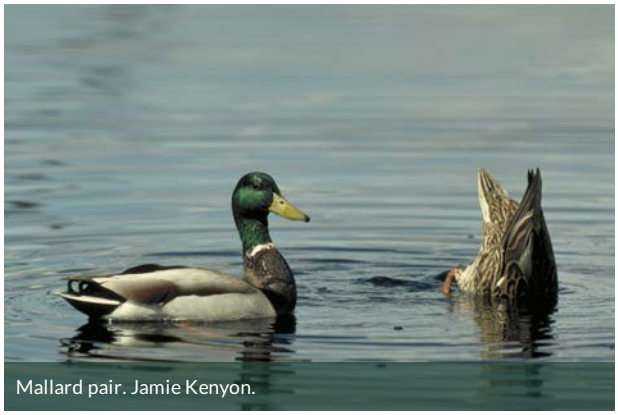
- The Southern Lakes ground survey shows that there is a modest long-term increasing population trend (over 15 years) for Mallards. Additionally, from 2012 to 2013 the breeding pair population of Mallards observed increased by 20 per cent.

Mallard is a common dabbling duck that is also extensively hunted in Canada; therefore, their populations are monitored. Across North America, Mallard populations are 26 per cent above the North American Waterfowl Management Plan target.

- At Old Crow Flats, the 2017 Mallard total adult population estimate was 9,479 - 30 per cent more than the 2016 estimate. There is an overall increasing trend for Mallards (Figure 2).

FIGURE 2: Adult population estimate for Mallard at Old Crow Flats




Mallard pair. Jamie Kenyon.

Taking action

The *North American Waterfowl Management Plan* sets conservation goals for waterfowl across the continent; Yukon surveys contribute to information for continent-wide population monitoring.

References

Canadian Wildlife Service Waterfowl Committee. 2013. Population Status of Migratory Game Birds in Canada. Environment Canada, Gatineau, Quebec, Canada. Available from: http://www.ec.gc.ca/rcom-mbhr/B2A654BC-6B73-4D14-86CB-8D2FB3A70143/2013-November-report---EN---FINAL.pdf

North American Wetlands Conservation Council (Canada). 2013. North American Waterfowl Management Plan [cited 2018 Jan 5]. Available from: http://nawmp.wetlandnetwork.ca/

U.S. Fish and Wildlife Service. 1999-2015. Population Status [cited 2018 Jan 5]. Available from: http://www.fws.gov/birds/surveys-and-data/reports-and-publications/population-status.php

Data quality

Surveys are conducted annually in the Old Crow Flats wetland. In the Southern Lakes region, wetlands are surveyed along roadsides.

Old Crow Flats

- U.S. Fish and Wildlife Waterfowl Population Status
- The annual aerial surveys are carried out on one day; count results may be influenced by weather conditions.

Southern Lakes ground survey

- Cooperative Yukon Roadside Waterfowl Breeding Population Survey
- The survey consisted of counts in a sample of wetlands, conducted four or five times from early May to mid-June between 1991 and 2016.
- This ground survey tracks trends only, not population estimates.
- Ground surveys provide better accuracy for identification at the species level, but are limited by the requirement for road/foot access and are not suited to population estimates. Aerial surveys cover larger areas and are better suited for population estimates.

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BIRDS

TRUMPETER SWAN POPULATION MONITORING

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

The Committee on the Status of Endangered Wildlife in Canada designated Trumpeter Swans as a species of Special Concern in April 1978. Their status was re-examined and they were found to no longer be at risk in April 1996, largely based on surveys of Trumpeter Swan breeding grounds in northern Canada and Alaska (COSEWIC 2011).

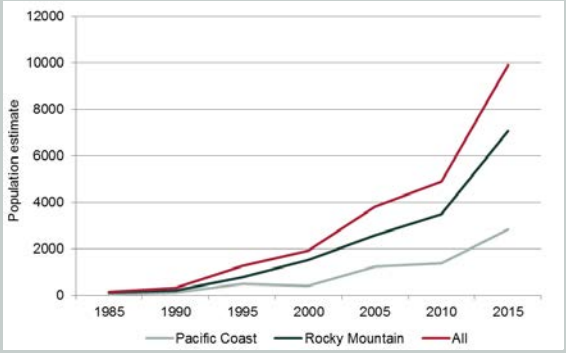
Trumpeter Swan in flight. Cameron Eckert.

What is happening?

- Yukon has two swan populations—the Rocky Mountain Population and the Pacific Coast Population, surveyed since 1985 in Yukon and northern BC.
- The Pacific Coast Population breeds mainly in Alaska, but also in Yukon and northwestern British Columbia.
- The Rocky Mountain Population breeds mainly in Alberta,western Saskatchewan, southern Yukon, and the Northwest Territories.

FIGURE 1: Distribution of Trumpeter Swan populations in Yukon and northern BC. Blue squares are Pacific Coast Population. Purple squares are Rocky Mountain Population.

FIGURE 2: Preliminary population estimates for Yukon and northern BC Trumpeter Swans.

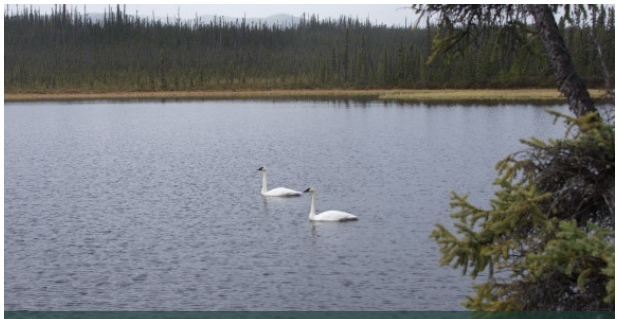


- The 2015 estimate for the Canadian portion of the Rocky Mountain Population was 16,143, an 80 per cent increase compared to the 8,950 estimate for 2010.
- The 2015 estimate for the Canadian portion of the Pacific Coast Population was 2,979, a 106 per cent increase compared to the 1,443 estimate for 2010.
- All Canadian areas of the Rocky Mountain and Pacific Coast Populations exhibited growth since the 2010 survey.

Taking action

Surveys coordinated by Environment and Climate Change Canada in Yukon contribute to national and international trend and population estimates for Trumpeter Swans.

The Government of Yukon operates the Swan Haven Interpretive Centre, where visitors can view and learn about M'Clintock Bay on Marsh Lake, an important staging area for migrating swans, waterfowl, gulls and shorebirds.



Trumpeter Swans © Environment Canada, Jim Hawkings

Data quality

- Continued monitoring of this species occurs through the North American Trumpeter Swan Survey. Yukon contributes survey information of its swan populations to the continent-wide monitoring.
- The North American Trumpeter Swan Survey is conducted across Trumpeter Swan breeding grounds every five years. Surveys have been conducted since 1968.
- The survey was originally designed as a complete census, i.e., counting all the birds across the entire range. By 1995, increases in the Trumpeter Swan population made a complete census unfeasible and a stratified random sampling approach was adopted, i.e., randomly selecting map grids to survey which arelikely to have breeding swans.

References

Canadian Wildlife Service Waterfowl Committee. 2015. Population Status of Migratory Game Birds in Canada: November 2015. CWS Migratory Birds Regulatory Report Number 45. Available from: https://www.ec.gc.ca/rcom-mbhr/default.asp?lang=En&n=9DB378FC-1#_2_40.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2011. Canadian Wildlife Species at Risk. Environment Canada, Gatineau, Quebec, Canada.

Groves, D.J., compiler. 2012. The 2010 North American Trumpeter Swan Survey. U.S. Fish and Wildlife Service, Juneau, Alaska, U.S.A. Available from: http://www.fws.gov.migratorybirds/pdf/surveys-and -data/NATrumpterSwanSurvey_2005.pdf

Groves, D.J., compiler. 2015. The 2015 North American Trumpeter Swan Survey. U.S. Fish and Wildlife Service, Juneau, Alaska, U.S.A. Available from: https://www.fws.gov/migratorybirds/pdf/surveys-and-data/NATrumpeterSwanSurvey_2015.pdf

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BIRDS

LEAD SURVEILLANCE IN WILD BIRDS

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

The Department of Environment's Animal Health Unit is determining if there is evidence of lead exposure in Yukon's wild birds by opportunistically sampling bird livers. Lead poisoning is usually a chronic disease in birds, which is typically detected in birds that are found dead.

Targeted surveillance groups include scavenging birds and waterfowl as they are more likely to ingest sources of lead due to their feeding behaviours:

- Lead shot and bullets can be ingested by scavengers and waterfowl. Lead shot is no longer used for hunting waterfowl, but lead ammunition is still commonly used for hunting upland birds.
- Offal piles from hunted animals (i.e., moose, sheep and caribou) often contain lead fragments that can be consumed by scavenger birds.
- Lead fishing sinkers can be ingested by loons or waterfowl.

If lead levels in bird livers remain high or trend upwards, it may indicate that lead shot and bullets, lead fragments and lead fishing sinkers represent a persistent environmental source of contamination.

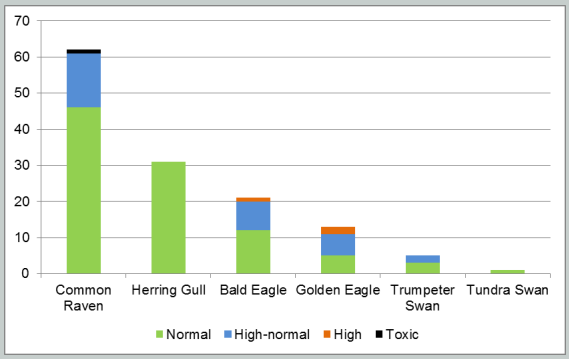
Bald Eagle. Cameron Eckert.

What is happening?

- Lead testing is complete for 132 wild birds to date, creating a baseline of information collected since 2013.
- As more samples are gathered, the data will be analyzed to explore trends based on species, locations and other measures of avian health.

Herring Gull. Cameron Eckert.

FIGURE 1: Presence of lead and toxicity in sampled wild birds



Source: Environment Yukon

Taking action

- The Department of Environment's Animal Health Unit is responsible for health monitoring and diagnosis of disease in both wildlife and domestic animals.
- By opportunistically monitoring lead levels in target birds, the Animal Health Unit hopes to better understand how birds are being affected by lead and how it varies by species.

Common Raven. Cameron Eckert.

Data quality

- Data are collected by opportunistic sampling of the livers of wild birds that have been found dead or euthanized sick birds that could not be rehabilitated.
- Currently, most samples come from southern Yukon in areas where human population is highest.
- A laboratory analyzes the samples to determine the

concentration of lead in parts per million (ppm) of wet weight detected in each liver sample. These levels determine whether the bird has a normal (up to 0.2 ppm), high-normal (0.2 ppm to 2 ppm) high (2 ppm to 10 ppm), or toxic (more than 10 ppm) lead level.

Peregrine Falcon. Cameron Eckert.

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SPECIES AT RISK

NUMBER OF SPECIES AT RISK IN YUKON

> SIGNIFICANCE > WHAT IS HAPPENING? > TAKING ACTION

Significance

Species at risk are naturally occurring plant and animal species that are in danger of extinction or extirpation. Extirpation means species that have disappeared from Yukon.

Loss of any species contributes to a loss of biodiversity – the variety of life that exists on our planet. Biodiversity loss is occurring at an increasing rate internationally. The United Nations recognized the international concern for loss of biodiversity by declaring a Decade on Biodiversity (2011-2020) to promote an overall vision of living in harmony with nature.

Major reasons why many species are at risk in Canada include:

- competition from alien invasive species;
- habitat loss;
- a changing climate;
- genetic and reproductive isolation;
- environmental contamination;
- overharvesting; and
- disease.

Tracking the number of nationally assessed species at risk that occur in Yukon indicates where there might be species vulnerability. However, a national rating does not necessarily mean that there is local conservation concern for that species in Yukon. Yukon's healthy ecosystems are a refuge to many species that are considered at risk nationality.

Collared Pika. John Meikle.

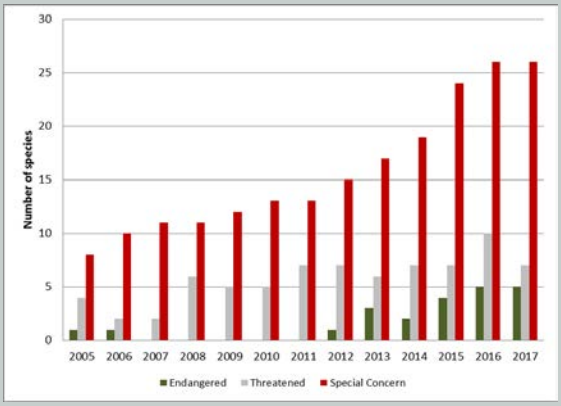
What is happening?

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses species at risk across Canada to rank them as:

- **Endangered**: A species facing imminent extirpation or extinction.
- **Threatened**: A species likely to become endangered if limiting factors are not reversed.
- **Special Concern**: A species with characteristics that make it particularly sensitive to human activities or natural events.
- **Extirpated**: A species that is extinct from an area where they used to exist.
- **Extinct**: A species that no longer exists.

As of 2017, COSEWIC has identified 769 populations of 753 species at risk in Canada, of which 36 occur in Yukon. The number of species at risk in Yukon has increased over time (Figure 1), and is expected to continue to increase as more species are assessed. Three fish populations and the Bearded Seal are considered Data Deficient. Not enough information is available to assess their status. Thirty-five additional Yukon species have been assessed as Not At Risk including Peregrine Falcon and Grey Whale (Eastern North Pacific Population) that were reassessed in 2017.

FIGURE 1: Number of COSEWIC assessed species in Yukon, 2005-2017



- Yukon Draba (plant) and the Squanga Whitefish are endemic to Yukon – they are not found anywhere else on earth.
- Yukon is home to most of the world's population of Collared Pika (50 per cent of its total range) and Yukon Podistera (90 per cent of its total range). Both were assessed as special concern based on the potential effects of climate change on their alpine populations.
- For a comparison of species at risk between jurisdictions, see Environment Canada's indicator.

(1) Yukon Podistera. Syd Cannings, CWS. (2) Yukon Draba. Martin Owen, YG.

Taking action

- The Yukon Conservation Data Centre collects and shares information on at risk plants, animals, lichens and ecological communities in Yukon, including those that have not been formally assessed.
- The Yukon government contributes to national species at risk recovery plans in partnership with other governments and groups in the territory. Yukon government technical experts are on recovery planning teams organized by Environment Canada to share knowledge of the local situation.

Conservation status of Yukon biodiversity 2017

Determining which species and ecosystems are thriving and which are rare or declining is crucial for targeting conservation towards elements of biodiversity in greatest need. The Yukon Conservation Data Centre as part of the NatureServe network uses a suite of factors to assess the conservation status of plant, animal, and fungal species, as well as ecosystems (ecological communities and systems). The outcome of researching and recording information on the conservation status factors is the assignment of a conservation status rank with supporting documentation. For species, these ranks provide an estimate of extinction risk, and for ecosystems, they provide an estimate of the risk of elimination. Eight core status rank factors are used to develop the ranks including: range extent, area of occupancy, population size, trends (in distribution and population), vulnerability, ecological integrity, and threats.

Conservation status ranks are based on a one to five scale, ranging from Critically Imperilled (S1), Imperilled (S2), Vulnerable (S3), Probably Secure (S4) to demonstrably Secure (S5). Additional ranks include Historical (SH) – known from only historical (greater than 40 years since last reported) occurrences but still some hope of rediscovery; there is evidence that the species may be extinct or extirpated, but not enough to state this with certainty. Not Applicable (SNA) – a conservation status rank is not applicable because the species is not a suitable target for conservation activities. This includes accidental (e.g., Great Egret) or introduced species (e.g., Sweetclover). Unranked (SNR) – conservation status not yet assessed. Unrankable (SU) due to lack of information or due to substantially conflicting information about status or trends.

Figure 2: The number of taxa (species, subspecies, or varieties) for each group of plants, animals, and fungi that are known from Yukon in 2017 and their conservation rank (Yukon Conservation Data Centre).

PROFILE

HOW TO CONTRIBUTE

iNaturalist.ca.

HOW TO CONTRIBUTE

Identifying species is an important way of connecting people with the environment. iNaturalist Canada is a free citizen science app that provides a platform where users can crowd source species identifications via photos, download electronic guides of animals and plants across the Yukon, and join events such as a BioBlitz, which is a biological treasure-hunt where participants search for species in a short time.

In 2016 the Yukon Conservation Data Centre (YTCDC) and the Biological Survey of Canada ran a BioBlitz in the Carmacks area. Over 60 participants attended including many experts on plants and insects from around Canada. iNaturalist Canada was used to make a free species guide as well as a Projects Page where participants could upload photographs and organisers could easily download the generated data.

A guide was also created in partnership with the YTCDC and Parks Canada for Ivvavik National Park, highlighting the incredible diversity of this remote area. This guide is advertised for tourists who visit the park, but is available for anyone to download.

iNaturalist Canada is a fantastic resource that will be continued to be utilized, with more guides and a BioBlitz planned for 2017.

	Conservation Status Rank										COSEWIC assessed[1]	SARA listed[2]
Taxonomic Groups	**S1**	**S2**	**S3**	**S4**	**S5**	**SH**	**SNA**	**SNR**	**SU**	**Grand Total**		
Amphibians	1	1	1	1	0	0	0	0	0	**4**	**2**	**1**
Bees, Ants & Wasps	1	2	10	28	68	0	1	2	19	**131**	**3**	
Beetles	3	3	3	265	153	0	25	252	371	**1075**	**1**	
Birds	28	14	50	75	51	0	28	0	13	**259**	**34**	**10**
Butterflies & Moths	0	14	29	147	67	0	0	203	270	**738**	**0**	
Caddisflies	0	0	0	15	18	0	0	105	12	**151**	**0**	
Dragonflies	4	5	8	8	16	0	0	0	0	**41**	**0**	
Fishes	2	4	9	9	6	0	7	2	5	**44**	**9**	**1**
Flies	0	2	6	136	38	0	4	3	115	**304**	**1**	**1**
Grasshoppers	0	0	0	7	5	0	0	1	1	**17**	**0**	
Lichens	0	22	38	72	45	0	197	179	110	**663**	**0**	
Mammals	4	6	13	16	24	0	7	2	10	**82**	**18**	**9**
Mayflies	0	0	0	6	1	0	0	1	21	**29**	**0**	
Molluscs	0	1	7	12	5	0	16	1	43	**85**	**0**	
Mosses & Liverworts	16	72	120	108	46	34	52	42	184	**674**	**0**	
Other Invertebrates	0	0	0	15	4	0	5	354	24	**402**	**0**	
Spiders	0	1	1	127	18	0	2	11	206	**366**	**0**	
Stoneflies	0	0	1	21	21	0	0	0	33	**76**	**0**	
Vascular Plants	75	172	231	295	281	15	190	57	65	**1381**	**9**	**1**
Grand Total	**134**	**319**	**531**	**1363**	**867**	**49**	**542**	**1215**	**1502**	**6522**	**77**	**23**

[1] Committee on the Status of Endangered Wildlife in Canada (COSEWIC) formally assess the status of a species or population in Canada.

[2] *Species At Risk Act* (SARA) Federal legislation that offers protection to species deemed to be at risk.

Data quality

- For more information on Yukon's species at risk including a complete list of species, visit the Department of Environment's species at risk page.
- COSEWIC has yet to assess every Yukon species that might be at risk.

References

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2017. Wildlife Species Search [modified 2017 Dec 19; cited 2017 Jan 8]. Available from: https://www.canada.ca/en/environment-climate-change/services/committee-status-endangered-wildlife/assessments/summary-results-november-2017.html

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