Yukon State of the Environment Report 2008

Yukon
Environment

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Highlights

Climate Change

Yukon has consistently produced fewer greenhouse gas emissions per capita than Canada. Transportation is our leading source of emissions. Climate change impacts were observed in Yukon. Building on its *Climate Change Strategy*, released in 2006, the Yukon government continued to develop a detailed Climate Change Action Plan and an Energy Strategy for Yukon.

Air

In 2008, particulate matter levels in the air were the lowest of all other Canadian air quality surveillance stations, and among the lowest recorded for Whitehorse. The National Air Pollution Surveillance Program continued to monitor air pollution at a station in Whitehorse.

Water

In 2008, a total of 130 water quality samples were collected from ten monitoring stations in Yukon including four Canadian Environmental Sustainability Indicator (CESI) stations. A three-year rolling average for four of the stations ranked water quality from marginal to excellent.

Land

Land use and resource management planning

Regional land use planning was underway for 26 per cent of Yukon's land mass. Twelve per cent of Yukon's area was protected as a national or territorial park, habitat protection area, or other designation.

Solid waste management

Overall, Whitehorse diverted 17 per cent of its solid waste from landfills by recycling and composting. Households with curbside compost collection, combined with recycling, diverted 39 per cent of their garbage from the city's landfill.

Fish and Wildlife

Population trends and planning initiatives

The conservation target for returning Chinook salmon in the Canadian portion of the Yukon River drainage was not met. The majority of lake trout fisheries were sustainable, but harvest from four lakes exceeded sustainable limits. Four of 24 caribou herds were known to be in decline.

Contaminants

Moose and caribou meat remained a healthy food choice because cadmium and mercury levels were low. Although mercury concentrations appeared to be increasing in female Porcupine caribou, this may have been part of a cycle and not a true increase in mercury levels. Mercury and some organochlorine levels in lake trout from Lake Laberge and Kusawa Lake decreased in 2008 from 2007, perhaps marking the beginning of a decline.

Species at risk

The Yukon government began public and stakeholder consultations on a stand-alone Yukon *Species at Risk Act* focussed on local management of and participation in the protection of species and their critical habitat.

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Introduction

Why produce a State of the Environment Report for Yukon?

Yukon's *Environment Act* requires state of the environment reporting every three years along with interim reports in intervening years.

> ***Environment Act***
>
> ***State of Environment Report***
>
> ***47.*** *(1) The government of Yukon shall report publicly on the state of the environment pursuant to this Act.*
>
> *(2) The purpose of this 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 the progress toward the achievement of the objectives of this Act; and*
>
> *c. To provide baseline information for environmental planning, assessment and regulation.*

This report answers five basic questions:

- What is the issue?
- What are the indicators?
- What is happening?
- Why is it happening?
- Why is it significant?

This report tracks indicators in several areas including climate change, air, water, land, and fish and wildlife. Indicators are key measurements used to monitor, describe and interpret change. Indicators cannot provide all of the information on a particular topic, but they give key information that shows how aspects of the environment are doing. The indicators featured here are based on key criteria including data availability, data reliability, usefulness and ease of understanding. Indicators are used to evaluate and demonstrate whether environmental changes are positive or negative.

How was this report developed?

This report represents a collective effort from scientific experts, government agencies, and non-governmental organizations who have provided information, data and advice.

1. Climate Change

1.1 Greenhouse Gas Emissions

What is the issue?

Greenhouse gas (GHG) concentrations in our atmosphere are linked to a global temperature increase, which is affecting global climate systems. Climate change is a global issue, presenting a range of challenges to many parts of the world. The Intergovernmental Panel on Climate Change, a scientific body established to collect and synthesize the world's best research on climate change, considers global climate change to be the most significant threat our environment faces today. Many jurisdictions are introducing measures to limit their GHG emissions that are produced from human activities such as the burning of fossil fuels.

What are the indicators?

The levels of GHG emissions, which include carbon dioxide, methane and nitrous oxide, have been increasing since the industrial revolution. Carbon dioxide (CO_2) is the most common GHG in our atmosphere and it has increased steadily from the industrial revolution to the highest levels in over 400,000 years. These high concentrations are trapping more and more of the energy radiated from the earth which, in turn, are impacting global temperatures and affecting our climate.

Globally, the concentration of GHGS in the atmosphere is increasing. Yukon is experiencing the effects of the changing climate and is committed to managing GHG emissions. GHG emissions information available for Yukon includes:

- Total Yukon GHG emissions (Table 1.1.1)
- Yukon GHG by sector (Table 1.1.2 and Figure 1.1.1)

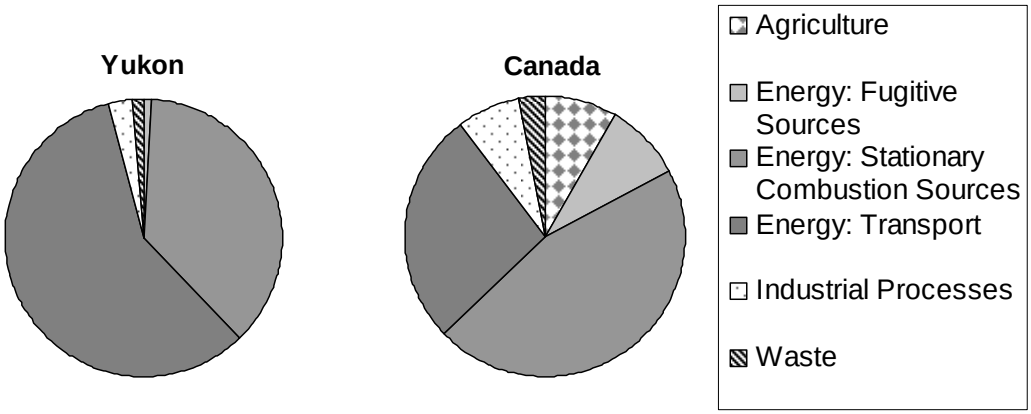
Table 1.1.1 Trends in greenhouse gas (GHG) emissions in Yukon, 1990-2008

	1990	2004	2005	2006	2007	2008
Total GHG Emissions (Mt)[1]	0.531	.411	0.394	0.408	0.407	0.350
Annual Change (%)	NA	NA	-4.1	3.6	-0.3	-14.1
Change since 1990 (%)	NA	-22.6	-25.8	-23.1	-23.4	-34.2

Source: Environment Canada, National Inventory Report 1990–2008, 2010.

Note: (1) Mt: megatonnes.

Figure 1.1.1 2008 Greenhouse gas (GHG) emissions by sector



Source: Environment Canada, National Inventory Report 1990–2008, 2010.

What is happening?

- Yukon's total GHG emissions for 2008 were 0.35 megatonnes. This is a 34 per cent reduction since 1990 (Table 1.1.1).
- Canadian emissions have increased 24 per cent above 1990 levels. Canada is ranked among the highest of all countries in the world in terms of per-capita GHG emissions.
- Yukon's total GHG emissions (0.35 megatonnes) contributed only 0.05 of one per cent of Canada's total emissions (734 megatonnes). Although Yukon's emissions are low compared to the rest of the country, Yukon relies on goods and services produced nationally.
- In 2008 Yukon produced fewer GHG emissions per capita (10.5 tonnes) than the rest of Canada (22.0 tonnes) and has seen a per capita reduction of GHG emissions (largely due to a decrease in mining activity) from 1990 levels by 44 per cent (Table 1.1.1). Overall, Yukon has one of the lowest levels of GHG emissions per capita in Canada.

Table 1.1.2 Yukon greenhouse gas (GHG) emissions by sector, 1990-2008

Greenhouse Gas Categories	1990	2004	2005	2006	2007	2008
TOTAL (kt CO_2 equivalent)	531	411	394	408	407	350
ENERGY	526	398	380	394	393	335
a. Stationary Combustion Sources	226	129	124	140	133	129
Electricity and Heat Generation	93.6	7.99	7.53	7.81	10.9	11.7
Fossil Fuel Production and Refining	2.9	9.8	28	36	30	17
Mining & Oil and Gas Extraction	4.12	1.73	3.08	3.26	3.93	5.08
Manufacturing Industries	8.01	-	-	-	-	-
Construction	5.46	1.95	1.07	1.70	2.09	1.67
Commercial & Institutional	81.9	40.0	39.8	42.5	47.6	49.7
Residential	29	55	39	42	39	44
Agriculture & Forestry	1.24	13.2	6.27	6.02	-	-
b. Transport	300	265	252	252	256	203
Civil Aviation (Domestic Aviation)	21	22	21	25	29	24
Road Transportation	180	161	156	144	133	127
Light-Duty Gasoline Vehicles	79.1	39.1	34.1	29.3	23.9	19.1
Light-Duty Gasoline Trucks	30.4	40.4	37.6	32.3	26.4	21.2
Heavy-Duty Gasoline Vehicles	10.2	5.83	5.26	4.51	3.67	2.96
Motorcycles	0.46	0.35	0.32	0.27	0.22	0.18
Light-Duty Diesel Vehicles	0.55	0.32	0.28	0.24	0.20	0.16
Light-Duty Diesel Trucks	0.60	2.54	2.64	2.33	1.91	1.56
Heavy-Duty Diesel Vehicles	57.2	70.3	74.9	73.3	75.0	79.9
Propane & Natural Gas Vehicles	1.5	2.1	1.1	1.5	1.8	1.8
Other Transportation	98	82	75	83	94	52
Off-Road Gasoline	10	2.7	2.9	2.5	1.9	1.5
Off-Road Diesel	88	79	72	80	92	50
c. Fugitive Sources	-	3.68	3.88	3.32	3.02	3.10
Oil and Natural Gas	-	3.68	3.88	3.32	3.02	3.10
INDUSTRIAL PROCESSES	1.43	8.42	9.30	8.92	9.48	9.81
a. Mineral Products Use	0.06	-	-	-	-	-
b. Production and Consumption of Halocarbons	-	7.9	8.7	8.4	8.8	9.1
c. Other & Undifferentiated Production	1.4	0.48	0.66	0.66	0.71	0.71
SOLVENT & OTHER PRODUCT USE	0.18	0.21	0.18	0.32	0.32	0.33
AGRICULTURE	0.0	0.0	0.0	0.0	0.0	0.0
WASTE	3.4	4.1	4.2	4.3	4.4	4.5
a. Solid Waste Disposal on Land	0.55	0.93	0.96	0.99	1.0	1.1
b. Wastewater Handling	2.9	3.2	3.3	3.3	3.4	3.4

Source: Environment Canada, National Inventory Report 1990–2008, 2010

Notes: *(1) Indicates no emissions. (2) kt CO_2 eq: Kilotons of CO_2 equivalent. (3) Emission totals in chart may not add up due to rounding protocol. Categories with 0 or no emissions are not shown.*

Why is it happening?

Reductions in Yukon GHG emissions since 1990 are mainly due to changes in the nature and extent of the mining industry (Table 1.1.2). The cyclical nature of Yukon's resource economy significantly affects GHG emission levels. Emissions were high in 1990 and low in 2008. There was more activity in Yukon's mining industry in the 1990s than in 2008.

Transportation accounts for the largest share of GHG emissions in Yukon (Table 1.1.2 and Figure 1.1.1). In this energy combustion sub-sector, heavy-duty diesel vehicles are the largest contributors followed by off-road diesel use. Off-road diesel use includes the use of heavy mobile equipment in construction, agriculture and mining, as well diesel that is used to generate electricity in remote locations.

Electricity generation can be a major contributor to GHG emissions when energy demands are high, even with the expanded Mayo-Dawson grid and enhanced hydro generation capacity. When the demand for electricity exceeds Yukon's hydro generation capacity, diesel generators are used to make up the shortfall.

Why is it significant?

A variety of conditions, unique to Yukon, present challenges in addressing climate change and reducing GHG emissions. A high energy input is required to live long distances from production centres and to heat buildings during cold winters. Fluctuating mining activity and an isolated electricity grid that is not always able to meet the demand of the mining activity results in fluctuations in emission levels.

From a global perspective, Yukon-generated GHG emissions are very low, while the rate and magnitude of temperature change in the region is predicted to be one of the largest. Although Yukon GHG emissions have limited influence over global emission levels, the Yukon government can demonstrate environmental leadership and responsibility as it communicates the magnitude of northern climate change impacts to the rest of the world.

Taking action in 2008

The *Government of Yukon Climate Change Strategy* was released in 2006. This strategy sets out a vision and goals for addressing climate change in the territory. In 2008, the draft *Yukon Government Climate Change Action Plan* was released for public consultation. The draft *Action*

Plan builds on the vision and goals set out in the *Strategy* and outlines concrete actions the Yukon government will take to address climate change within its areas of responsibility. The draft *Action Plan* is based on the following goals:

1. Enhance Yukon's understanding and awareness of climate change;
2. Improve Yukon's ability to adapt to climate change;
3. Reduce Yukon's GHG emissions; and
4. Establish Yukon as a northern leader for climate change research and innovation.

In 2008, the Yukon government consulted with the public on an *Energy Strategy for Yukon*. The *Energy Strategy* is intended to complement and be coordinated with the government's *Climate Change Strategy* and *Action Plan*. The vision of the *Energy Strategy* is for a sustainable and secure energy sector that is environmentally, economically and socially responsible. The strategy is also to develop and use energy resources to meet Yukon's energy needs and generate benefits for Yukon people, both now and for generations to come.

The Good Energy program was launched by the Energy Solutions Centre in 2008 to provide information and financial rebates for best-in-class household energy equipment, including selected household appliances, heating appliances, heat recovery ventilators, solar water heaters, and boat motors. The Energy Solutions Centre's mandate is to encourage improvements in energy efficiency and the adoption of more forms of renewable energy.

The Yukon Housing Corporation developed Super GreenHome building techniques in 2008 and launched the Super GreenHome program, including industry training. Starting in 2008, all new affordable housing projects of the Yukon Housing Corporation were to be built to Super GreenHome standards. The Yukon Housing Corporation also assisted the City of Whitehorse in developing new energy efficiency bylaws.

Data quality

National and territorial greenhouse GHG data are compiled and published annually by Environment Canada. Environment Canada notes that interpretation of the data must consider the possible presence of estimation, calculation or input errors.

1.2 Changing Climate

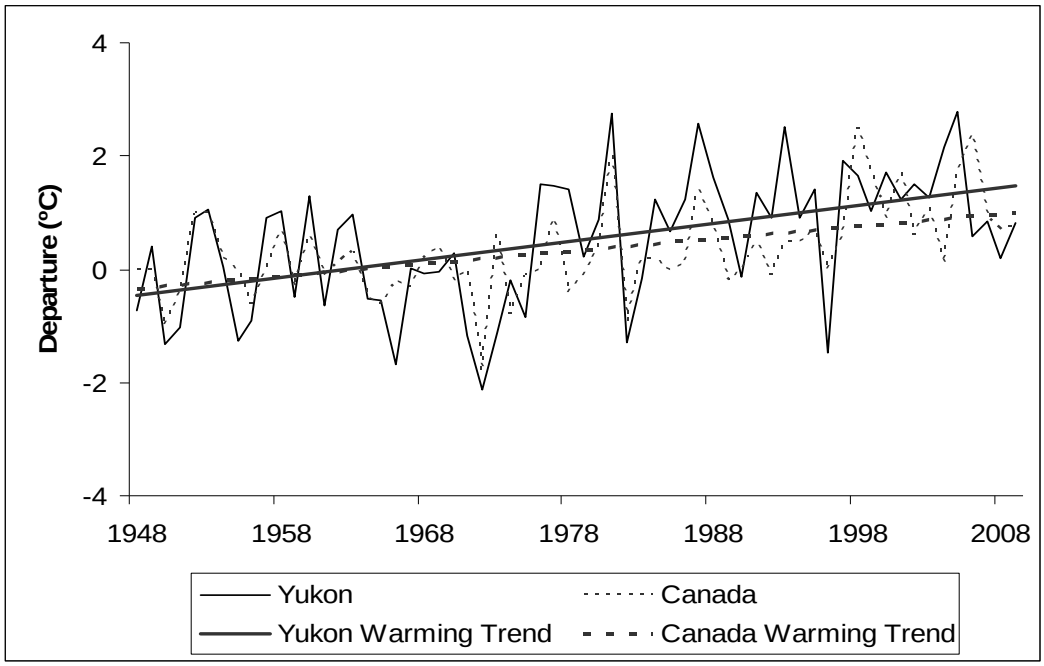
What is the issue?

Climate change impacts are already being observed in the north. These impacts include melting permafrost and polar ice, rising sea levels, eroding coastlines, receding glaciers, beetle infestations in forests, and changes in the range and distribution of plants and animals. Average Arctic temperatures have risen at almost double the global rate in the past few decades and this trend is expected to continue. Climate models project that, over the next century, temperatures could rise by three to five degrees Celsius over land and up to seven degrees Celsius over the oceans. Increased winter precipitation and increased variability in precipitation patterns year-round is also expected in Yukon. Essential steps in adapting to climate change include understanding current and future climate change data, as well as what impact this will have on key aspects of our environment.

What are the indicators?

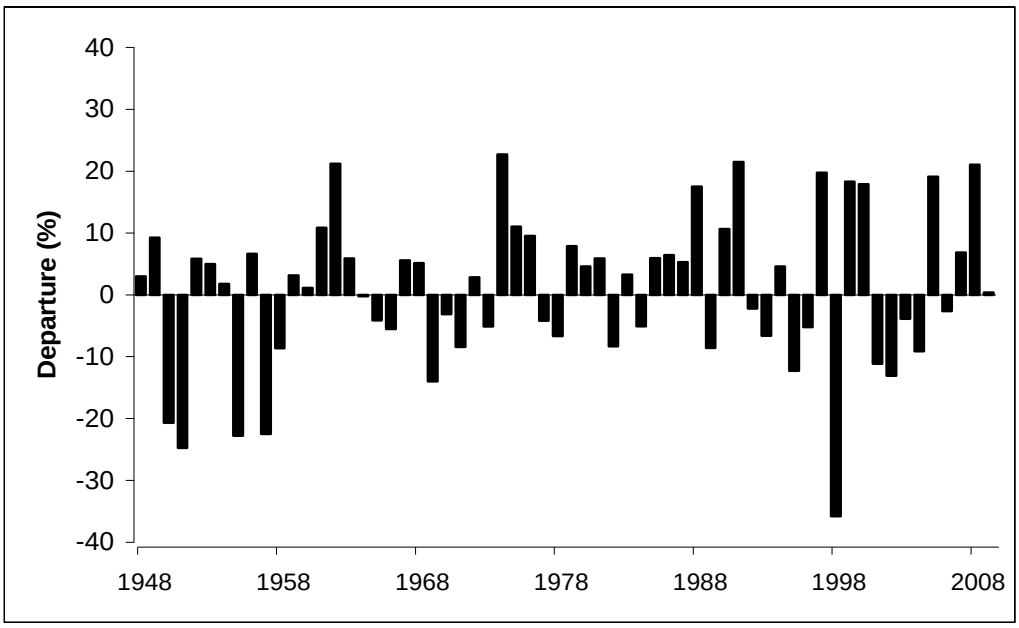
- Higher year-round temperatures, with winters warming more than summers and winter warming being greater farther north. Summers will warm more in the south and central Yukon than in the north due to the moderating effect of the Beaufort Sea (Figure 1.2.1).
- More precipitation in the winter, with the change being greater farther north. There will be little change in average summer precipitation levels. Precipitation patterns will continue to become more variable with greater uncertainty in frequency and amount received during a precipitation event (Figure 1.2.2).
- More extreme weather events, e.g. winter storms, e.g. heavy rainfall.

Figure 1.2.1 Annual temperature departures from normal and long-term trends for Yukon and Canada, 1948-2009 (Yukon data include British Columbia mountains)



Note: Lines show the temperature difference (positive or negative) from the long-term average annual temperatures. Positive temperatures are warmer than normal and negative temperatures are colder than normal.

Figure 1.2.2 Annual precipitation departures from normal and long-term trends for Yukon, 1948-2009 (Yukon data include British Columbia mountains)



Source for both figures: Environment Canada, Climate Trends and Variations Bulletin, 2009.
Note: Bars show precipitation as a per centage difference (positive or negative) from the long-term average precipitation values. Positive bars are wetter than normal and negative bars are drier than normal.

What is happening and why is it happening?

- Yukon's average temperature rose approximately 2.0 ºC since 1948 while Canada's average temperature rose 1.3 ºC (Figure 1.2.1). This trend toward higher year-round temperatures is expected to continue in Yukon. According to the *Arctic Climate Impact Assessment* (2004), average winter temperatures in Alaska and western Canada (including Yukon) increased by as much as three to four degrees Celsius between 1950 and 2000.
- 2008 was the fourth wettest year in Yukon and was 21% wetter than normal (Figure 1.2.2).
- Severe storm events are becoming more frequent in Yukon and that trend is expected to continue in future. August 2008 had record monthly rainfall in western and central Yukon, with more than double the previous record monthly rainfall amounts at Beaver Creek, Burwash Landing and Faro. Climate change projections indicate that heavy summer rainfall events for Yukon are likely to increase. Record rainfall in August 2008 and melting permafrost caused flooding and road washouts that closed the North Klondike Highway in two locations near Carmacks for a day with limited traffic over the next several.

- A large landslide occurred at Little Salmon Lake in August 2008, triggered by heavy rainfall that caused destabilization of a permafrost slope.
- Changes in the distribution of native and invasive plants are anticipated as Yukon's climate changes. White Sweet Clover, an invasive species, is covering more landscape in Yukon and displacing native plants and animals, including ground nesting birds. Over two meters tall, it can obscure drivers' views of signage and wildlife, creating a serious hazard for motorists.

Why is it significant?

All jurisdictions have an important role to play to meet the global challenge of climate change. The *Arctic Climate Impact Assessment* (2004) projected that the rate and magnitude of future temperature change will be greatest in the high latitude regions of the northern hemisphere, including Yukon. Yukon residents should use research, innovation, and collaboration to understand and adapt to the impacts of a changing climate.

Taking action in 2008

The Yukon government continued to develop the climate change action plan which will set out the specific actions and initiatives needed to implement the *Climate Change Strategy*.

Substantial work was undertaken to establish a Yukon Research Centre of Excellence by a partnership of Yukon College, the Council of Yukon First Nations, and the Yukon government. The centre of excellence is intended to further develop Yukon's research and innovation sector with a priority focus on regional climate change research, adaptation and mitigation.

In 2008, the Northern Climate ExChange (NCE) began the Dawson City adaptation planning process to identify specific initiatives to build community resilience to a changing climate. NCE is a program of the Northern Research Institute at Yukon College. Northern Strategy funding will allow NCE to assist three Yukon communities with developing their climate change adaptation plans.

The Yukon government, the Council of Yukon First Nations, and Yukon College partnered to develop a three-year-long project to support the development of regional climate change scenarios. Actions in 2008 included establishing a server node for the Canadian Climate Change Scenarios Network at the college and initiating climate data collection and input.

The Yukon Geological Survey monitored and characterized terrain hazards associated with permafrost degradation in southern and central Yukon, e.g. landslide activity and permafrost subsidence.

The Transportation Engineering Branch of the department of Highways and Public Works and the University of Alaska partnered to field test permafrost adaptation techniques to reduce costly and dangerous frost heaves on Yukon highways.

The department of Health and Social Services monitored health statistics to observe and mitigate changes that may result from climate change, such as an increase in insect-borne disease transmission.

Environment Yukon biologists and researchers were involved in 41 inventory and 17 wildlife management projects with climate change components including habitats, ecosystems, wetlands, forests, wildlife, and hydrology.

In 2008, the Forest Management Branch of the department of Energy, Mines and Resources initiated a three-year-long project to assess the vulnerability and adaptive capacity to climate change of Yukon forest tree species and ecosystems. The branch also wrote the forestry section of the northern chapter for the national assessment of climate change impacts, *From impacts to adaptation: Canada in a changing climate* (2007).

Data Quality

National and territorial greenhouse gas emission data are compiled and published annually by Environment Canada. Environment Canada notes that interpretation of the data must consider the possible presence of estimation, calculation or input errors.

2. Air

2.1 Air Quality

What is the issue?

Poor air quality can harm human and environmental health. Children, the elderly, and people with respiratory problems are particularly at risk. Air quality is affected by natural events, such as wildfires, and pollution from wood stoves, emissions of fossil fuel burning, and industrial activities. To monitor air quality, scientists measure fine particulate matter, ground level ozone, nitrogen oxides and carbon monoxide.

What are the indicators?

Fine Particulate Matter ($PM_{2.5}$), comprised of airborne pollutants in the form of smoke liquid droplets or dust that are 2.5 microns or less in diameter, is a toxic substance that can be inhaled deeply into the lungs. The concentration of this pollutant in the atmosphere is one indicator of air quality. Specific indicators monitored through the surveillance station in Whitehorse are:

- Average ambient annual $PM_{2.5}$ levels in the City of Whitehorse (Table 2.1.1).
- Number of days per year that $PM_{2.5}$ levels (24-hour average) exceeds the Yukon's Ambient Air Quality Standard of 30 micrograms/m^3 (adopted from the Canada Wide Standard for Particulate Matter) (Table 2.1.1).
- Average monthly and annual $PM_{2.5}$ levels compared with average values for the City of Whitehorse (Figure 2.1.1).
- Average monthly and annual $PM_{2.5}$ levels compared with other relevant jurisdictions (Figure 2.1.2).

Table 2.1.1 Average annual particulate matter ($PM_{2.5}$) and number of days that particulate matter levels exceeded the national standard in Whitehorse, 2002-2008

Year	Mean Annual $PM_{2.5}$ ($\mu g/m^3$)	Number days $PM_{2.5}$ ($\mu g/m^3$) Exceeded National Standard
2001	Began monitoring in August	Began monitoring in August
2002	2.4	0
2003	2.4	0
2004	4.8	12
2005	2.8	4
2006	Not Available	Not Available
2007	1.8	0
2008	1.9	0

Figure 2.1.1 Monthly and annual averages of particulate matter ($PM_{2.5}$) in Whitehorse for 2008 and an average from 2001-2007

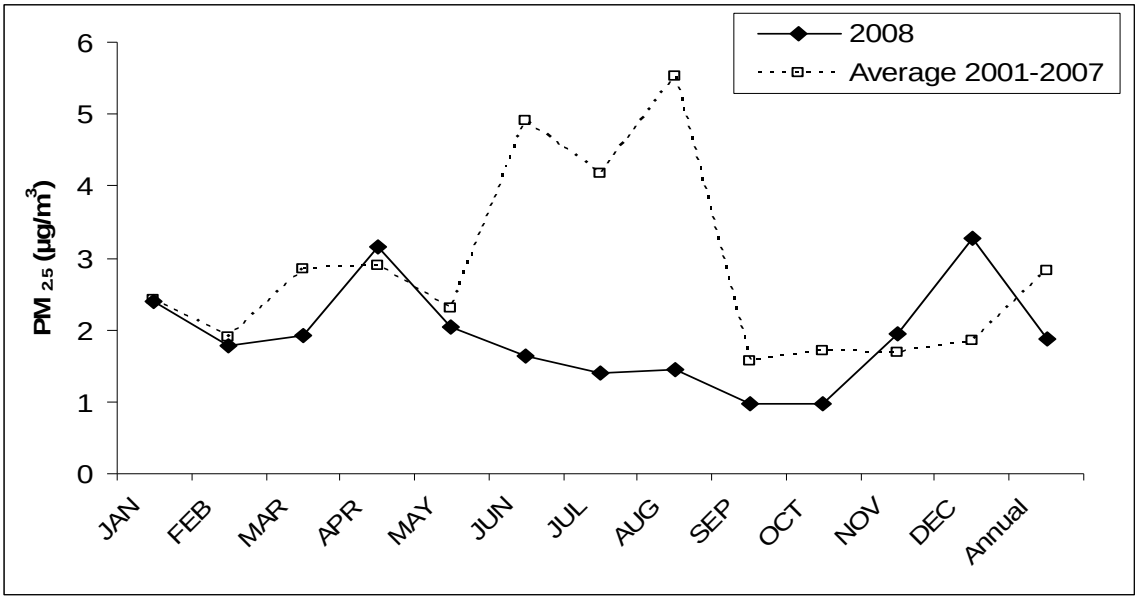
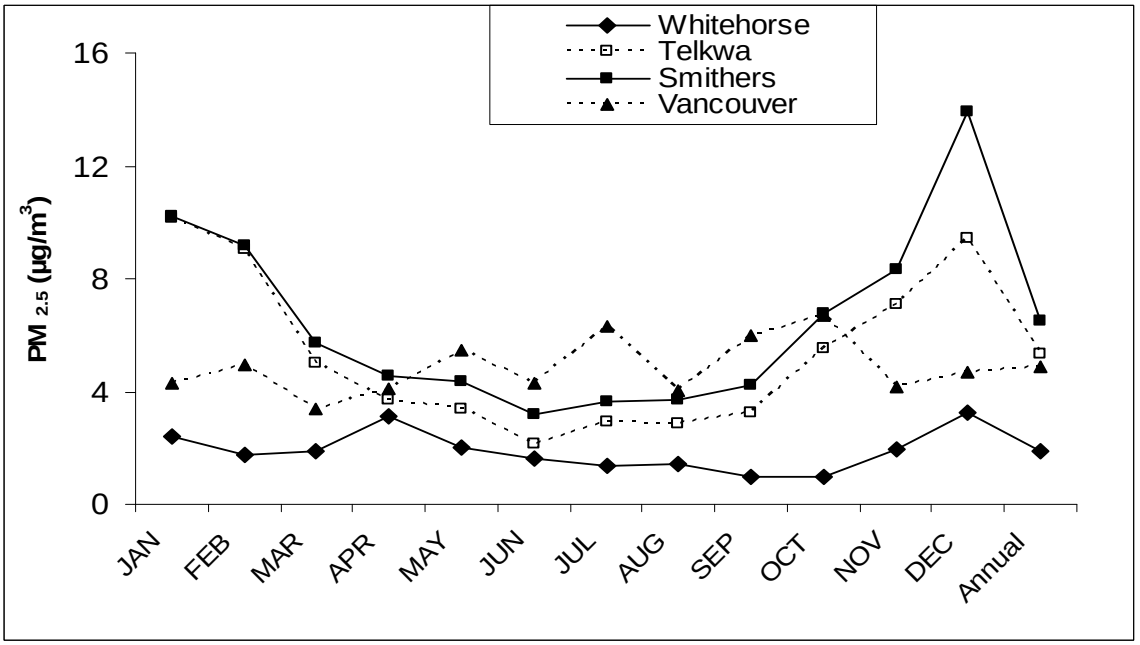


Figure 2.1.2 2008 Monthly and annual averages of particulate matter ($PM_{2.5}$) in Whitehorse and selected communities in British Columbia



Source for both Figures: Environment Canada National Air Pollution Surveillance Network, Environment Yukon.

What is happening?

- The average ambient annual $PM_{2.5}$ concentration for Whitehorse in 2008 was the lowest of all Canadian National Air Pollution Surveillance Stations (Table 2.1.1).
- $PM_{2.5}$ values (24-hr average) did not exceed the Canada-wide standard of 30 $\mu g/m^3$ in 2008 (Table 2.1.1).
- The annual $PM_{2.5}$ level for 2008 was lower than the Whitehorse average from 2001-2007 (Figure 2.1.1). Monthly $PM_{2.5}$ levels for the summer of 2008 were lower than the Whitehorse average from 2001-2007.
- Monthly and annual $PM_{2.5}$ levels for 2008 were lower than selected communities, such as Telkwa and Smithers (which have similar size and comparable woodstove smoke concerns) and Vancouver (an urban centre) (Figure 2.1.2).
- According to a five year report for *Canada-wide standards for particulate matter and ozone* released in 2008, Whitehorse $PM_{2.5}$ and ozone levels met Canada-wide standard targets between the years 2000 and 2005.

Why is it happening?

Elevated $PM_{2.5}$ levels often occur as a result of wood smoke from woodstoves or wildfires, from backyard burning and barbeques, from improperly burned fuels for heating or vehicles, and from road dust, particularly in the spring. Elevated $PM_{2.5}$ levels may also occur as a result of natural causes such as pollen events, dust storms, or volcanic eruptions

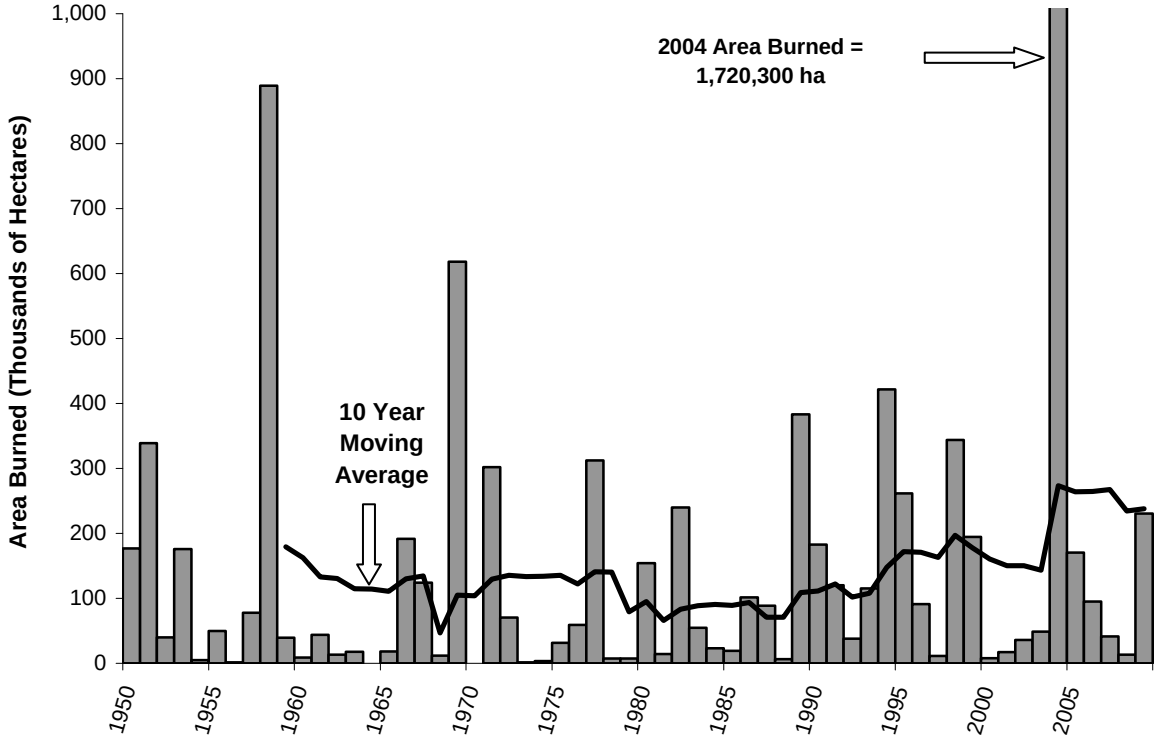
$PM_{2.5}$ levels were low for 2008 compared to the 2001-2007 Whitehorse average because there were no smoke issues affecting Whitehorse during the summer. The 2008 wildfire season saw 76 fires that burned about 13,000 hectares, making it a below-average fire year for Yukon (Figure 2.1.3). In 2004, Whitehorse exceeded Yukon's Ambient Air Quality Standard for 12 days of the year due to an exceptional wildfire season.

In 2000, federal, provincial and territorial governments signed the Canada-wide Standards for Particulate Matter and Ozone. These standards committed provinces and territories to reducing emissions that contribute to particulate matter and ground-level ozone levels by 2010.

Why is it significant?

When inhaled, fine particulate matter may pose serious risks to human health, especially among the elderly, children and people with chronic respiratory illnesses. Health impacts include chronic bronchitis, asthma, and premature death. Reduced visibility as a result of high levels of fine particulate matter may affect aviation, driving and daily life.

Figure 2.1.3 Area burned by wildfires in Yukon, 1950-2009



Source: Wildland Fire Management, Community Services.

Taking action in 2008

The National Air Pollution Surveillance station in Whitehorse recorded ambient air quality data for particulate matter, ozone, nitrous oxide, and carbon monoxide.

The *Clear the Air* campaign continued in 2008. It is a joint educational program between the City of Whitehorse and Environment Yukon to discourage vehicle idling and promote good woodstove burning practices.. The program's goal is to improve air quality.

In 2008, the government's Energy Solution Centre began offering *Good Energy* program rebates for EPA approved woodstoves and CSA approved pellet stoves. These stoves are the most efficient and emit the lowest particulate amounts. In 2008-2009, rebates were given for 129 woodstoves and 14 pellet stoves. Rebates were also given for other energy efficient heating appliances.

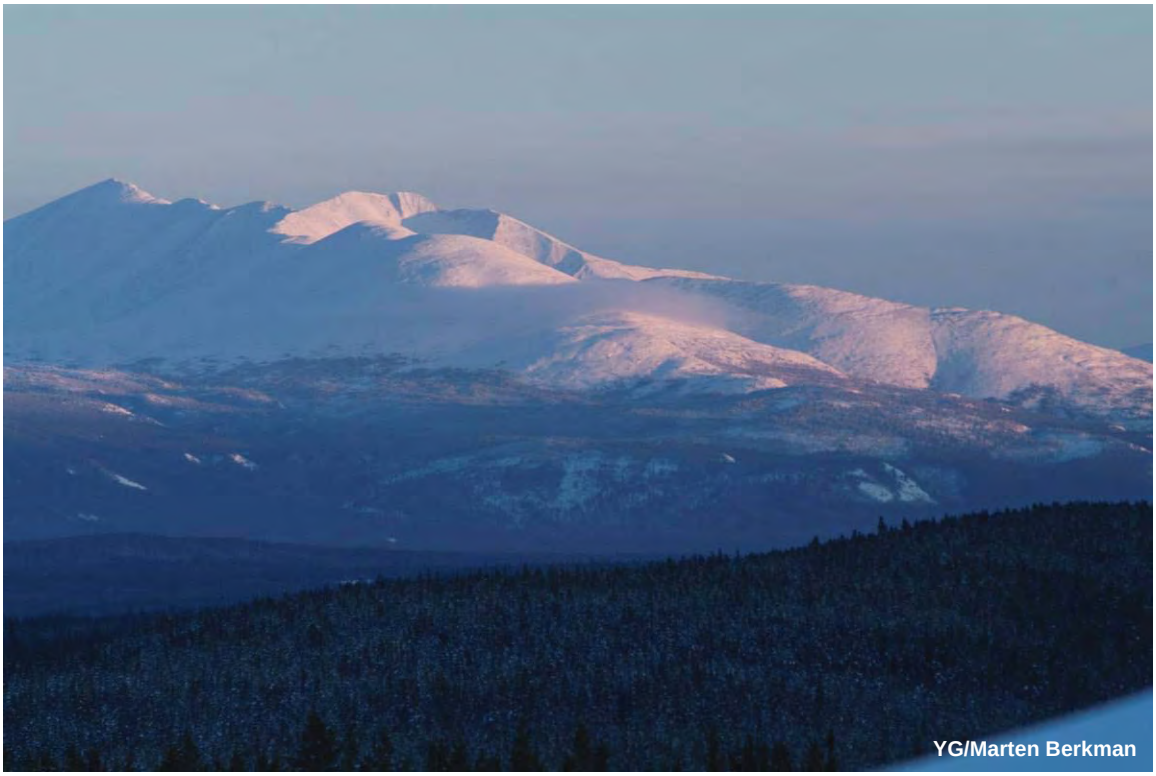
The Yukon government passed the *Smoke-Free Places Act* which banned smoking in all public enclosed spaces in Yukon, including all indoor workplaces, commercial vehicles carrying two or more people, public buildings, and private vehicles carrying children under the age of 18 years.

The Act was intended to improve indoor air quality and human health. The department of Health and Social Services concentrated on education and implementation of the *Act*.

Data quality

National Air Pollution Surveillance data are quality controlled, assured and standardized by Environment Canada and Environment Yukon for inclusion into the Canada-wide air quality database. The program is managed by a cooperative agreement between Environment Canada and Environment Yukon. Data from 2006 are not available due to technical problems that year. The air quality data for the Whitehorse area is not necessarily representative of air quality throughout Yukon.

Wildfire data is maintained and standardized by Wildland Fire Management Branch of the Yukon government. While data coverage goes back to 1950, Yukon-wide fire detection and mapping capabilities were not fully developed until the 1960s. Fire perimeters are mapped for most cases, so unburned areas within the perimeter are included in the 'burned area' calculation. Until 1997, fires that covered less than 200 hectares were not included.



2.2 Interesting Story

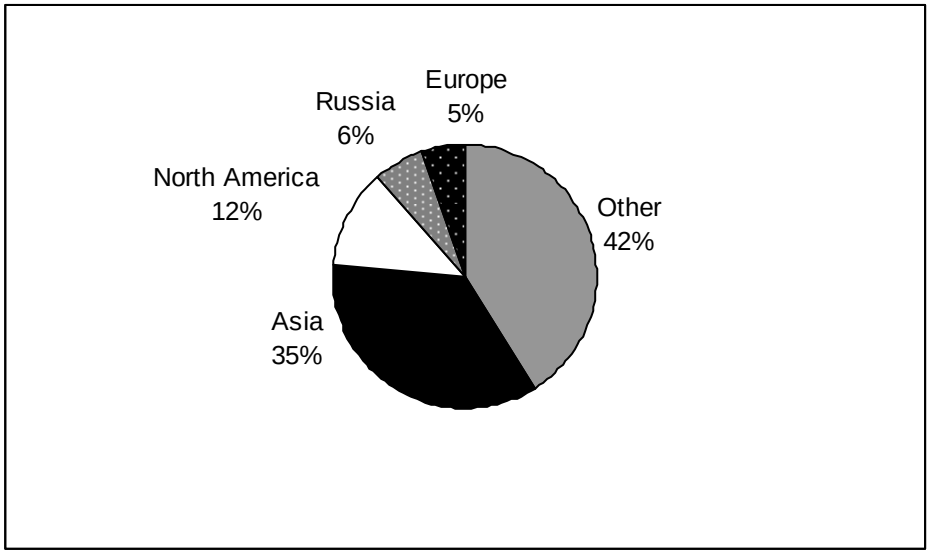
Airborne Contaminants at Little Fox Lake

Many airborne contaminants are transported to the north by wind. In 2007, researchers from Environment Canada and the Northern Contaminants Program began sampling for pollutants in the atmosphere at Little Fox Lake, 60 kilometers north of Whitehorse, as part of an International Polar Year project examining the transport of atmospheric pollutants to the Arctic

An airborne pollutant of particular interest was mercury, which can cause health problems in humans. Airborne mercury can enter the atmosphere naturally or from human activities. Mercury can remain in the atmosphere for six months to two years and be transported great distances by winds. Mercury deposition in Alaska's Arctic is three times higher than prior to the industrial revolution.

Approximately 35 per cent of airborne mercury found at Little Fox Lake originated in Asia, compared with 12 per cent from North America.

Figure 2.2.1 Sources of mercury in the air at Little Fox Lake



Source: Durnford and colleagues. 2010.

3. Water

3.1 Water Quality Index

What is the issue?

Freshwater of sufficient quality and quantity is essential for aquatic life and to support human uses for industry, recreation, agriculture and drinking. Yukon's water bodies and watersheds are monitored to determine ambient water quality.

What is the indicator?

- The Canadian Water Quality Index (Table 3.1.1).

  The Water Quality Index (the Index) compiles important information about the state of water quality and identifies emerging trends. It reduces data about the quality of a water body to a number scale that corresponds to a rating such as poor, good or excellent. The Index evaluates the suitability of the streams to support aquatic life. (Tables 3.1.2 and 3.1.3).

Table 3.1.1 Water Quality Index ratings defined by Canadian Environmental Sustainability Indicators

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.

Table 3.1.2 Number of samples collected at Yukon monitoring stations, 2006-2008

River	Station	Ecoregion	2006	2007	2008
Alsek River	Above Bates River	Yukon-Stikine Highlands	10	6	6
Dezadeash River	At Haines Junction	Ruby Range	27	23	31
Klondike River	Above Bonanza	Klondike Plateau	13	11	7
Liard River	At Upper Crossing	Liard Basin	18	13	15
Old Crow River	At mouth	Old Crow Flats		4	7
Porcupine River	Above Old Crow River	Old Crow Flats		6	7
Rose Creek	Above Anvil Creek	Yukon Plateau – Central			18
South McQuesten River	Below Flat Creek	Yukon Plateau – North	9	9	8
Yukon River	Above Takhini River	Yukon Southern Lakes	9	12	12
Yukon River	At Marsh Lake Dam	Yukon Southern Lakes	10	12	19
Total samples			*96*	*96*	*130*

Table 3.1.3 Water Quality Index rolling average ratings for Yukon monitoring stations, 2001-2008*

Location	2001-2003	2002-2004	2003-2005	2004-2006	2005-2007	2006-2008	Current Rating
Dezadeash River at Haines Junction	89.5	83.8	84.2	84.2	89.5	n/a	n/a
Klondike River above Bonanza Creek	n/a	n/a	n/a	n/a	66.8	66.6	Fair
Liard River at Upper Crossing	100	93.6	93.6	93.6	93.6	87.2	Good
Porcupine River above Old Crow River	85.6	n/a	n/a	n/a	n/a	n/a	n/a
South McQuesten River below Flat Creek	n/a	n/a	n/a	n/a	64.4	64.3	Marginal
Yukon River at Marsh Lake Dam	n/a	n/a	n/a	n/a	100	n/a	n/a
Yukon River above Takhini River	n/a	n/a	n/a	n/a	100	100	Excellent

** The rolling average does not include the Alsek River, Rose Creek and one of the two Old Crow River sites at this time.*

Sources: Environment Canada and Environment Yukon.

Note: (n/a) Not available.

What is happening?

- In 2008, a total of 130 samples were collected from the ten monitoring stations in Yukon operated by Environment Canada and Environment Yukon (Table 3.1.2).
- The Water Quality Index ratings for the Liard, Dezadeash, Klondike, South McQuesten and Yukon River above Takhini stations ranged from marginal to excellent (Table 3.1.3). A three-year rolling average scoring provides additional confidence in the ratings.

Why is it happening?

Water quality varies throughout the year. For example, suspended solids and turbidity are higher in spring when increased stream flow from melting snow accelerates bank erosion. Copper in the Dezadeash River can exceed the site-specific guidelines during high flow. However, copper associated with suspended solids is not available for uptake by fish and other aquatic organisms. Each three-year index score period at each station may have natural variations or human-caused impacts on water quality which will result in changes to the index score.

Why is it significant?

The water quality index rating for the Yukon River above the Takhini River is rated as ‘excellent.’ This station is down-river from the City of Whitehorse wastewater discharge (Livingstone Trail Lagoon). The Klondike River above Bonanza Creek is influenced by historic gold mining, rural development, agriculture, placer mining and recreation. Concentrations of metals exceed guidelines during the May-June period and coincide with high flow and turbidity, resulting in a ‘fair’ water quality index rating. The South McQuesten River is a snowmelt-fed system downstream of abandoned tailings piles from the Keno Hill silver-lead-zinc mine. Concentrations of metals exceeded guidelines in the May to August period, with additional zinc contributions in the fall. The water quality index rating for South McQuesten is ‘marginal.’ The recent increase in care and maintenance activities at this mine site may result in improved water quality over time. The Liard River is stable and rated as ‘good,’ as one would expect in natural systems with little human impact. Increases in metal concentrations are associated with spring melt.

Sampling Water – South McQuesten River Environment Canada

Taking action in 2008

In March 2008, an additional monitoring site was established on Rose Creek, downstream of the abandoned lead-zinc mine in Faro. This station was sampled bi-weekly for metals, general ions (e.g. sulphate) and nutrients.

Data quality

Water quality samples were obtained by locally trained personnel using established protocols for sample collection and transport. Samples were analyzed in Environment Canada laboratories. The data was quality controlled, assured and standardized by Environment Canada and Environment Yukon following the program for the Canadian Environmental Sustainability Indicators, Chronological Index reporting led by Statistics Canada.

3.2 Wetlands

What is the issue?

Wetlands are productive ecosystems that cover only three per cent of Yukon's land base. Wetlands include bogs, fens, swamps, marshes and shallow open water areas and they play an important role in the functioning of our overall natural environment. Wetlands provide summer habitats for migratory birds and may be particularly important during low water years on the prairies and for species under stress in their wintering areas.

What are the indicators?

- The number of wetlands inventoried and described by criteria based on habitat, ecosystem and cultural values (Table 3.2.1 and Figure 3.2.1).
- The conservation status inventoried wetlands, e.g. habitat protection area (Table 3.2.1)

What is happening?

- Fifty-four wetlands are recognized by the Yukon Wetland Technical Committee, primarily for their habitat value to migratory and rare birds. The largest wetlands are concentrated permafrost terrain north of the Arctic Circle. Small wetlands are scattered throughout the territory. Wetland inventory is ongoing by various governments and non-government organizations.
- Nine of the inventoried wetlands have protection measures in place.

Why is it happening?

Inventories, designations and notations of wetlands are occurring because government and non-governmental organizations recognize the high value of these ecosystems. Land claim agreements often include provisions to protect important wetlands. The process for establishing a special management area can take years, however.

Why is it significant?

Wetlands are important for plants, animals, migratory birds, fish, and water quality. Functioning and intact wetland ecosystems maintain water flows, protect areas from floods, purify water, recharge groundwater and provide habitat for fish and wildlife. Some are culturally important for human communities. Inventory data help planners identify what is happening in wetlands so that they can ensure their ongoing viability.

Taking action in 2008

The recommended North Yukon Land Use Plan (2008) identified additional wetlands for protection, including the Summit Lake and Whitefish Wetlands. (Habitat Protection Area status was proposed for the Whitefish Wetlands.)

Management plans for the Old Crow Flats Special Management Area and Łútsäw Habitat Protection Area were implemented in 2008. These areas are important regionally for waterfowl and other fish and wildlife.

The 40th annual conference of the Trumpeter Swan Society was held in Whitehorse to recognize the role Yukon has played in the recovery of the species.

Environment Yukon hosted a Swan Gala as part of the annual Celebration of Swans that explored through art, stories and dance how swans influence our lives. Performers included the First Nations People's Performances, the Northern Lights School of Dance, Jim Hawkings, and Marten Berkman.

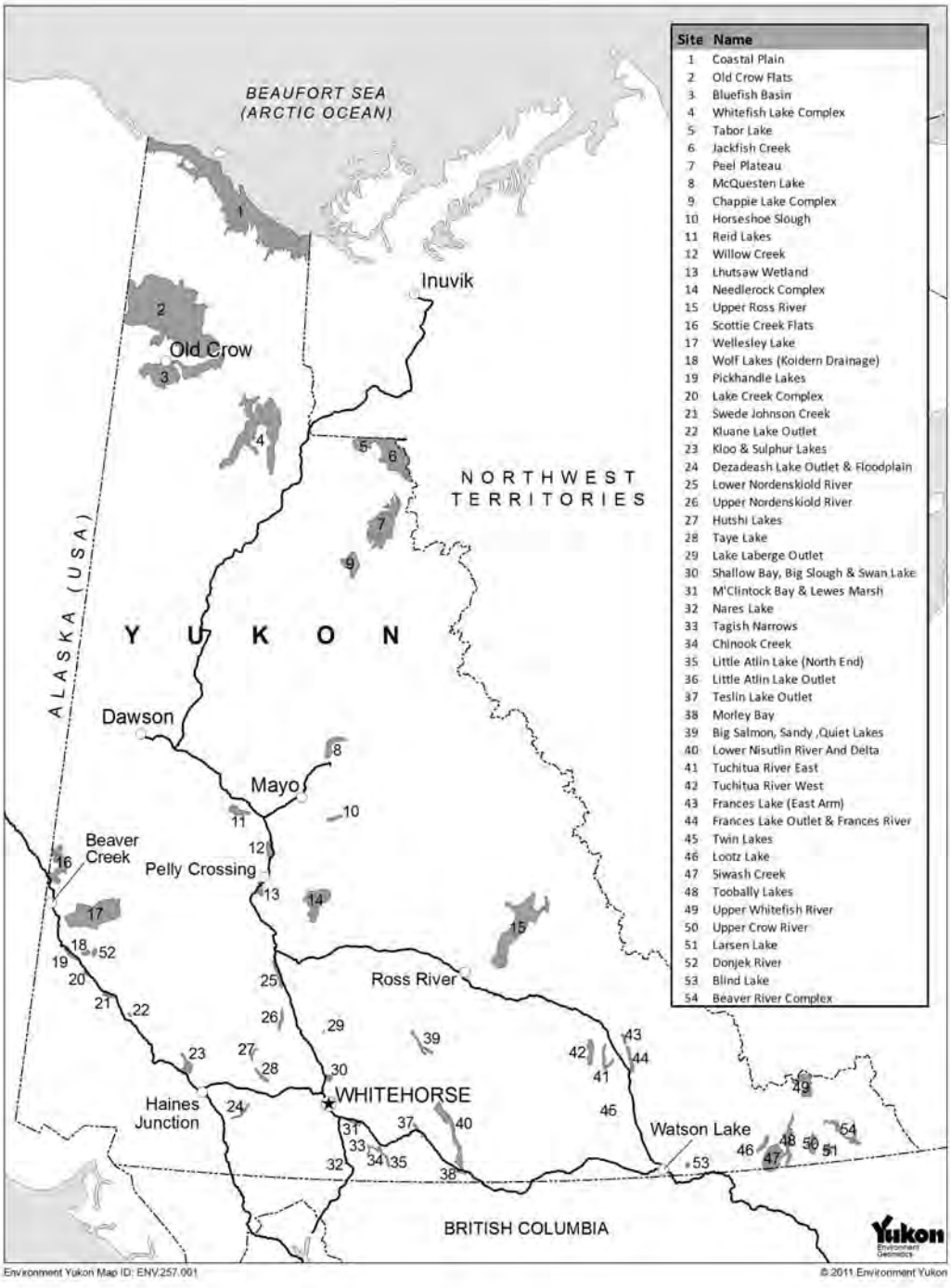
The Yukon Placer Secretariat released an *Adaptive Management Framework* in November 2008. It incorporated a risk-based approach to decision making while balancing two management objectives: the conservation and protection of fish and fish habitat supporting fisheries; and a sustainable Yukon placer mining industry. The framework used information gathered from three monitoring programs (water objectives, aquatic health and economic health monitoring) and traditional knowledge to ensure fish habitat management objectives are achieved.

Table 3.2.1 Status of Inventoried Yukon Wetlands in 2008 (✱ Awaiting designation)

SITE #	Wetland Name	Conservation Status
1	Coastal Plain	National Park
2	Old Crow Flats	Special Management Area
3	Bluefish Basin	
4	Whitefish Lake Complex	Proposed Habitat Protection Area
5	Tabor Lake	
6	Jackfish Creek	
7	Peel Plateau	
8	McQuesten Lake	
9	Chappie Lake Complex	
10	Horseshoe Slough	Habitat Protection Area
11	Reid Lakes	
12	Willow Creek	
13	Lhutsaw Wetland	Habitat Protection Area
14	Needlerock Complex	
15	Upper Ross River	(includes Sheldon Lakes)
16	Scottie Creek Flats	
17	Wellesley Lake	
18	Wolf Lakes (Koidern Drainage)	
19	Pickhandle Lakes	Habitat Protection Area ✱
20	Lake Creek Complex	
21	Swede Johnson Wetland	
22	Kluane Lake Outlet	
23	Kloo and Sulphur Lakes	
24	Dezadeash Lake Outlet and Floodplain	Notation
25	Lower Nordenskiold River	Habitat Protection Area ✱
26	Upper Nordenskiold River	
27	Hutshi Lakes	
28	Taye Lake	
29	Lake Laberge Outlet	
30	Shallow Bay, Big Slough, and Swan Lake	
31	M'Clintock Bay and Lewes Marsh	Habitat Protection Area ✱
32	Nares Lake	
33	Tagish Narrows	Habitat Protection Area ✱
34	Chinook Creek	
35	Little Atlin Lake (North End)	
36	Little Atlin Lake Outlet	
37	Teslin Lake Outlet	
38	Morley Bay	
39	Big Salmon, Sandy, and Quiet Lakes	
40	Lower Nisutlin River and Delta	National Wildlife Area
41	Tuchitua East	
42	Tuchitua West	
43	Frances Lake (East Arm)	
44	Frances Lake Outlet and Frances River	
45	Twin Lakes	
46	Lootz Lake	
47	Siwash Creek	
48	Toobally Lakes	
49	Upper Whitefish River	
50	Upper Crow River	
51	Larsen Lake	
52	Donjek River	
53	Blind Lake	
54	Beaver River complex	

Source: Yukon Wetlands Technical Committee and Environment Yukon.

Figure 3.2.1 Inventoried Wetlands in Yukon



Source: Environment Yukon.

3.3 Interesting Story

Rapid drainage of Zelma Lake in Old Crow Flats

The Old Crow Flats (Figure 3.2.1) is a network of some 2,700 lakes that covers 5,600 km^2 and is internationally recognized for its ecological significance. The area is closely linked to the cultural identity of the Vuntut Gwitchin. Zelma Lake stood out because of its large size and nearness to Old Crow. Local residents long used it for hunting, trapping and fishing.

In June 2007, however, most of Zelma Lake drained away. This was witnessed by both the community and researchers already in the community to study environmental change and traditional use of the Old Crow Flats.

In 2008, hydrologists with the Old Crow Flats International Polar Year Project used aerial photos from July 2007 and water depth measurements to calculate the volume of water drained: more than 80 per cent of the lake's original volume, or approximately 5.8 million m^3 (the equivalent of 2,300 Olympic-size swimming pools).

Substantial rainfall in the 10 months leading up to June 2007 (e.g. May 2007 had the highest recorded precipitation since measurements began in 1951) likely increased lake levels and triggered rapid erosion of an outlet leading to the channel network the exports water from the Flats. The rapid draining of Zelma Lake impacted fishing and hunting activities, as the lake now covers 57 per cent of its former area.

Zelma Lake – July 2007 K. Turner

4. Land

4.1 Land Use and Resource Management Planning

What is the issue?

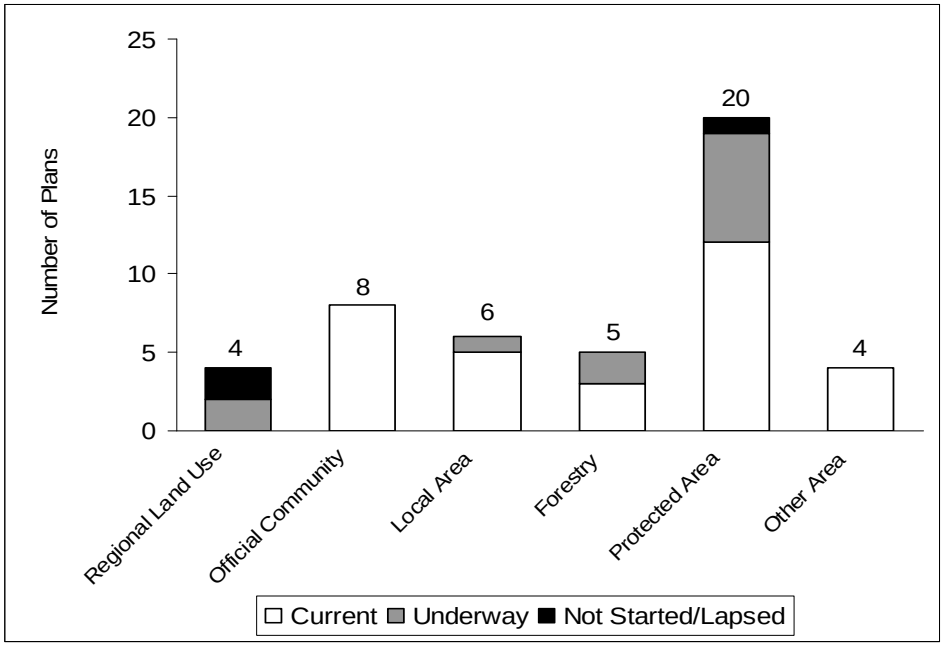
The sustainability of resource use and development depends on effective planning for future human activities and environmental protection.

What are the indicators?

- The status of management plans related to land use, resources and protected areas (Figure 4.1.1).

  These plans generally include an inventory of resources and interests, and strategies to meet a set of management objectives. For this report, management plans are divided into three status categories: current (plan is finalized and in use), underway (plan is in development), or not started/lapsed (plan is out of date or awaiting a new planning process) (Figure 4.1.1). The types of management plans include regional land use plans, official community plans, local area plans, forest resource management plans, protected area and habitat protection area plans, and other areas (includes Canadian Heritage Rivers).

Figure 4.1.1 2008 Status of land use and resource management plans in Yukon



Source: Updates from resource planners.

What is happening, and why is it happening?

- Regional Land Use Plans (Table 4.1.1)
  Planning commissions were actively planning for two regions (Figure 4.1.2), the North Yukon and Peel Watershed, which represents 26 per cent of Yukon's area. The planning process is set out in Chapter 11 of First Nations Final Agreements.

  The North Yukon Planning Commission completed a recommended land use plan in 2008. The plan recommended a sustainable development framework for land management and addressed key issues of oil and gas development in Porcupine caribou habitat and development impacts in wetlands. The plan also recommended protected area status for the Whitefish Wetlands and the Summit Lake-Bell River area. The plan identified important traditional use and wildlife areas that were mapped from local and traditional knowledge.

  In 2008, the Peel Watershed Planning Commission completed a variety of reports, assessments, maps, workshops and public meetings to develop scenarios and look at potential land use conflicts and environmental and economic impacts.

  Two other regions were earlier identified for future planning: Dawson and Teslin. The Yukon Land Use Planning Council facilitated the terms of reference for a Dawson Regional Planning Commission at the request of the Tr'ondëk Hwëch'in. The Teslin Regional Planning Commission was suspended in 2004.

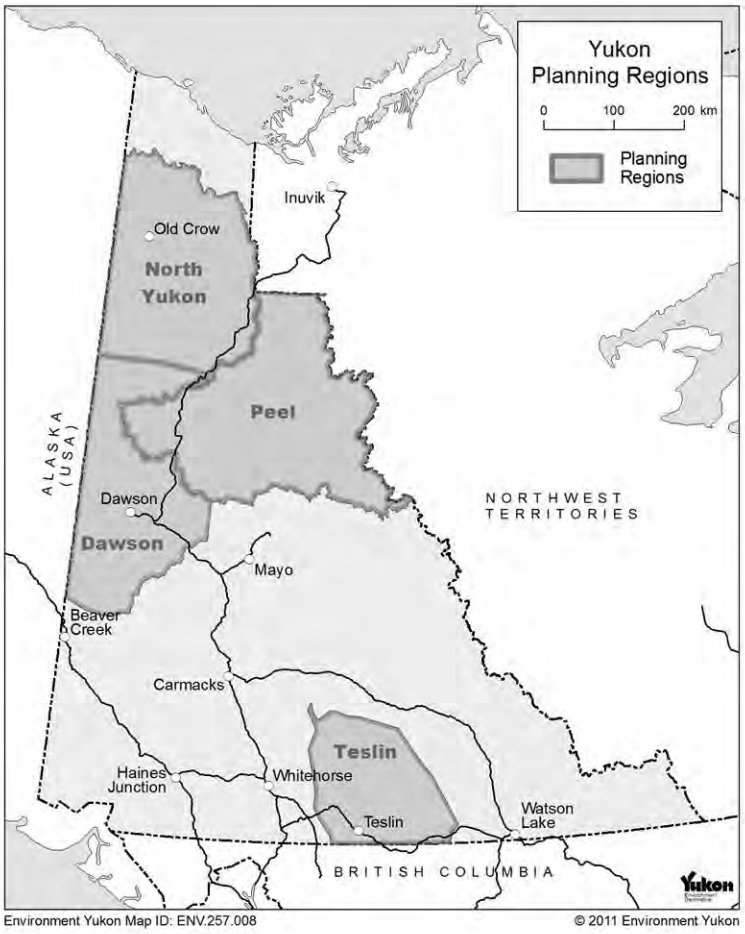


Figure 4.1.2 Yukon planning regions in 2008

Source:
Environment Yukon

- Forest Resources Management Plans (Table 4.1.1).
  Plans were completed for the Teslin Tlingit and Champagne and Aishihik traditional territories under Chapter 17 of First Nations Final Agreements. The Yukon *Forest Resources Act* was passed in 2008 to outline the planning process and purpose and scope of these plans.

  Several forest resources management plans were underway. The Kaska Forest Resource Stewardship Council provided a draft Forest Resource Management Plan to the parties for consideration. The Yukon government and the Tr'ondëk Hwëch'in established a forest management planning process in Dawson City. Terms of reference to establish a planning team for forest management planning for the Southern Lakes area were developed with the Carcross/Tagish First Nation, the Kwanlin Dün First Nation and the Ta'an Kwäch'än Council.

- Official Community Plans (Table 4.1.1).
  All eight Yukon municipalities had official community plans in place, as required under the *Municipal Act*.

Table 4.1.1 Status of land use, forest resources, and official community planning processes in Yukon in 2008

Plans	Approved	Status
Regional Land Use Plans		
North Yukon Planning Commission	No	Underway Recommended Plan completed in 2008. Commission was established in 2003.
Peel Watershed Planning Commission	No	Underway Conservation Priorities Assessment Report and Resource Assessment Reports Completed in 2008; Scenarios modeling underway in 2008. Commission was established in 2004.
Dawson Planning Commission	No	Not started
Teslin Planning Commission	No	Lapsed Planning commission was established in 2001 and suspended in 2004
Forest Resources Management Plans		
Tr'ondëk Hwëch'in Traditional Territory	No	Underway
Kaska Traditional Territory	No	Underway In Review of Final Draft
Champagne and Aishihik Traditional Territory Strategic Forest Management Plan	2004	Current
Integrated Landscape Plan for Champagne and Aishihik Traditional Territory	2006	Current
Forest Management Plan for the Teslin Tlingit Traditional Territory	2006	Current
Official Community Plans		
Carmacks	2005	Current
Dawson	1992	Current
Faro	2003	Current
Haines Junction	2006	Current
Mayo	2006	Current
Teslin	1999	Current
Watson Lake	1995	Current
Whitehorse	2002	Current

- Local Area Plans (Table 4.1.2).
  Five local area plans or community plans were in place and one was under development. These plans often address development pressures and are initiated by either residents or a government. The plans can be regulated through zoning regulations pursuant to the *Area Development Act*. Over time, the number of local area plans outside of municipal boundaries is increasing.

Table 4.1.2 Status of local area plans and zoning regulations in 2008

Development Area	Local Area Plan	Zoning Regulation
Bear Creek	No	1983
Carcross General Development Area	No	1976
Deep Creek	2001	Under Development
Dempster Highway	No	1979
Destruction Bay	No	1980
Golden Horn	2004	Under Development
Grizzly Valley	No	1996
Hamlet of Ibex Valley	2001	2005
Hamlet of Mount Lorne	1995	2006
Hot Springs Road	2002	2005
Jackfish Bay	No	2000
Klondike Valley	No	1992
Little Teslin Lake Recreation Area	No	Under Development
M'Clintock Place	No	1996
Mayo	No	1976
Mayo Road	No	2005
Mendenhall	No	1990
Pine Lake	No	1990
Ross River	No	1978
West Dawson/Sunnydale	Under Development	1990
Whitehorse Periphery	No	1978

- Protected area plans (Table 4.1.3 and Figure 4.1.3).
  The majority of protected areas are first recognized as Special Management Areas under Chapter 10 of First Nations Final Agreements and then later designated. Three territorial park management plans were in place and four more planning processes (Kusawa, Agay Mene, Tombstone, and Coal River Springs) were underway. Five Habitat Protection Area (HPA) management plans were in place and three more HPA planning processes were underway.

- Other Areas
  Canadian Heritage River designation recognizes rivers or river segments for their natural, heritage and/or recreational values but do not provide protection. Yukon had four Canadian heritage rivers in 2008, all with current management plans. The Kluane Wildlife Sanctuary provides a refuge for wildlife from licenced hunters, with only two permits allowed each year.

Why is it significant?

The development of long-term management plans through public processes is a proactive way for government to recognize and balance competing views about how lands and natural resources should be used. 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. Planning is an important obligation arising from land claims agreements.

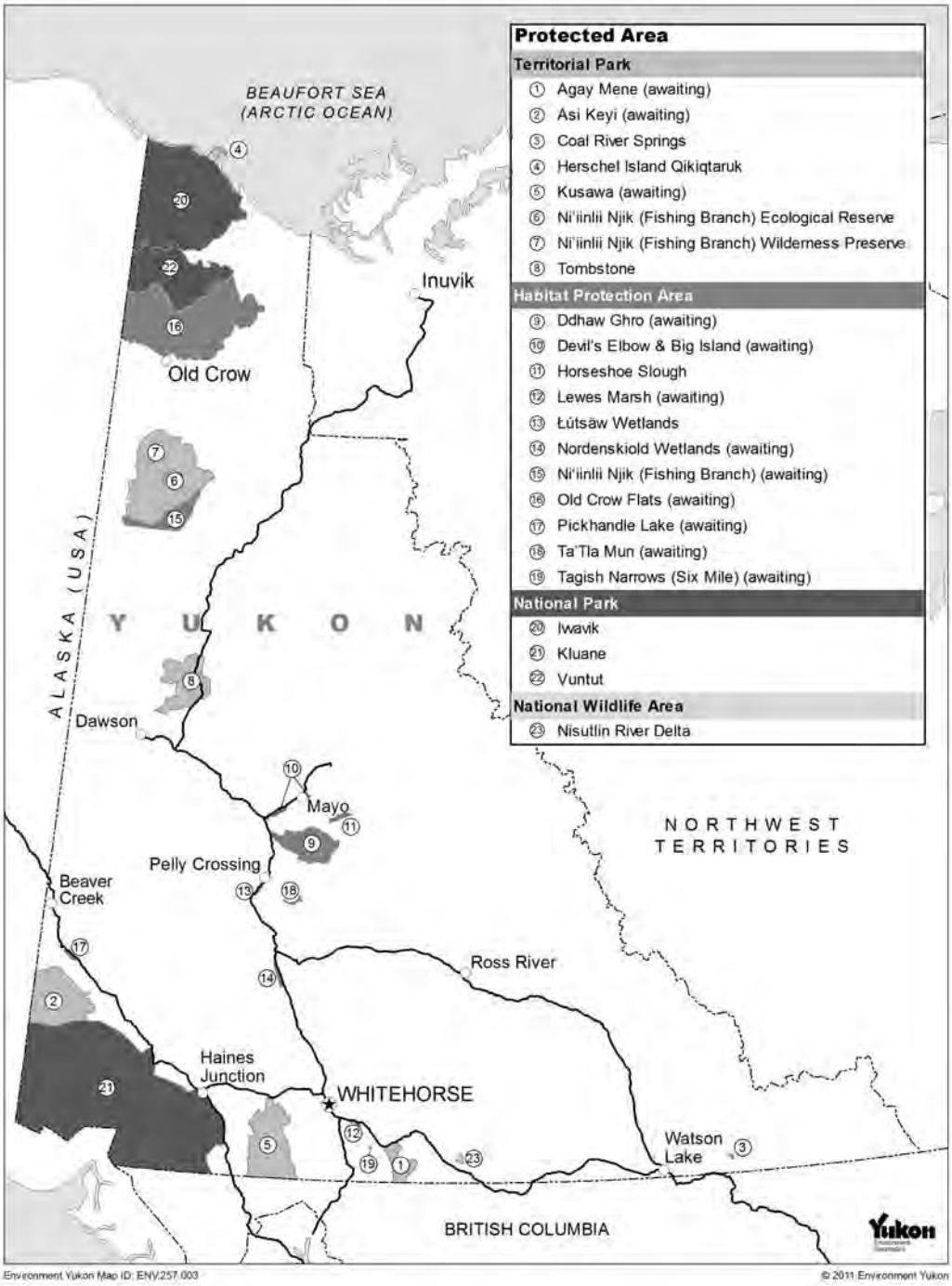
Alsek River

Table 4.1.3 Total Area and Percentage of Parks and Other Areas in Yukon, 2008

Area Name	Land Withdrawal*	Designated	Management Plan	Size	
				Area (km^2)	% of Yukon
Territorial Park					
Agay Mene	None	No	Under development	725	0.150
Asi Keyi	Interim protected	No	Not yet initiated	2,984	0.617
Coal River Springs	Permanent	1991	Under development	16	0.003
Herschel Island-Qikiqtaruk	Permanent	1987	2006	113	0.023
Kusawa	Interim protected	No	Under development	3,082	0.637
Ni'iinlii Njik (Fishing Branch) Ecological Reserve	Permanent	2003	2004	169	0.035
Ni'iinlii Njik (Fishing Branch) Wilderness Preserve	Permanent	2003	2004	5,355	1.108
Tombstone	Permanent	2004	Draft complete	2,050	0.424
Subtotal				14,494	2.997
Habitat Protection Area					
Ddhaw Ghro	Interim protected	No	Draft Completed	1,609	0.333
Devil's Elbow & Big Island	None	No	Under Development	83	0.162
Horseshoe Slough	Interim protected	2001	2002	77	0.016
Lewes Marsh	Interim protected	No	No	20	0.004
Łútsäw Wetlands	Interim protected	2006	2006	32	0.007
Nordenskiold Wetlands	Interim protected	No	Under Development	78	0.016
Ni'iinlii Njik (Fishing Branch)	None	2004	2004	978	0.202
Old Crow Flats	Permanent	2007	2006	3,783	0.782
Pickhandle Lake	None	No	No	51	0.011
Ta'Tla Mun	None	No	2005	33	0.007
Tagish Narrows (Six Mile)	None	No	No	4	0.001
Subtotal				6,748	1.397
National Park					
Ivvavik	Permanent	1984	2007	9,704	2.006
Kluane	Permanent	1972	2004	22,155	4.581
Vuntut	Permanent	1995	2004	4,350	0.899
Subtotal				36,209	7.486
National Wildlife Area					
Nisutlin River Delta	None	1995	2004	55	0.011
Grand Total				57,506	12%

Source: Environment Yukon
Note: (*) Refers to withdrawal of surface and/or subsurface from mineral and oil and gas exploration and development, and other activities.

Figure 4.1.3 Protected areas in Yukon including those awaiting designation



Source: Environment Yukon

4.2 Interesting Story

Ecosystem mapping in land use planning

Ecosystem maps are important tools for creating regional land use plans because they use predictive approaches to help identify important habitat and wildlife areas in remote areas. Ecosystem maps show geographic landscapes or ecosystem units with relatively uniform vegetation communities with uniform soil and terrain.

Environment Yukon produced a regional ecosystem map in 2008 for the Peel Watershed Land Use Planning Commission to help it identify important areas for conservation in the land use plan for the Peel Watershed. The Peel region makes up about 14 per cent of Yukon (68,000 square kilometers) and is almost as large as New Brunswick.

Environment Yukon used a predictive ecosystem mapping approach that brought together spatial biotic data and abiotic data to classify ecosystems. Ecologists and remote sensing specialists used information gathered from land cover images, soil moisture, and landscape positions to develop the models.

Environment Yukon and the Peel Watershed Planning Commission used these ecosystem maps to assist in the identification of suitable habitat for a variety of species: moose, Dall's sheep, caribou, grizzly bear, breeding birds, waterbirds, rare birds, and rare plants. Local and traditional knowledge contributed to most of these habitat suitability models. Experts were asked to interpret the relative quality of each of the ecological land classes for specific species.

As Environment Yukon's ecosystem and landscape classification program continues to evolve, the Peel Watershed ecosystem map will be updated. The Peel Watershed ecosystem map will be used as a tool for land-use management in the planning region by all levels of government.

4.3 Solid Waste Management

What is the issue?

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. We reduce our reliance on landfills by generating less waste and by having more recycling and composting.

What are the indicators?

- Total annual tonnage of waste arriving at the City of Whitehorse landfill (Figure 4.3.1).
- Curbside collection of garbage and compostables from approximately 5,000 Whitehorse single family households. (Figure 4.3.2).
- Overall diversion rate in Whitehorse based on the total waste landfilled (Figure 4.3.3).

Figure 4.3.1 Waste arriving at the City of Whitehorse landfill, 2000-2008

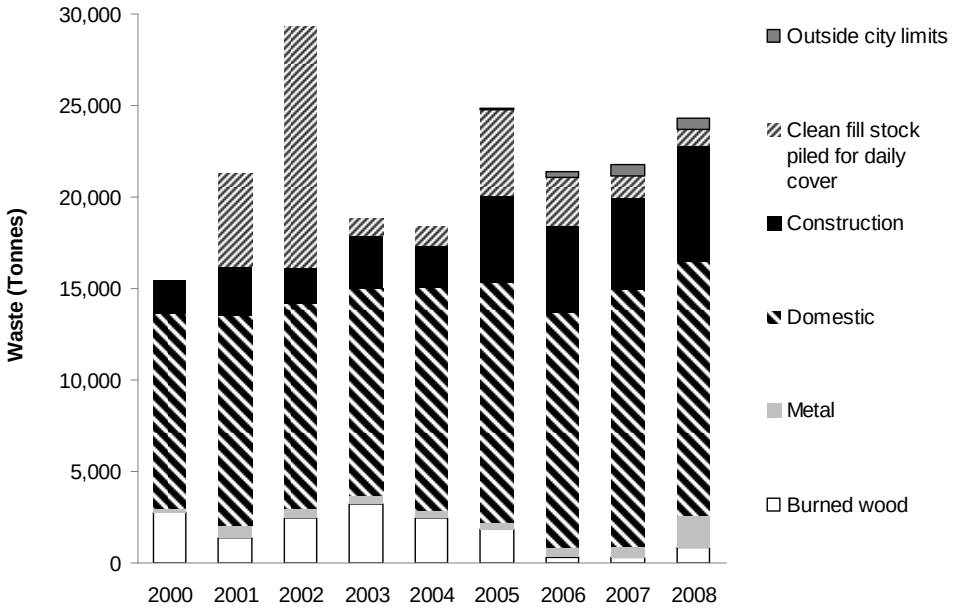


Figure 4.3.2 Curbside waste collection and diversion from single family homes in Whitehorse, 2000-2008. Garbage might include items that could be composted or recycled, but were put out with garbage and sent to the landfill.

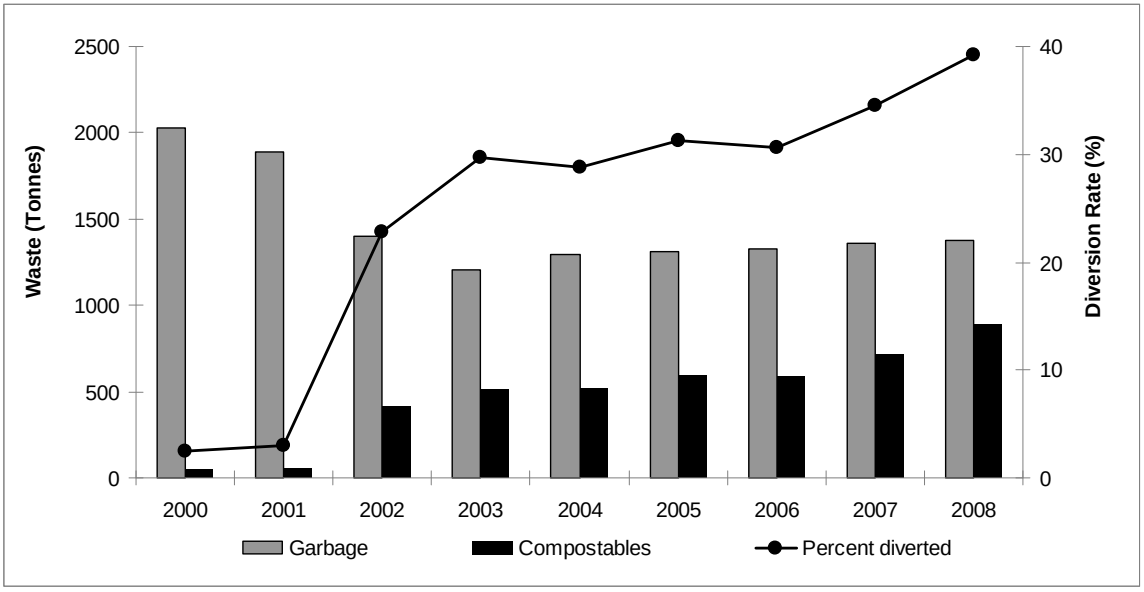
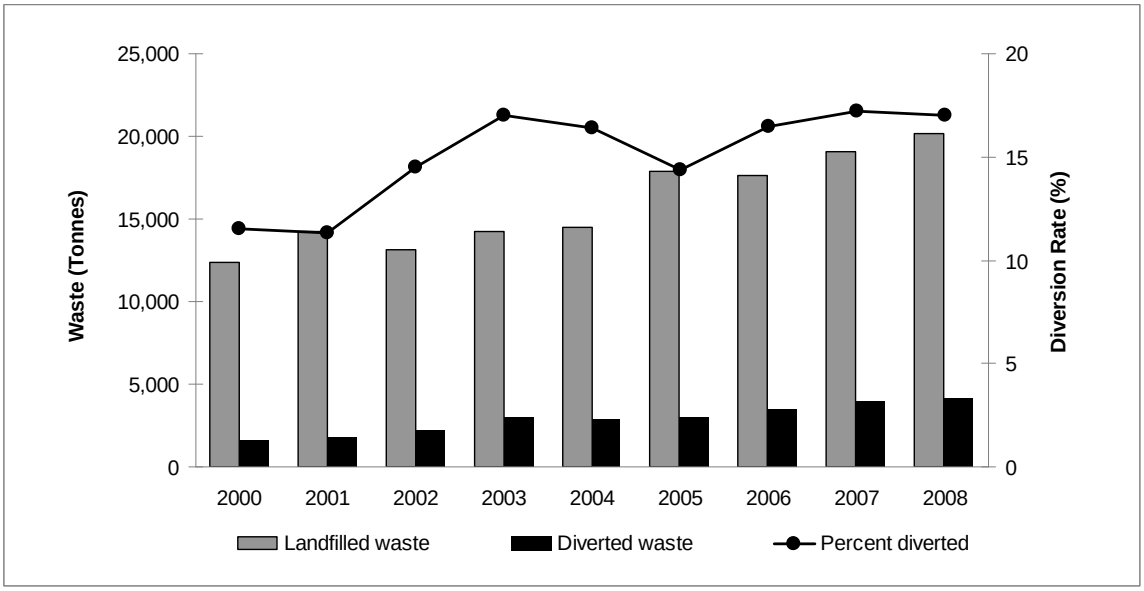


Figure 4.3.3 Total waste landfilled and diverted in Whitehorse, 2000-2008. Landfilled waste includes domestic, institutional/commercial/industrial, construction and demolition wastes. Diverted waste includes composting, recycling and 7-year average for scrap metal removed from the landfill.



What is happening?

- The overall diversion rate in Whitehorse remained stable at 17 per cent. This does not include hazardous waste diverted through household hazardous waste collection days and the Yukon government's commercial hazardous waste program.
- Families with curbside compostable collection diverted 39 per cent of their household waste. More waste may actually be diverted from households since this figure does not include diverted waste that is not measured such as recycling, backyard/worm composting, or the use of garburators.

Why is it happening and why is it significant?

A pilot project that started in June 2007 helped 500 households increase their waste diversion rate to 47 per cent from 30 per cent. Each household received a green cart for compostable materials and a black cart for garbage, along with an information brochure.

Waste disposal can negatively affect the quality of land, air and water, especially when it ends up in landfills and/or is burned. Individuals can mitigate these impacts by reducing, reusing, recycling and composting their waste as much as possible. Waste diversion through recycling and composting creates employment opportunities; recycling also prolongs resource supplies.

Taking action in 2008

Building on the success of the pilot project, the City of Whitehorse began planning for the purchase and distribution of black and green carts to all Whitehorse households. The project was to be funded through the Canada Yukon Gas Tax initiative, and include the replacement of the three existing solid waste collection vehicles.

The City of Whitehorse and the Yukon government held two household hazardous waste collection events in Whitehorse in 2008. The Yukon government continued to offer shipping assistance for commercial hazardous waste disposal.

Data quality

The City of Whitehorse was improving its methods to track waste. The curbside collection data is of high quality. Commercial, construction and domestic wastes are more challenging to allocate to a specific category because they arrive at the landfill co-mingled. Data regarding waste diversion are minimal. Data for the City of Whitehorse do not represent what is happening in Yukon communities. Community solid waste data is not available on a regular, consistent basis.

5. Fish and Wildlife

5.1 Population trends and planning initiatives

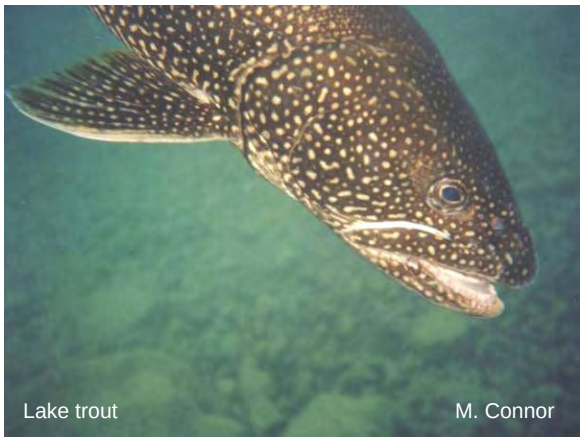
What is the issue?

The health of fish and wildlife populations is important for healthy ecosystems and the well-being of the people who rely on them. Planning processes find long-term and cooperative solutions that ensure healthy fish and wildlife populations.

What are the indicators?

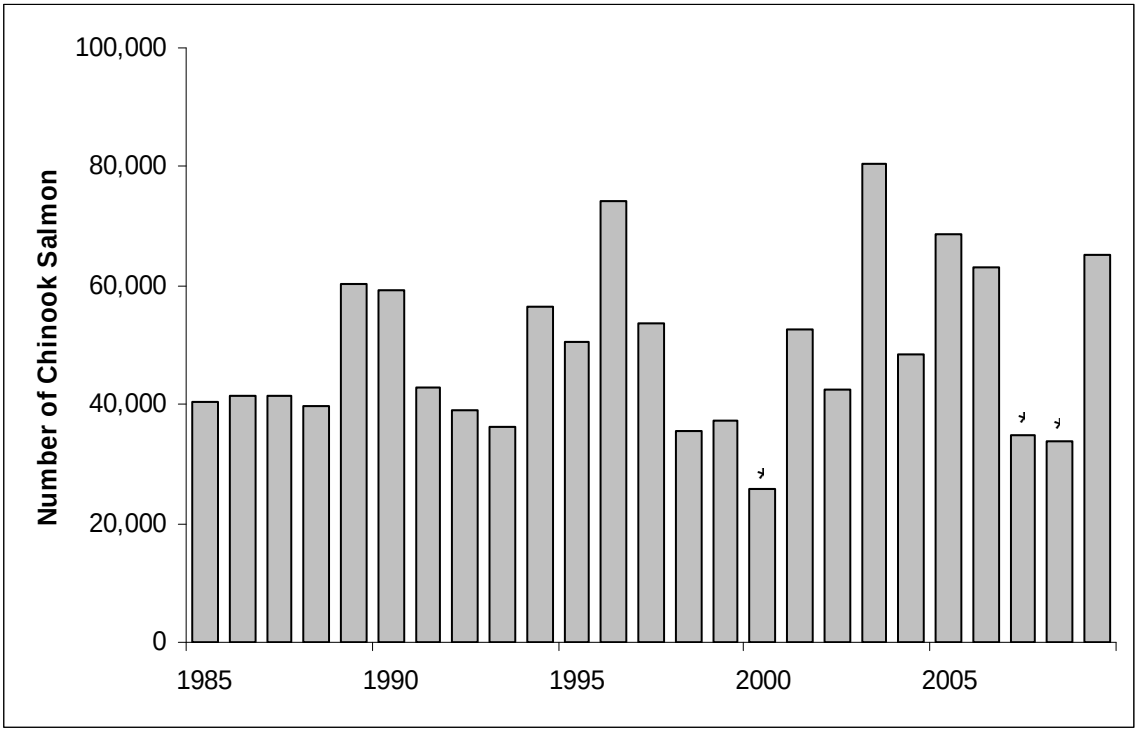
Trends for select species and the development of plans to manage fish and wildlife populations:

- Returns of spawning Chinook salmon in the Canadian portion of the upper Yukon River drainage (Figure 5.1.1);
- Status of lake trout fisheries in Yukon (Figure 5.1.2);
- Status of caribou herds in Yukon (Figure 5.1.3); and
- Status of community-based wildlife plans and species plans (Table 5.1.1).



Lake trout M. Connor

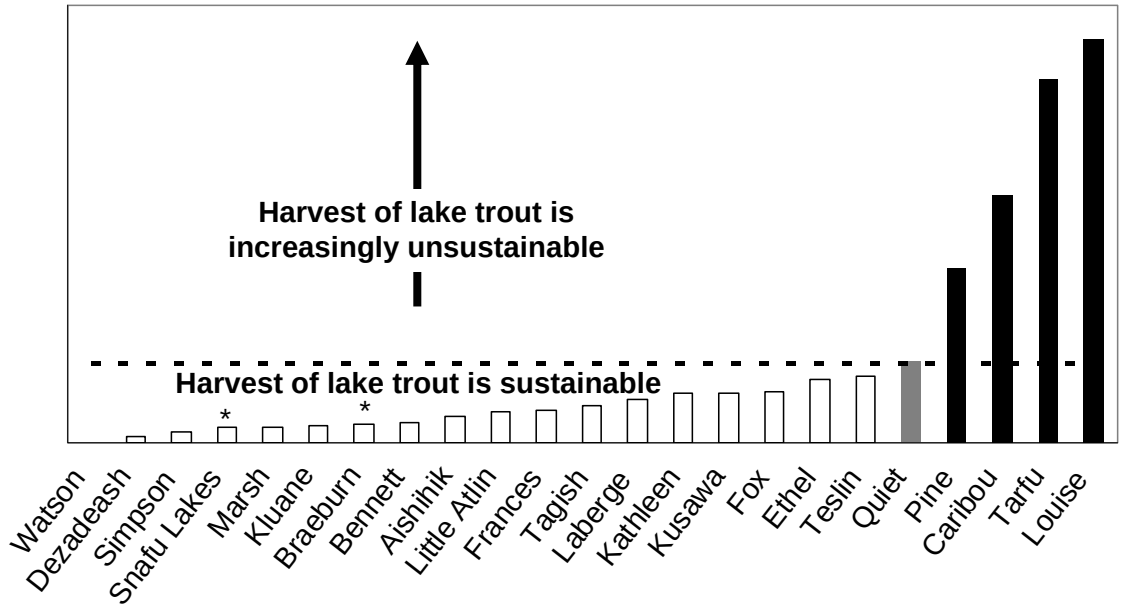
Figure 5.1.1 Returns of spawning Chinook salmon in the Canadian portion of the upper Yukon River drainage, excluding the Porcupine River drainage, 1985-2009



Source: Fisheries and Oceans Canada

Note: (*) Conservation targets for returning spawning salmon were not met in 2000, 2007, and 2008.

Figure 5.1.2 Sustainability of angler harvest on select Yukon lake trout populations based on angler harvest data



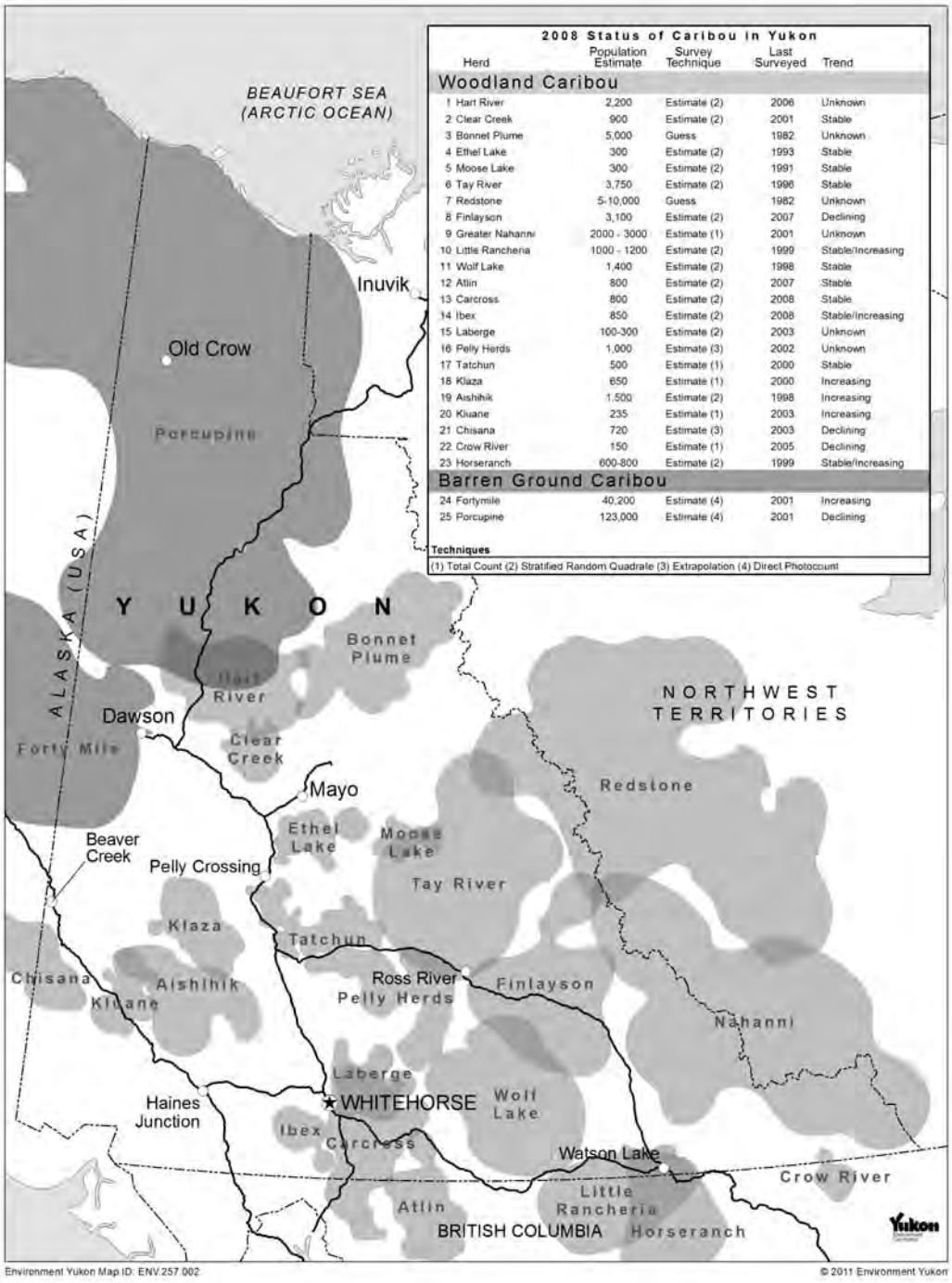
Source: Environment Yukon, Status of Yukon Fisheries, 2010

Note 1: Harvest is considered to be unsustainable when it exceeds the optimal sustainable yield, which is derived from a model based on physical and chemical parameters of the lake such as temperature and nutrient content.

Note 2: (*) Harvest may appear to be sustainable, when in fact a lake trout population are depressed (Snafu and Braeburn Lakes). Harvest data are available for these lakes because they are where the most intensive fisheries take place. Fisheries on other lakes are expected to be, in most cases, within sustainable levels.


Surveying harvested lake trout

Figure 5.1.3 Status and ranges of caribou in Yukon, 2008



2008 Status of Caribou in Yukon

Herd	Population Estimate	Survey Technique	Last Surveyed	Trend
Woodland Caribou				
1 Hart River	2,200	Estimate (2)	2006	Unknown
2 Clear Creek	900	Estimate (2)	2001	Stable
3 Bonnet Plume	5,000	Guess	1982	Unknown
4 Ethel Lake	300	Estimate (2)	1993	Stable
5 Moose Lake	300	Estimate (2)	1991	Stable
6 Tay River	3,750	Estimate (2)	1998	Stable
7 Redstone	5-10,000	Guess	1982	Unknown
8 Finlayson	3,100	Estimate (2)	2007	Declining
9 Greater Nahanni	2000 - 3000	Estimate (1)	2001	Unknown
10 Little Rancheria	1000 - 1200	Estimate (2)	1999	Stable/Increasing
11 Wolf Lake	1,400	Estimate (2)	1998	Stable
12 Atlin	800	Estimate (2)	2007	Stable
13 Carcross	800	Estimate (2)	2008	Stable
14 Ibex	850	Estimate (2)	2008	Stable/Increasing
15 Laberge	100-300	Estimate (2)	2003	Unknown
16 Pelly Herds	1,000	Estimate (3)	2002	Unknown
17 Tatchun	500	Estimate (1)	2000	Stable
18 Klaza	650	Estimate (1)	2000	Increasing
19 Aishihik	1,500	Estimate (2)	1998	Increasing
20 Kluane	235	Estimate (1)	2003	Increasing
21 Chisana	720	Estimate (3)	2003	Declining
22 Crow River	150	Estimate (1)	2005	Declining
23 Horseranch	600-800	Estimate (2)	1999	Stable/Increasing
Barren Ground Caribou				
24 Fortymile	40,200	Estimate (4)	2001	Increasing
25 Porcupine	123,000	Estimate (4)	2001	Declining

Techniques
(1) Total Count (2) Stratified Random Quadrate (3) Extrapolation (4) Direct Photocount

Source: Environment Yukon

Table 5.1.1 Status of community-based wildlife plans and species plans in 2008

Plan	Approved	Status
Community-based fish and wildlife work plans		
Champagne and Aishihik Traditional Territory	No	Under development
Dezadeash Lake	No	Under development
Little Salmon/Carmacks Traditional Territory	2004	Current
Na-Cho Nyäk Dun Traditional Territory Community Based Fish and Wildlife Work Plan	2008	Current
Teslin Tlingit Traditional Territory	No	Under development
Vuntut Gwitchin Traditional Territory	No	Under development
Species Plans		
Baikal Sedge Recovery Strategy	No	Under development
Management Plan for Elk in Yukon	1998	Current
Mandanna Lake	No	Under development
Northern Mountain Caribou Management Plan	No	Under development
Management Plan for Dall's Sheep In the Northern Richardson Mountains	No	Draft recommended plan
North Slope Muskox Management Plan	No	Under development
Porcupine Caribou Harvest Management Plan	No	Under development
Southern Lakes Caribou Recovery Program	1992	Current
Wolf Conservation and Management Plan	1992	Current
Wood Bison Management Plan	No	Under development

Source: Updates from Environment Yukon.

What is happening and why is it happening?

- In 2008, approximately 33,630 Chinook salmon returned to spawn in the Canadian portion of the upper Yukon River drainage (Figure 5.1.1). The salmon run was low and did not meet the conservation target of 45,000. Harvest restrictions (both voluntary and enforced) caused serious hardships for commercial and traditional harvesters in both Alaska and Yukon. Conservation targets were also not met in 2000 and 2007. Salmon returns vary considerably due to a suite of factors which include the strength of returning age classes and fishing pressure, as well as environmental variables such as climatic events (Pacific decadal oscillation, El Niño, La Niña), predation, water levels and temperature, and disease loads.
- The majority of lake trout harvest in Yukon was sustainable; most water bodies were expected to continue to maintain quality fisheries (Figure 5.1.2). Only four lakes had a harvest that exceeded the sustainable limits: Pine, Caribou, Tarfu, and Louise lakes. Teslin, Quiet, and Ethel were nearing the point where harvest becomes unsustainable, however.

Generally small lakes are more vulnerable to overharvesting because of their smaller lake trout populations and lower sustainable yields.

- Of the 24 caribou herds in Yukon (Figure 5.1.3), four were increasing, 11 were considered relatively stable, five were unknown and four were declining. The declines in Yukon and other herds across the circumpolar north may be due to environmental changes, natural population cycles, and human influences such as harvest and development.

Six community-based fish and wildlife plans and species plans were current and nine other planning processes were underway (Table 5.1.1). Requests for fish, wildlife and habitat plans continued to grow because the process is an effective way for participants plan management together. Many of these plans recognize that science, local, and traditional knowledge must all be considered when managing fish and wildlife.

Why is it significant?

Chinook salmon are an important part of the ecosystem, providing a key food source for bears, eagles and other predators, as well as bringing nutrients from the ocean to freshwater and terrestrial ecosystems. Salmon are important culturally, socially, and economically in Yukon. This was recognized in 2001, when Canada and the United States ratified the Yukon River Salmon Agreement to help rebuild and conserve stocks. The conservation targets for spawning salmon were not met in 2007 and 2008 however.

Lake trout are considered an indicator species due to their slow growth, position at the top of the aquatic food chain, reliance on healthy and clean habitats, and high value in Yukon fisheries. If lake trout populations are healthy, then this is indicative of the general health of the entire aquatic ecosystem. The status of lake trout fisheries informs decisions by fishery managers made to maintain sustainable fisheries.

Caribou are important ecologically and culturally. Many people also rely on caribou for subsistence and spiritual well-being. Caribou herds that cross jurisdictional boundaries require a coordinated approach to their management, e.g. Porcupine caribou herd.

Taking action in 2008

Salmon fishery managers implemented very conservative management measures in 2008. They closed commercial fishing in both countries. In the United States, they reduced sport fishing bag limits and reduced fishing time in the subsistence fisheries, and allowed only small mesh gillnets in some districts. In Canada, sport fishing was closed and First Nations voluntarily reduced their harvest by more than 50 per cent. The Yukon River Panel established by the Yukon River Salmon Agreement recommended spawning goals and allocated funding to program proposals submitted to the $1.2 million Yukon River Salmon Restoration fund.

Environment Yukon surveyed key fisheries through angler harvest studies (Teslin and Pine lakes) and fish population assessments (Chadburn, Crag, Morley, and Schwatka lakes).

Caribou were continually monitored by Environment Yukon in order assess overall status and trends. The Porcupine Caribou Management Board undertook an extensive community engagement tour in September and October to help it develop a harvest management plan for the Canadian portion of the herd's range. A management plan for the northern mountain caribou was also being developed under the federal Species at Risk Act (see species at risk, section 5.3).

Increasing industrial development in the Greater Nahanni ecosystem raised concerns about the impacts of human activities on the area's caribou population. (Caribou in this region are accessible via the Nahanni Range Road.) The Yukon and Northwest Territories governments and Parks Canada began a multi-year inventory of the herd in fall 2008, fitting fitted 30 adult female caribou with satellite radio-collars. These will help monitor movement patterns and herd composition, and estimate the herd's size. Managers will use these results to ensure a sustainable harvest and to provide recommendations for mitigating potential impacts of development.

Data Quality

Data are standardized by the agencies collecting the information. Estimates of returning spawning salmon are based on aerial survey counts (1985-2002), radio tagging studies (2002-2004), and Eagle sonar estimates (2005-2009). The methods used prior to Eagle sonar underestimated returning salmon and therefore salmon returns were corrected to remove the bias.

Caribou herd ranges were based on information current to 2008 and were calculated using 95 per cent kernel estimates from radio collared cow caribou.

5.2 Contaminants

What is the issue?

Contaminants such as heavy metals, persistent organic pollutants and radionuclides can persist in the environment. Contaminants concentrated along the food chain may have serious health implications for wildlife as well as people – especially those who depend on traditional foods. Many contaminants found in the north were never used in the region or have been banned or restricted for many years. Transported here by wind and water, they tend to settle out in colder climates.

What are the indicators?

- Mercury levels in Yukon caribou.

  Mercury levels have been measured in Yukon caribou since 1994 which has allowed a thorough analysis of changes in mercury over time.

- Persistent organic pollutants and mercury concentrations in lake trout (Figure 5.2.1).

  Between 1993 and 2008, a study examined mercury and organochlorine concentrations in lake trout from Lake Laberge and Kusawa Lake.

- Cadmium levels in Yukon caribou and moose.

  Through the volunteer hunter survey program, the Yukon Contaminants Committee, Environment Yukon, and Northern Contaminants Program annually collect liver, kidney and muscle samples from moose and caribou for contaminant analysis.

What is happening?

- Caribou meat remained a healthy food choice because mercury levels are very low. Mercury concentrations appeared to be increasing in female Porcupine caribou, although this may be part of a cycle and not a true increase in mercury levels. Female Porcupine caribou tended to have higher levels of mercury than males.

- There was a decrease in 2008 of mercury found in trout from both Lake Laberge and Kusawa Lake from 2007 levels (Figure 5.2.1). Mercury and some organochlorine concentrations have varied over the years; more years of sampling are needed to better understand this pattern. The recommended guideline of 0.50 μg/g for mercury in fish to be sold commercially was exceeded by Lake Laberge fish from 2003 to 2007 and by Kusawa fish in 2006.

- There were considerable yearly changes in polybrominated diphenyl ether concentrations in lake trout from Lake Laberge and Kusawa Lake but no clear trend from either lake between 1993 and 2008. Fluorinated compounds were measured in trout from 2006 to 2008.

- Caribou and moose meat remained a healthy food choice because cadmium levels were low. Over the last 15 years, cadmium levels did not appear to be changing. Cadmium concentrates in the liver and kidneys; it is recommended that people restrict their intake of both organs. Yukon moose tend to have higher cadmium levels than barren-ground caribou. Cadmium levels are more variable in woodland caribou due to diet. Modern woodland caribou (Aishihik and Southern Lakes herds) actually have lower cadmium levels than fossilized teeth of caribou from the same areas, supporting the theory that cadmium is naturally occurring and stable over time.

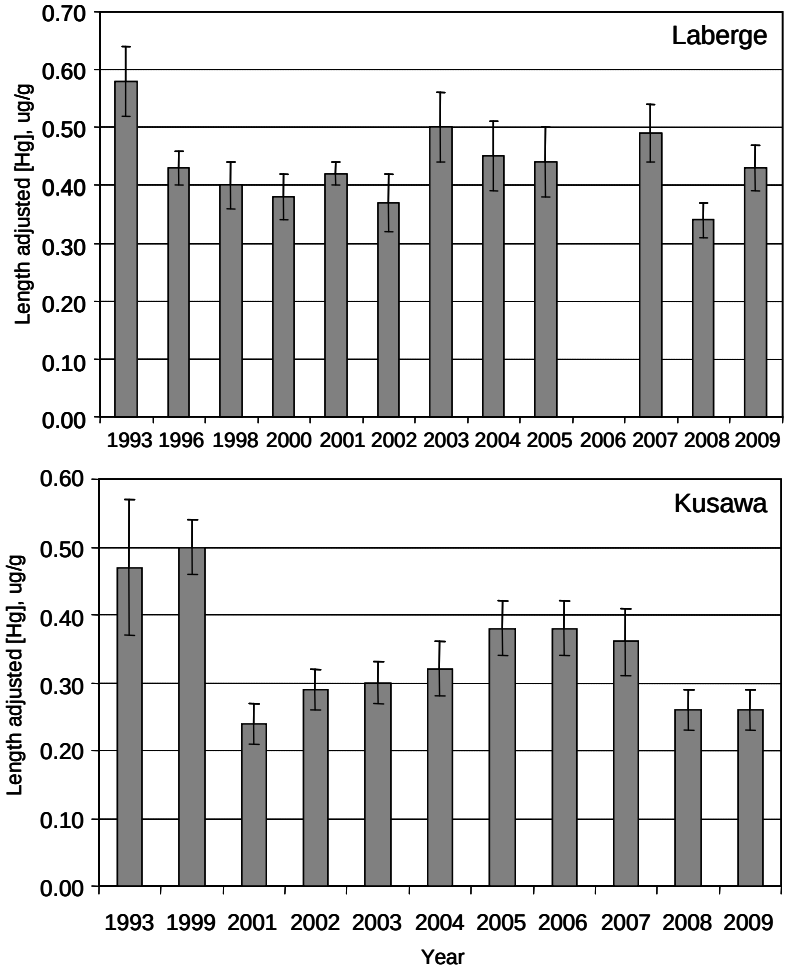
Why is it happening?

Caribou feed on lichen that can directly absorb airborne contaminants, such as mercury. The changes over time may reflect changes in mercury levels or changes in the environment (e.g. temperature, precipitation and wind) that affect how the mercury moves from the air to caribou forage. Female caribou have higher concentrations of mercury than males because they are smaller and eat proportionally more food.

Changes in the biology of fish and their habitat can influence persistent organic pollutant patterns. Long-range atmospheric deposition levels of contaminants affect the availability of these contaminants to fish. Concentrations of some organochlorines seem to have decreased in the atmosphere in the North while mercury concentrations appear to be relatively stable, at least in the far North. While most organochlorines are human-made, the mercury that makes its way into fish comes from a combination of naturally occurring sources and industrial activity.

Cadmium is present in Yukon’s underlying geology, especially in the southeast region. The relatively high concentrations found in moose and woodland caribou are more likely the result of local sources rather than long range transport. Moose feed primarily on willows, which are hyperaccumulators of cadmium from the soil. Lichen, in contrast, has no root system to allow the absorption of local cadmium through the soil. Woodland caribou feed on a combination of willows and lichen. Barren-ground caribou feed almost exclusively on lichen during the winter months, so their cadmium levels tend to be lower.

Figure 5.2.1 Mercury levels (Hg) in lake trout from Lake Laberge and Kusawa Lake, 1993-2009



Source: Northern Contaminants Program Synopsis of Research, 2009/2010.
Note: The recommended guideline for commercial sale for mercury levels is 0.50µg/g.

Why is it significant?

The concentration of mercury in caribou meat – an important food source for many Yukon people – was very low. However, the apparent increase in mercury in caribou over time is of concern particularly as female caribou seemed to be more sensitive to environmental mercury. Mercury levels continued to be studied in the Porcupine caribou herd and other barren-ground herds across the Arctic.

Organochlorines and mercury are found in fish across the Arctic (as well as southern areas). While organochlorines were not at levels thought to cause health concerns, average mercury concentrations in lake trout in both Lake Laberge and Kusawa Lake were just below recommended ,limit of 0.50µg/*g* for the commercial sale of fish.

Yukon fish are a very healthy food choice even though both fish caught in Yukon and store-bought fish may contain small amounts of mercury. In some circumstances, certain people may have to limit their intake to avoid adverse health effects. For more information contact the Yukon department of Health and Social Services.

Because the high levels of cadmium in Yukon moose and caribou are likely coming from naturally occurring sources, the only course of action is to be aware of the issue as a potential health concern. The Northern Contaminants Committee recommends consuming one moose liver or kidney per year, and 7 to 32 caribou kidneys or 4 to 16 caribou livers depending on the herd.

Taking action in 2008

The federal Northern Contaminants Program guided and funded contaminants research and monitoring in the Canadian Arctic. The program supported a wide range of contaminant studies and was committed to monitoring contaminants in the Porcupine Caribou Herd, and lake trout in Lake Laberge and Kusawa Lake on an annual basis, as well as moose and one Yukon woodland caribou herd every five years.


S. Gottermann

5.3 Species at Risk

What is the issue?

Species around the world are going extinct at an alarming rate and many more species are at risk, including some that live in Yukon. A variety of mechanisms at local, regional, national and global levels could be used to recover species at risk and reduce extinction risks. For example, a species that is locally healthy, but globally at risk would require coordinated efforts across borders to recover its numbers and maintain biodiversity.

What are the indicators?

- The number of species at risk in Yukon (Table 5.3.1)

  The Yukon Conservation Data Centre ranks conservation status of species in Yukon that incorporates global, national and territorial status ranks.

Table 5.3.1 National species at risk that occur in Yukon 2008

Taxonomic Group	Common Name / Population	COSEWIC Status	Recovery Strategy or Management Plan
Amphibians	Western Toad	Special Concern	No
Birds	Canada Warbler	Threatened	No
	Common Nighthawk	Threatened	No
	Peregrine Falcon	Special Concern	In progress
	Rusty Blackbird	Special Concern	No
	Short-eared Owl	Special Concern	No
	Olive-sided Flycatcher	Threatened	No
	Red Knot (*roselaari* type)	Threatened	
Fish	Bering Cisco	Special Concern	No
	Squanga Whitefish	Special Concern	No
Mammals	Wood Bison	Threatened	In progress
	Bowhead Whale (Western Arctic Ocean)	Special Concern	Yes
	Grizzly Bear (Northwestern population)	Special Concern	No
	Polar Bear	Special Concern	No
	Wolverine (Western population)	Special Concern	No
	Woodland Caribou (Northern Mountain population)	Special Concern	In progress
Plants	Baikal Sedge	Threatened	In progress

Source: Committee on the Status of Endangered Wildlife in Canada,.

What is happening?

- The federal *Species at Risk Act* came into effect in 2002. Under this Act, species at risk can be listed as being of Special Concern, Threatened, Endangered, Extirpated or Extinct. The federal Cabinet makes the final decision on whether a species is designated pursuant to the *Species at Risk Act* and the steps to be taken to help it recover.
- In 2008, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) had identified 564 species at risk: 234 Endangered, 143 Threatened, 152 Special Concern, 22 Extirpated, and 13 Extinct species.
- In 2008, Yukon had the second lowest number of species at risk, behind Prince Edward Island. Northwest Territories has almost twice as many species at risk as Yukon. However, COSEWIC had yet to assess many of Yukon's rare, and possibly at-risk, species of plants and insects.
- Recovery and management plans were being developed nationally for three species found in Yukon: wood bison, Northern mountain caribou, and Baikal sedge.
- The Yukon government signed the national *Accord for the Protection of Species at Risk* in 1998 which committed it to enact legislation for the protection of species at risk.

Collared wood bison

Why is it happening?

Habitat loss is the major reason many species are at risk. Other factors are genetic and reproductive isolation, environmental contamination, overharvesting, climate change, disease and the presence of invasive species.

Different tools are required at territorial, national and international levels for the effective protection of species at risk,

Why is it significant?

Canada committed along with other countries to achieve a significant reduction of the current rate of biodiversity loss at the global and national level as a contribution to poverty alleviation and to the benefit of all life on earth by 2010, the International Year of Biodiversity.

Taking action in 2008

The Yukon government began a consultation process to develop a stand-alone Yukon *Species at Risk Act*. Territorial legislation would give the Yukon government significant input into how species would be listed and managed within the territory. It would also ensure that traditional and local knowledge play a role in these processes. The government recognized that recovery plans and management strategies should clearly reflect the realities of Yukon's environment and the values of Yukon people. Across the country, species specialists and community members are working hard to protect species at risk.

The Yukon government worked in coordination with different levels of governments and organizations under land claims agreements to manage species at risk. Tracking the status of these species was a challenge, given the large geographic area and a lack of information for most species.

Environment Yukon hired a Biodiversity Information Specialist to support the Yukon Conservation Data Centre. The centre tracks and reports on the status of rare species and ecological communities in Yukon and serves as a central source for all rare species data for the territory.

The first Yukon invasive species workshop was held in Whitehorse in October. Representatives from organizations from throughout Yukon, Alaska, British Columbia, Washington, Ontario, and Manitoba participated in the two-day workshop. They explored ways to improve communication and coordination of invasive species management in Yukon and surrounding jurisdictions.

5.4 Interesting Story

Managing elk in Yukon

Elk came to North America via the Beringian land bridge more than 10,000 years ago. Prior to European settlement, up to 10 million elk roamed across North America but by the turn of the century their range was confined to west of the Rocky Mountains. To restore this species to its original range, several populations have been reintroduced over the years throughout North America.

Elk found in southeast Yukon came here naturally by migrating from the south.

Elk in southwest Yukon were introduced by humans in order to provide new hunting opportunities and alleviate hunting pressure on other big game. Animals from Elk Island National Park were released in 1951, 1954, and 1989-1994 and today form the Takhini Valley and Braeburn herds.

In 2008, the *Management Plan for Elk in Yukon* was released, following several years of public consultation and review by the Yukon Fish and Wildlife Management Board The plan set five goals:

1. Ensure healthy populations of free-ranging elk, including maintaining stable populations with genetic integrity that are free of diseases and parasites.
2. Manage habitat wisely, including defining and managing core range and key habitats.
3. Understand the effect of elk on the land, including investigating the effects of elk on their range and other species.
4. Provide for greater human use and appreciation, including viewing opportunities and limited hunting opportunities and promoting great public knowledge.
5. Address human concerns, including reducing risks of vehicle collisions, increase public safety, and minimize land-use conflicts between elk and agriculturalists.

Elk were also removed from the list of specially protected wildlife under the *Wildlife Act* in 2008 in anticipation of a permit hunt being established in the next few years.

Conclusion

The State of Environment Report fulfills an important requirement of the *Environment Act*. Environment Yukon is hopeful this report will help Yukoners better understand what is happening with the environment and to engage in discussions about what government is doing well and where improvements may be needed.

Yukon has a rich and diverse natural environment. Good information about the current health of our environment allows the government to plan for the future with a clear idea of where we are coming from. We have the benefit as well of being able to learn from the experiences of others. Ensuring we are headed in a sustainable direction underlines all our planning processes.

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Chapter 1 Climate Change

1.1 Greenhouse Gas Emissions

Specific:

Tables 1.1.1 and 1.1.2 and Figure 1.1.1: Source: Environment Canada, Greenhouse Gas Division. *National Inventory Report 1990–2008. Greenhouse Gas Sources and Sinks for Canada*. 2010. <www.ec.gc.ca/Publications/>

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2.1 Air Quality

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Figure 2.1.2 Environment Canada National Air Pollution Surveillance Program Network <www.ec.gc.ca/rnspa-naps/> , and National Air Pollution Surveillance Station data from Whitehorse Standards and Approvals, Environmental Programs branch, Environment Yukon., British Columbia Environment, and Metro Vancouver.

Figure 2.1.3 Source: Government of Yukon, Yukon Wildland Fire Management, Department of Community Services <www.community.gov.yk.ca/firemanagement>

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Tables 3.1.2 and 3.1.3 Sources: Environment Canada and Water Resources Branch, Environment Yukon, Government of Yukon.

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Chapter 4 Land

4.1 Land Use and Resource Management Planning

Specific:

Figure 4.1.1 and Tables 4.1.1, 4.1.2, 4.1.3 Sources:

Regional Land Use Plans— Yukon Land Use Planning Council <www.planyukon.ca>

Official Community Plans and Local Area Plans/Area Zoning Regulations—update provided by Community Affairs, Community Development branch, Department of Community Services.

Forestry Management Plans—update provided by Forest Planning and Development, Department of Energy Mines and Resources.

Protected Area and Other plans—data provided by Yukon Parks Branch and Fish and Wildlife Branch, Environment Yukon.
<www.environmentyukon.gov.yk.ca/parksconservation/parks.php>

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4.3 Solid Waste Management

Specific:

Figures 4.3.1, 4.3.2, and 4.3.3 Sources: Data provided by Engineering & Environmental Services, City of Whitehorse.

General:

Engineering & Environmental Services, City of Whitehorse <www.city.whitehorse.yk.ca>

Raven Recycling, Education Department <www.ravenrecycling.org>

Chapter 5 Fish and Wildlife

5.1 Population Trends and Planning Initiatives

Specific:

Figure 5.1.1 Source: Data provided by Fisheries and Oceans Canada, Pacific Region.

Figure 5.1.2 Source: Environment Yukon. *Status of Yukon Fisheries 2010: An overview of the state of Yukon fisheries and the health of fish stocks, with special reference to fisheries management programs*. Yukon Fish and Wildlife Branch Report MR-10-01. 2010. <www.environmentyukon.gov.yk.ca/mapspublications/documents/status_yukon_fisheries2010.pdf>

Figure 5.1.3 Source: Data Provided by Environment Yukon, Fish and Wildlife Branch.

Figure 5.1.4 Source: Fish, wildlife, and habitat plans update provided by Fish & Wildlife branch, Environment Yukon.

General:

CircumArctic Rangifer Monitoring and Assessment Network (CARMA). <www.carmanetwork.com>

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Porcupine Caribou Management Board. <www.taiga.net/pcmb>

Yukon River Panel. <yukonriverpanel.com/salmon>

5.2 Contaminants

Specific:

Figure 5.2.1 Source: Stern, G. *Trace metals and organohalogen contaminants in fish from selected Yukon lakes.* In Synopsis of research conducted under the 2009-2010 Northern

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Fish and Wildlife Branch, Environment Yukon.
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5.3 Species at Risk

Specific:

Table 5.3.1 Source: Committee on the Status of Endangered Wildlife in Canada <www.cosewic.gc.ca> and Biodiversity Programs, Fish and Wildlife Branch, Environment Yukon

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Fish and Wildlife Branch, Environment Yukon.
<www.environmentyukon.gov.yk.ca/wildlifebiodiversity>

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