

Yukon State of the Environment Interim Report

Environmental Indicators for 2006

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Interim Report

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Introduction

Why produce an interim State of the Environment Report for Yukon?

Interim state of the environment reporting is a requirement of Yukon's *Environment Act*. The interim report's purpose is to provide an early warning and analysis of potential problems for the environment, to allow the public to monitor progress toward the achievement of the objectives of the *Environment Act* and to provide baseline information for environmental planning, assessment and regulation. The focus of this interim report is to provide an update on climate change, air, water, land and nature.

Environment Act Interim Report

50. (1) *Commencing from the date of the first Yukon State of the Environment Report, for every period of twelve consecutive months in which a Yukon State of the Environment Report is not made, the Minister shall prepare an interim report 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.

This interim SOE Report answers five basic questions:

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

Indicators are used to evaluate and demonstrate whether environmental changes are positive or negative.

What is an indicator?

Indicators are key measurements used to monitor, describe and interpret change. Indicators cannot provide all information on a particular topic, but can give key information that shows how things in the environment are doing. The indicators featured here are based on key criteria including data availability, data reliability, usefulness and ease of understanding.

How was this report developed?

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

Highlights

Climate Change

Yukon has consistently produced fewer greenhouse gas emissions (GHGs) per capita than Canada. Transportation is our leading source of emissions. Climate change impacts are being observed in Yukon. In 2006, the Yukon government released its *Climate Change Strategy*.

Air

National Pollution Surveillance (NAPS) data for Whitehorse in 2006 is not available due to technical problems in accessing the data for the first three quarters of 2006. The remaining 2006 data set is not statistically useable and there is no alternate source of data for 2006.

Water

Samples taken from two river systems continue to be ranked as ‘excellent’ or ‘good.’ The Yukon government and Environment Canada added four sites to the Canada Yukon Water Quality Monitoring Network, and they started sampling in mid-2005. The Yukon government continued to work towards developing its water quality indicator database.

Land

Land Use and Resource Management Planning

The sustainability of resource use and development depends on effective planning for future human activities and environmental protection. The status of seven types of land use and resource management planning in Yukon varies from lapsed to current and active. Regional land use planning is underway in several areas of the Yukon.

Interesting Stories for 2006

Commercial Bear Viewing at Bear Cave Mountain

Habitat Suitability Mapping

City of Whitehorse Solid Waste Management

In 2006, the overall diversion rate in Whitehorse remains at approximately 16 percent. The City of Whitehorse continued its citywide curbside compost collection program, which has a goal to divert at least 50 percent of solid waste from the landfill site. Curbside compostable collection from single family households has stabilized at a 30 percent diversion.

Nature

Contaminants

Mercury concentrations are changing over time in the Porcupine caribou. This may be part of a natural cycle, but it appears that the overall trend is increasing over time. After declining since 1993, organochlorine and mercury concentrations appear to have started rising again in lake trout. After 15 years of testing, the Northern Contaminants Program has concluded that cadmium levels are stable and do not appear to be changing.

Species at Risk

NatureServe Yukon continued their work to collect baseline data to address critical gaps in our knowledge. The Yukon government sought input into amending the *Wildlife Act* to address species at risk.

Ecosystems: Wetlands

Inventory work continued in 2006, and we continued to develop our understanding about the important function wetlands play across the landscape.

Interesting Stories for 2006

Monitoring Black Guillemots at Herschel Island

BIGFOOT littlefoot Conservation Education Game

Yukon Invaders – Invasive Species Brochure

1. Climate Change

1.1 Climate Change Drivers – Greenhouse Gas Emissions

What is the issue?

Climate change is a global issue, presenting challenges all over the world. The Intergovernmental Panel on Climate Change (IPCC), the 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.

According to the *Arctic Climate Impact Assessment (2004)*, many climate change impacts are already being observed in the North, including the Yukon. These impacts include melting permafrost and polar ice, rising sea levels, eroding coastlines, receding glaciers, beetle infestations in our forests, and new species of animals and plants moving into northern areas while other northern native species are declining.

The IPCC believes there is a direct link between the increase of greenhouse gas emissions (GHG) in our atmosphere and global increases in temperatures. For this reason, many jurisdictions are introducing measures to limit their GHG emissions. In 2006, the Yukon government approved and released its *Climate Change Strategy*. This strategy set out a vision and goals for addressing climate change in the territory.

What are the indicators?

The levels of GHG emissions, which include carbon dioxide, methane and nitrous oxide, have been increasing since the Industrial Revolution. Scientists believe this is, in part, a result of human activities such as the burning of fossil fuels.

According to the IPCC, carbon dioxide (CO₂) concentration in the atmosphere was 280 ± 10 parts per million (ppm) for several thousand years prior to the Industrial Revolution. According to Environment Canada, the present atmospheric CO₂ concentration is above 360 ppm. This is the highest level of CO₂ concentration in our atmosphere in the past 420,000 years. These high concentrations are trapping more and more of the energy radiated from the earth which, in turn, is contributing to global temperatures and affecting our climate.

Greenhouse Gas Emissions

The most common GHG in our atmosphere is carbon dioxide (CO₂), which is formed through natural processes and by the burning of fossil fuels. Compared to the rest of the country, Yukon contributes only a small percentage of the total Canadian GHG emissions. Yukon, with a GHG emission total for 2006 of 0.4 Mt (megatonnes), has shown a 27 percent reduction since 1990,

most of which is due to reductions in combustion emissions from electricity and heat generation, the commercial and institutional subsector, and gasoline automobiles.

Table 1.1.1 Trends in GHG Emissions in Yukon, 1990-2006

| | 1990 | 1995 | 2000 | 2005 | 2006 |
|--------------------------|------|------|-------|-------|-------|
| Total GHG Emissions (Mt) | 0.54 | 0.55 | 0.45 | 0.40 | 0.39 |
| Annual Change (%) | NA | 14.7 | -18.6 | -10.6 | -1.0 |
| Growth Since 1990 (%) | NA | 1.7 | -17.2 | -26.0 | -26.7 |

According to Environment Canada's *National Inventory Report 1990-2006: Greenhouse Gas Sources and Sinks in Canada*, Yukon residents each produce approximately 12.6 tonnes of GHGs annually. This is below the national average of 22.1 tonnes. Yukon is now one of the lowest per capita GHG emitters in Canada, behind only Quebec.

What is happening, and why is it happening?

In looking at Yukon GHG emissions by sector (*see Table 1.1.2: Yukon Greenhouse Gas Emissions by Sector*), Environment Canada's statistics show that:

- The cyclical nature of the Yukon's resource economy significantly affects emission levels. Emissions were highest in 1996 and lowest in 2006. There was more activity in Yukon's mining industry in the 1990s than in 2006.
- The transportation sector accounts for the largest share of GHG emissions in Yukon. In this sector, heavy duty diesel vehicles are the largest contributors, and other significant contributors include government, business and personal vehicles.
- Off-road diesel use is a major contributor. This includes activities such as use of heavy mobile equipment in the construction, agriculture and mining sectors, and recreational vehicles such as snowmobiles and all-terrain vehicles (ATVs).
- The electricity sector can be a major contributor to GHG emissions when energy demands are high. When the demand for electricity exceeds Yukon's hydro generation capacity, diesel generators are used to make up the shortfall.
- Since 1990, Yukon has produced fewer GHGs per capita than Canada and reduced GHG emissions from 1990 levels by 26.7 percent.

Canada is ranked among the highest of all countries in the world in terms of per-capita GHG emissions, with 77 percent of the increase of Canada's GHG emissions since 1990 attributed to just two components of Canada's economy: the fossil fuel industries and electricity generation. These two sectors are very emission-intensive when measured by economic activity and their growth therefore has a strong effect on emission trends.

Why is it significant?

A variety of conditions unique to Yukon present a number of challenges in addressing climate change and reducing greenhouse gas emissions.

From a global perspective, Yukon-generated greenhouse gas emissions are very low while the rate and magnitude of temperature change in the region is predicted to be one of the largest. Even if Yukon achieved zero greenhouse gas emissions, the impact on global warming would be minimal. With such limited influence over global emission levels the extent of Yukon's impacts from climate change is controlled by large global emitters.

Although Yukon generates low greenhouse gas emissions in comparison to other jurisdictions, our per capita emission rate is quite high. This is the result of the high energy input required to live long distances from production centres.

Taking action in 2006

The *Government of Yukon Climate Change Strategy* (2006) was released in July 2006. The strategy is specific to internal government operations and outlines how the Yukon government will build on a foundation of experience and expertise in managing climate change. The following goals were outlined in the strategy:

- G1. Enhance awareness and understanding of climate change impacts on Yukon's environment, people and economy.
- G2. Reduce greenhouse gas emissions through efficiency improvements within Yukon government programs in the short term and additional measures related to infrastructure replacement in the longer term.
- G3. Build Yukon environmental, social and economic systems that are able to adapt to climate change impacts and are positioned to take advantage of opportunities presented by climate change.
- G4. Support efforts to establish Yukon as a northern leader for applied climate change research and innovation.

This will be succeeded by a comprehensive and detailed action plan that will outline the specific actions and initiatives that the government will undertake to implement the strategy.

Table 1.1.2 Yukon Greenhouse Gas Emissions by Sector, 1990-2006

| Greenhouse Gas Categories | 1990 | 1995 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|--|------|------|------|------|------|------|------|------|------|
| TOTAL (kt CO₂ eq) | 538 | 547 | 445 | 433 | 444 | 440 | 414 | 398 | 394 |
| ENERGY | 526 | 532 | 430 | 418 | 428 | 424 | 398 | 382 | 377 |
| a. Stationary Combustion Energy | 226 | 248 | 191 | 168 | 169 | 163 | 131 | 126 | 123 |
| Electricity and Heat | 93.6 | 53.3 | 17.0 | 14.6 | 17.2 | 10.7 | 7.99 | 7.53 | 7.81 |
| Fossil Fuel Industries | 2.9 | 91 | 84 | 56 | 48 | 28 | 11 | 29 | 38 |
| Mining & Oil and Gas | 4.12 | 10.3 | 1.54 | 2.09 | 2.90 | 2.11 | 1.73 | 3.08 | 0.53 |
| Manufacturing | 8.01 | 0.47 | - | 0.03 | - | - | - | - | - |
| Construction | 5.46 | 4.45 | 2.40 | 1.64 | 1.58 | 2.65 | 1.95 | 1.07 | 1.06 |
| Commercial / Institutional | 81.9 | 60.8 | 52.9 | 51.2 | 53.1 | 58.5 | 40.0 | 39.8 | 30.4 |
| Residential | 29 | 19 | 33 | 29 | 31 | 41 | 55 | 39 | 39 |
| Agriculture & Forestry | 1.24 | 7.56 | 0.95 | 13.9 | 14.7 | 19.9 | 13.2 | 6.27 | 6.02 |
| b. Transportation Energy | 300 | 280 | 240 | 250 | 250 | 260 | 260 | 250 | 250 |
| Domestic Aviation | 21 | 21 | 23 | 16 | 15 | 20 | 22 | 22 | 27 |
| Road Transportation (total) | 180 | 218 | 162 | 165 | 168 | 164 | 160 | 157 | 144 |
| Light Duty Gas Vehicles | 79.1 | 72.5 | 48.9 | 47.2 | 45.6 | 45.0 | 39.1 | 34.3 | 28.5 |
| Light Duty Gas Trucks | 30.4 | 41.7 | 39.6 | 41.4 | 42.5 | 44.2 | 40.3 | 37.7 | 33.5 |
| Heavy Duty Gas Vehicles | 10.2 | 9.69 | 5.89 | 6.28 | 6.08 | 6.31 | 5.83 | 5.28 | 4.49 |
| Motorcycles | 0.46 | 0.41 | 0.32 | 0.32 | 0.35 | 0.38 | 0.35 | 0.32 | 0.27 |
| Light Duty Diesel Vehicles | 0.55 | 0.51 | 0.35 | 0.34 | 0.33 | 0.34 | 0.32 | 0.28 | 0.24 |
| Light Duty Diesel Trucks | 0.60 | 0.96 | 2.51 | 2.55 | 2.58 | 2.71 | 2.53 | 2.65 | 2.68 |
| Heavy Duty Diesel Vehicles | 57.2 | 88.0 | 63.5 | 65.5 | 69.0 | 63.6 | 69.9 | 75.2 | 72.7 |
| Propane & NG Vehicles | 1.5 | 4.0 | 0.68 | 1.0 | 1.6 | 1.9 | 2.1 | 1.1 | 1.5 |
| Others (total) | 100 | 40 | 50 | 70 | 70 | 70 | 80 | 70 | 80 |
| Off Road Gasoline | 10 | 8 | 10 | 10 | 10 | 10 | 3 | 3 | 2 |
| Off Road Diesel | 90 | 30 | 40 | 60 | 60 | 60 | 80 | 70 | 80 |
| c. Fugitive Sources | - | 3.77 | 2.71 | 2.15 | 5.40 | 3.54 | 2.71 | 2.12 | 1.03 |
| Oil and Natural Gas | - | 3.77 | 2.71 | 2.15 | 5.40 | 3.54 | X | X | X |
| INDUSTRIAL PROCESSES | 1.38 | 2.09 | 0.71 | 0.61 | 0.99 | 0.75 | 0.49 | 0.56 | 0.56 |
| SOLVENT & OTHER PRODUCT USE | 0.18 | 0.22 | 0.24 | 0.21 | 0.16 | 0.21 | 0.20 | 0.17 | 0.31 |
| WASTE | 10 | 12 | 14 | 14 | 14 | 15 | 15 | 16 | 16 |
| a. Solid Waste Disposal on Land | 7.6 | 9.3 | 11 | 11 | 12 | 12 | 12 | 13 | 13 |
| b. Wastewater Handling | 2.9 | 3.2 | 2.9 | 2.8 | 2.8 | 3.0 | 3.1 | 3.1 | 3.1 |

Source: Summary of GHG Emissions for the Yukon: Environment Canada. National Inventory Report 1990–2006. Greenhouse Gas Sources and Sinks for Canada. 2008.

Notes: (1) - : Indicates no emissions. (2) X: Indicates confidential data. (3) kt CO₂ eq: Kilotons of CO₂ equivalent (4) Emission totals in chart may not add up due to rounding protocol.

1.2 Primary Indicators of a Changing Climate

What is the issue?

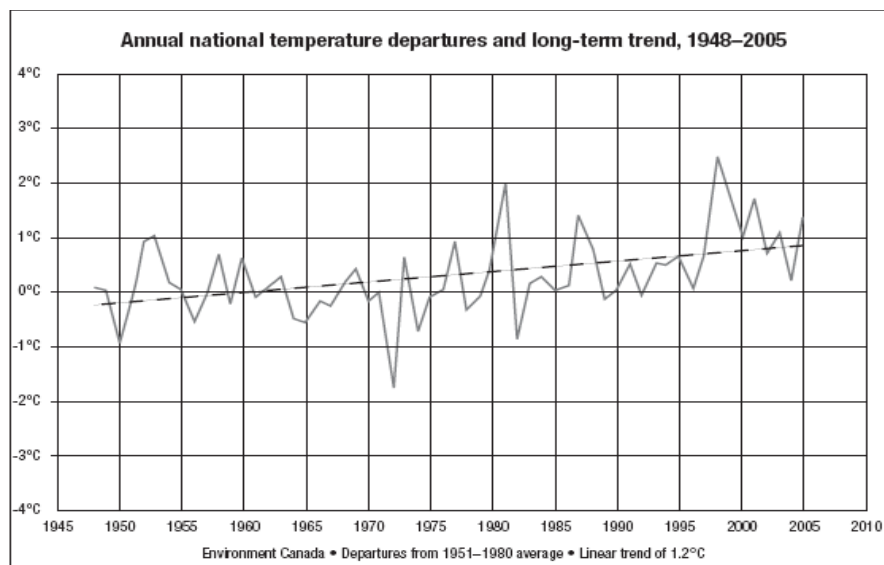
Recent analyses of the impacts of climate change, including the comprehensive *Arctic Climate Impact Assessment Report*, have increased the knowledge base and understanding of climate change in the North. We now know that average temperatures in the Arctic have risen at almost double the global rate in the past few decades and that 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. Levels of precipitation are also expected to increase in Yukon due to climate change, with more precipitation expected in the winter versus the summer.

What are the indicators?

Some indicators of climate change in Yukon include:

- Higher year-round temperatures: winters warming more than summers, with winter warming being greater farther north; summers warming more in the south and central Yukon than in the north, due to the moderating effect of the Beaufort Sea. According to the *Arctic Climate Impacts Assessment*, winter temperatures in Alaska and western Canada (including Yukon) have increased by as much as three to four degrees Celsius between 1950 and 2000.
- More precipitation in the winter, with the change being greater farther north. There will be little change in average summer precipitation levels.
- More and larger storms, both winter storms and heavy summer rainfall events, with more thunder and lightning.

Figure 1.2.1 Annual National Temperature Departures and Long-Term Trends, 1948-2005



(Source: Environment Canada Climate Trends and Variations Bulletin, 2005)

What is happening, and why is it happening?

Climate change impacts are classified as being one of two general types. Biophysical impacts include physical changes to northern landscapes and ecosystems. Socio-economic impacts arise from biophysical impacts and are expected to change how all Yukoners live and work. Some recent examples of impacts experienced in Yukon are listed below.

- Environment Canada reports that Canada's average temperature has risen about one degree Celsius between 1950 and 2000 (see Figure 1.2.1).
- In June 2005, the Yukon set a record for highest precipitation in a single storm. Yukon recorded its first funnel cloud. Storm events, including thunderstorms, are now more frequent.
- Increased temperatures, swings in precipitation and the onset of thunderstorms increase the chances of forest fire. Yukon's 2004 fire season was the largest on record, doubling the previous record.
- The spruce bark beetle is a problem in Yukon, as milder winters and springs allow more of these pests to survive and breed. Over 350,000 hectares (Ha) have been affected by the beetle in the spruce forest of Southwest Yukon.

Why is it significant?

Climate change is a global challenge where all jurisdictions, including Yukon, have an important role to play. The *2004 Arctic Climate Impact Assessment* projected that the rate and magnitude of future temperature change will be greatest in the high latitude regions of the Northern Hemisphere, including the Yukon. Yukoners must use their proven experience in research, public education, energy solution programs and traditional knowledge to work towards taking action on climate change.

Taking action in 2006

The Government of Yukon is strongly committed to reducing local emissions of greenhouse gases, examining the impacts of climate change on northerners, and preparing for the changes to come. The *Government of Yukon Climate Change Strategy (2006)* outlines how the government will build on existing programs, activities and experience to respond to the impacts of climate change. A Climate Change Action Plan is the next step. It will outline the specific actions and initiatives Government of Yukon will undertake to implement the strategy.

The responsibilities for addressing climate change are clearly shared, and there are partnerships with other levels of government and collaboration with NGOs and other interested parties.

- Northern Climate ExChange, a partnership between Government of Canada, Yukon College and Government of Yukon, was established to share information and promote understanding of the challenges and issues around climate change.
- Energy Solutions Centre is a service and program delivery agency for federal and Yukon government programs relating to energy efficiency and renewable energy.
- Yukon Housing is Government of Yukon's leader in providing information on healthy, energy efficient designs and products for houses.

1.3 Examples of Environmental Impacts

What is the issue?

The essential first steps in adapting to climate change are understanding how the climate is changing, how it will likely continue to change in the future, and what impact this will have on key aspects of our environment. This includes impacts on ground conditions, wildlife, vegetation, hydrology, infrastructure, culture, economy and human health. Once these impacts are understood, people will be in a better position to identify what methods can be used to adapt to these changes.

Snapshot of Yukon-based Studies of Interest in 2006

Some of these impacts are already occurring, and government is already involved in initiatives to identify the impacts and determine what can be done to adapt. Current work includes:

- Yukon Geological Survey is monitoring and characterizing terrain hazards associated with permafrost degradation (landslide activity and permafrost subsidence) in south and central Yukon.
- Transportation Engineering branch, department of Highways and Public Works, is experimenting with materials and surfaces that could be used to reduce permafrost degradation of roadways.
- Health and Social Services is monitoring population trends to observe and mitigate changes that may result from climate change, such as increase in insect-borne disease transmission.
- Department of Environment participates in numerous monitoring programs with climate change components including habitats, ecosystems, wetlands, forests, wildlife, hydrology, and rare and threatened species.
- The Forest Science Officer was a contributing author to the Northern Chapter of *National Assessment on Climate Change Impacts and Adaptation*, as well as *Sustainable Forest Management Network Synthesis Report: National Assessment of Climate Change Impacts, Adaptation and the Forest Sector*. They also conducted a survey, as part of a contribution to the national assessment of forest-practitioner perceptions on climate change.

2. Air

2.1 City of Whitehorse Air Quality

What is the issue?

Poor air quality related to emissions from activities like fossil fuel consumption, combined with local climate, geography and specific events such as forest fires, can negatively affect human and environmental health.

What are the indicators?

Fine Particulate Matter (PM_{2.5}), comprised of pollutants in the form of smoke, liquid droplets or dust smaller than 2.5 micrometers in diameter, is a toxic substance that can be inhaled deeply into the lungs. The levels of this pollutant provide a good indicator of air quality. Levels above this standard may cause a health hazard. Specific indicators are:

- Mean Ambient Annual PM_{2.5} levels in the City of Whitehorse.
- Mean monthly and annual PM_{2.5} levels compared with other relevant jurisdictions.
- Number of days per year that PM_{2.5} levels (24-hour average) exceeds the Canada-wide standard of 30 micrograms/m³ (levels above this pose a human health risk).

What is happening?

- Long term air quality trends based on annual PM_{2.5} levels cannot yet be assessed as data collection only began in July 2001.
- National Pollution Surveillance (NAPS) data for Whitehorse in 2006 is not available due to technical problems in accessing the data for the first three quarters of 2006. The remaining 2006 data set is not statistically useable and there is no alternate source of data for 2006.

Why is it happening?

The City of Whitehorse's – and Yukon's air quality as a whole – air quality tends to be good because of its limited industrial emissions and its relatively low population density. Elevated PM_{2.5} levels often occur as a result of wood smoke from woodstoves or forest fires, from backyard burning and barbecues, from improperly burned fuels for heating or vehicles, and from road dust, particularly in the spring.

Why is it significant?

When breathed, fine particulate matter in the air may pose serious risks to human health, especially among the elderly, children and people with chronic respiratory illnesses.

Taking action in 2006

The National Pollution Surveillance (NAPS) program continued in 2006; however, technical problems in accessing data in Whitehorse resulted in there being no PM_{2.5} data for the first nine months.

The NAPS station is located in downtown Whitehorse. As this is the only NAPS station in Yukon, the data it collects may not be representative of air quality Yukon-wide.

Data quality

NAPS data is quality controlled, assured and standardized by Environment Canada. According to national guidelines, three months of data is not adequate for reporting purposes; therefore no air quality data is reported for Whitehorse for 2006.

3. Water

3.1 Water Quality Index

What is the issue?

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

What is the indicator?

The Canadian Water Quality Index (WQI) provides an effective way to compile and communicate important information about the state of water quality, as well as to identify emerging trends. The WQI has been used to evaluate the suitability of the streams to support aquatic life. In the future, other water uses may be examined, such as drinking water.

Similar to the UV index, the WQI reduces technical data about the quality of a water body to a rating on a numerical scale where defined ranges correspond to simple, easy-to-report descriptors, for example, Poor, Good or Excellent.

What is happening?

In 2006 a total of 84 samples were collected from the six Canadian Environmental Sustainability Indicators (CESI) stations in Yukon operated by Environment Canada and Environment Yukon (Table 3.1).

Table 3.1.1 Samples Collected at Yukon CESI Water Quality Stations, 2001-2006

| River | Station | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|----------------------|---------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Dezadeash River | at Haines Junction | 23 | 25 | 26 | 26 | 25 | 27 |
| Liard River | at Upper Crossing | 17 | 19 | 15 | 20 | 16 | 16 |
| Yukon River | upstream of Takhini | | | | | 5 | 9 |
| Yukon River | at Marsh Lake | | | | | 7 | 10 |
| Klondike River | above Bonanza | | | | | 12 | 13 |
| S. McQuesten | Below Flat Creek | | | | | 5 | 9 |
| <i>Total samples</i> | | <i>40</i> | <i>44</i> | <i>41</i> | <i>46</i> | <i>70</i> | <i>84</i> |

Data from the Liard and Dezadeash River stations were used to calculate WQI ratings included in the *Canadian Environmental Sustainability Indicators 2007* report (the other stations will be included in future calculations once the minimum number of samples is obtained). The ratings given under the Water Quality Index for the two sites continue to be 'excellent' or 'good'

(Table 3.2). These two river systems are considered to have had little or no human interference. Environment Canada was unable to collect samples from the Porcupine River between 2004 and 2007.

Table 3.1.2 CESI Water Quality Index Scores for Yukon Stations

| Location | Rating | 2001-2003 | 2002-2004 | 2003-2005 |
|--------------------------------------|--------------------|-----------|-----------|-----------|
| Porcupine River Upstream of Old Crow | Good | 85.6 | n/a | n/a |
| Liard River at Upper Crossing | Excellent/ Good | 100 | 93.6 | 93.6 |
| Dezadeash River at Haines Junction | Good | 89.5 | 83.8 | 84.2 |

Why is it happening?

Water quality naturally varies through 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 is associated with the suspended solids and is not biologically available. Each three-year index score period at each station may have natural variations in water quality which will result in small changes in the index score.

Why is it significant?

The index score for the Dezadeash and Liard rivers are stable, as would be expected in natural systems with little human impact. However, there are Yukon streams with potential human impacts that are now being monitored to give a more balanced view of water quality.

Taking action in 2006

Yukon government and Environment Canada added four sites to the Canada-Yukon Water Quality Monitoring Network, and they started sampling in mid-2005 (Table 3.2). Overall trends and index calculations for these stations will be available after 2008 when three years of data are available. One additional site is planned for Rose Creek near the Anvil Mine in 2008.

Data quality

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

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?

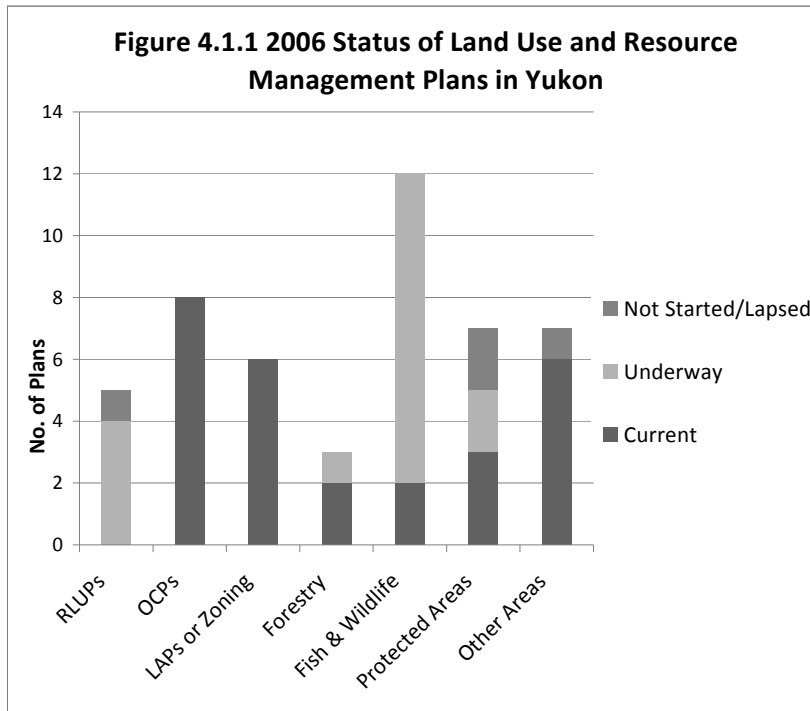
Management plans related to land use, resources and protected areas generally include an inventory of values, resources and interests; a set of goals and objectives; and strategies intended to achieve these objectives. The State of the Environment Report monitors the status of management plans for:

- a) Regional Land Use Plans (RLUPs);
- b) Official Community Plans (OCPs);
- c) Local Area Plans (LAPs) or Area Zoning Regulations;
- d) Forest Resource Management Plans;
- e) Fish and Wildlife Species or Area Plans;
- f) Protected Area Plans; and
- g) Other Areas.

Prior to 2006, the plans were divided into five progress categories. Starting in 2006, these categories are collapsed into three categories:

1. Current – Plan is finalized and in use;
2. Underway – Plan is in development (two prior categories, Preliminary Work and Near Completion, are now included in Underway); and
3. Not started/lapsed – Plan is out of date or awaiting a new planning process.

The status of land use and resource management plans is shown in Figure 4.1.1.



What is happening, and why is it happening?

- Regional Land Use Plans (RLUPs): Two planning commissions are actively planning in Yukon: the North Yukon Planning Commission and the Peel Watershed Planning Commission. This represents 26 percent of the Yukon's area. No regional plans have been completed to date, although the North Yukon regional plan is expected to enter the approval process in 2007. The North Yukon plan will recommend sustainable development thresholds for each of the landscape management units in the planning region. In addition, the Trondëk Hwëch'in have requested the establishment of the Dawson Regional Planning Commission, and the Yukon Land Use Planning Council is currently coordinating the production of Dawson Regional Planning Commission's Terms of Reference. The Teslin regional planning process has been suspended pending formation of the greater Dakh Ka planning region.
- Official Community Plans (OCPs): All eight Yukon municipalities have Official Community Plans, as required under the *Municipal Act*.
- Local Area Plans (LAPs) or Area Zoning Regulations: Residents or governments initiate Community or LAPs, often to address development pressures. The plans can be regulated through zoning regulations pursuant to the *Area Development Act*. Over time, the number of LAPs outside of municipal boundaries is increasing.
- Forest Resource Management Plans: Plans have been completed for the Teslin Tlingit Traditional Territory and the Champagne and Aishihik Traditional Territory. These plans

are considered Chapter 17 plans under Final Agreements and will be recognized as Forest Resource Management Plans under the *Forest Resources Act* in Yukon. The Kaska Forest Resource Stewardship Council has provided a draft Forest Resource Management Plan to the Yukon and Kaska for consideration. A Terms of Reference regarding forest management planning for the Southern Lakes area is being developed with the Carcross/Tagish First Nation to establish a planning team.

- Fish and Wildlife Species or Area Plans: By the end of 2006, seven area or species specific Fish and Wildlife Plans were current, two plans were underway, and two had expired. Fish and Wildlife Plans will likely grow in number as more land claims are settled. They are the most practical way to effectively implement elements of Chapter 16 of Final Agreements, which require management coordination.
- Protected Area Plans: Protected areas include territorial and national parks, most of which were created as Special Management Areas (SMAs) through Final Agreements. Herschel Island Qikiqtaruk Territorial Park was created through the *Inuvialuit Final Agreement (IFA)*. In 2006 there were four plans under development and three management plans were approved. The Herschel Island Qikiqtaruk Territorial Park Management Plan, the Old Crow Flats Special Management Area and the Lútsāw Wetland Habitat Protection Area were all approved in 2006.
- Other Areas: Other areas include Habitat Protection Areas (HPAs) and Canadian Heritage Rivers. CHRs recognize rivers or river segments for their natural, heritage and/or recreational values, however the status does not provide protection. Yukon has four Canadian Heritage Rivers. Kluane Wildlife Sanctuary is Yukon land with a prohibition on non-native hunting. In 2006 draft management plans for Ddhaw Ghro, Nordenskiöld HPAs, and Old Crow Flats SMA were undergoing technical reviews and consultation.

Why is it significant?

The development of long-term plans through responsive public processes is a proactive way to manage competing views about how lands and natural resources within Yukon's regions should be used. Regional planning needs to reflect the traditional knowledge, experience and recommendations of residents as well as science and broad socio-economic and environmental aspects. This ensures that governments and aboriginal authorities authorize uses that are consistent with social, cultural, economic and environmental values, including sustainable development. The role of planning has become all the more important as a result of obligations arising from land claims agreements.

The Yukon is able to complete some of its commitments to conservation area planning.

Table 4.1.1 Total Area and Percentage of Parks and Other Areas in Yukon, 2006

| Area Name | Size | |
|--|------------------------------|-----------------|
| | Area Km ² | % of Yukon |
| Yukon Territorial Parks | | |
| Agay Mene | 725 | 0.150 |
| Asi Keyi | 2 984 | 0.617 |
| Coal River Springs | 16 | 0.003 |
| Herschel Island Qikiqtaruk | 113 | 0.023 |
| Kusawa | 3 082 | 0.637 |
| Ni'inlii Njik (Fishing Branch) Ecological Reserve | 169 | 0.035 |
| Ni'inlii Njik (Fishing Branch) Wilderness Preserve | 5 355 | 1.108 |
| Tombstone | 2 050 | 0.424 |
| Total | 14 494 | 2.997 |
| Yukon Habitat Protection Areas (HPAs) | | |
| Ddhaw Ghro | 1 609 | 0.333 |
| Horseshoe Slough | 77 | 0.016 |
| Nordenskiold Wetlands | 78 | 0.016 |
| Ni'inlii Njik (Fishing Branch) | 978 | 0.202 |
| Lewes Marsh | 20 | 0.004 |
| Łútsäw Wetlands | 32 | 0.007 |
| Old Crow Flats | 3 238 | 0.669 |
| Pickhandle Lake | 51 | 0.011 |
| Tagish Narrows (Six Mile) | 4 | 0.001 |
| Ta'Tla Mun | 33 | 0.007 |
| Total | 6 634 | 1.372 |
| National Parks | | |
| Ivvavik | 9 704 | 2.006 |
| Kluane | 22 155 | 4.581 |
| Vuntut | 4 350 | 0.899 |
| Total | 36 209 | 7.486 |
| National Wildlife Areas | | |
| Nisutlin River Delta | 55 | 0.011 |
| Totals | 57 427 Km² | 11.866 % |

4.2 Interesting Stories for 2006

Commercial Bear Viewing at Bear Cave Mountain

In 2006 the commercial bear viewing operation at Bear Cave Mountain in Ni'iinlii Njik (Fishing Branch) Territorial Park welcomed its first guests.

Ni'iinlii Njik (Fishing Branch) was established through the *Vuntut Gwitchin Final Agreement*, and the park is governed by a joint management plan. The plan includes provisions for a commercial bear viewing operation at the base of Bear Cave Mountain, an ecologically rich area known for congregations of grizzly bears during the fall run of chum salmon. This exceptional wildlife viewing situation has the potential to provide economic benefits to the Yukon and Old Crow. The site affords the unique and safe opportunity to spend time in close proximity to grizzly bears.

A three-year pilot project to test the viability of commercial wildlife viewing began in 2006, and Bear Cave Mountain Eco-Adventures obtained a park use permit and Wilderness Tourism Licence to conduct tours to Ni'iinlii Njik (Fishing Branch) Territorial Park. Bear Cave Mountain Eco-Adventures is a joint venture between the Vuntut Gwitchin Development Corporation and Yukon bear specialist Phil Timpany, with the support of Environment Yukon's Parks Branch.

In preparation of commercial bear viewing, a risk management plan was completed and a monitoring program was initiated. The plan also set out limits on how many people can visit the ecological reserve in the park core. A maximum of one guide and four clients per week are permitted into the area for wildlife viewing purposes. The low numbers help ensure that the ecosystem remains intact while providing quality viewing opportunities.

Habitat Suitability Mapping

In 2005 and 2006, staff from the Habitat section of Environment Yukon developed habitat suitability maps for caribou, moose and marten in the North Yukon planning region. These maps were used to assist the North Yukon Planning Commission in their review of important values and potential in the region.

To develop habitat suitability maps, the region was divided into habitat types based on remote sensing and other GIS-based mapping information. Determining the number of habitat types or classes involved finding a balance between easily recognized types and potential oversimplification.

Suitability rankings were developed by showing experts examples of the different habitat types and asking them to rank the habitat value for a particular species. Experts included elders, biologists and other individuals familiar with the land in the region. This information was used to develop maps showing the relative rankings of habitat types in the North Yukon Planning Region.

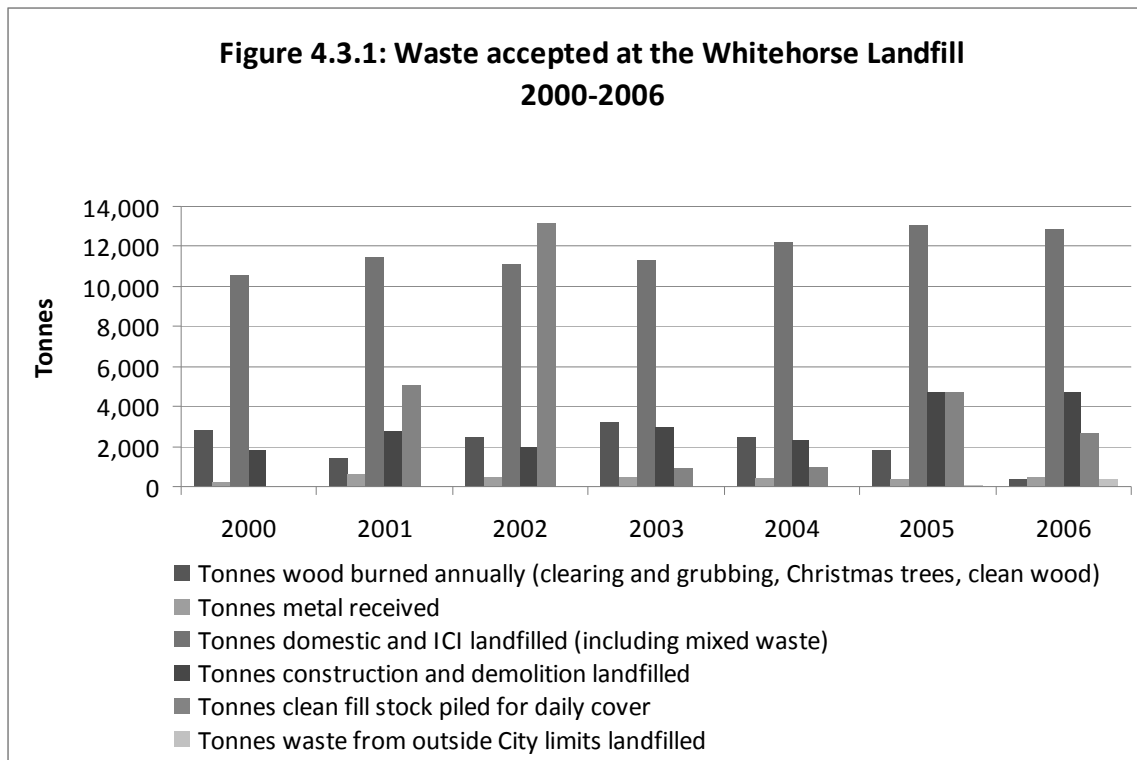
4.3 City of Whitehorse Solid Waste Management

What is the issue?

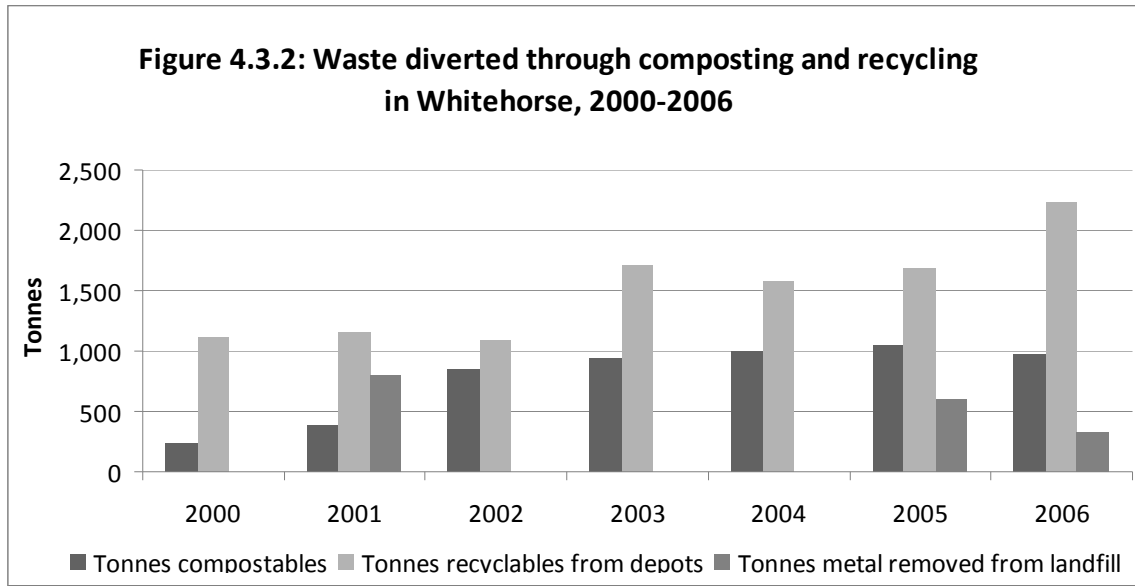
Solid waste produced in Yukon is costly to manage whether it is sent to landfills, diverted through recycling or composting, or shipped outside the territory for treatment. Solid waste disposal to local landfills can also pose environmental and health risks, as well as land use planning challenges. The best way to limit the negative effects of solid waste is to reduce the reliance on landfills by generating less waste and recycling or composting more of the remaining waste stream.

What are the indicators?

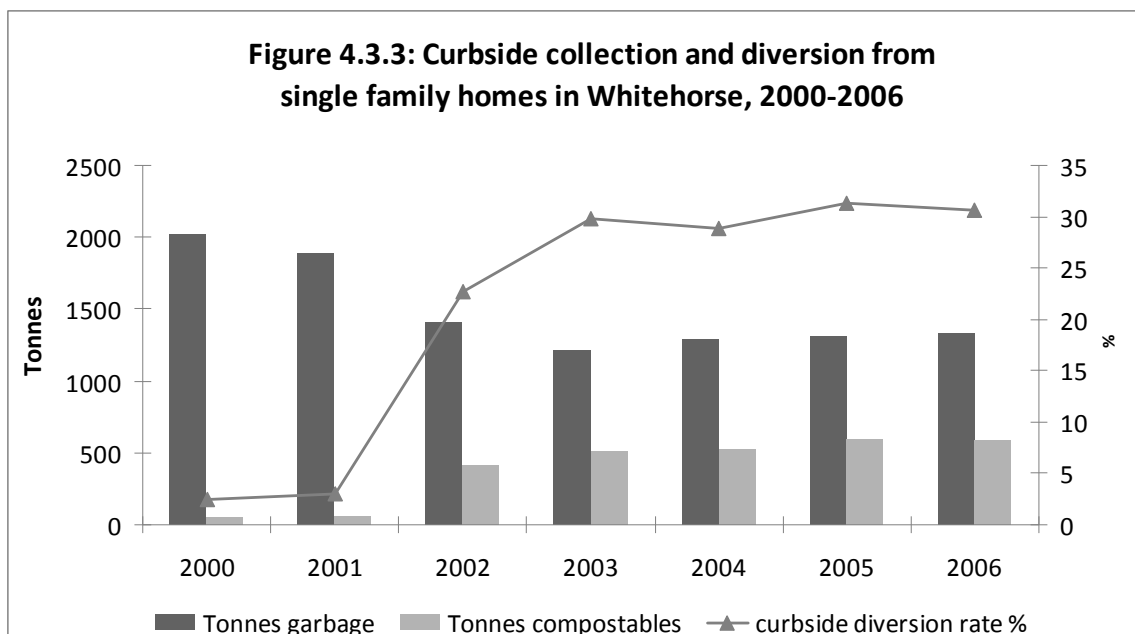
- Total annual tonnage of waste arriving at the City of Whitehorse Landfill (Figure 4.3.1).



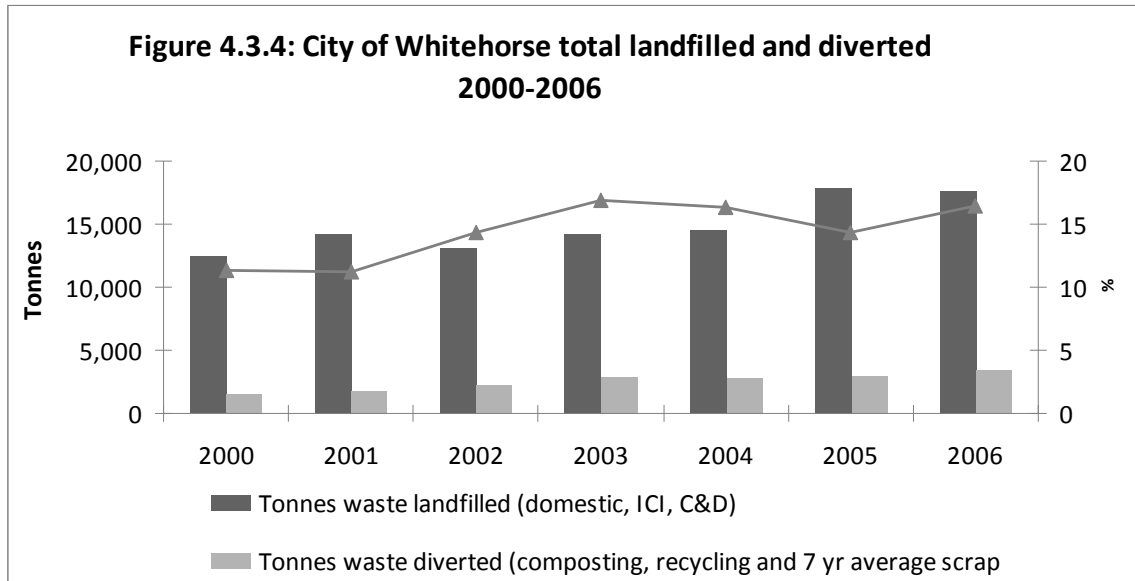
- Total annual waste diverted from the Whitehorse Landfill through composting (curbside collection from single family homes and drop-off at the landfill), recycling (through privately run depots) and stockpiles of scrap metal removed from the landfill for recycling. This figure shows a minimum value, as not all diversion activities are accurately tracked or reported (Figure 4.3.2).



- Curbside collection from approximately 5,000 City of Whitehorse single family households of garbage (might include items that could be composted or recycled, but were included with the garbage and therefore landfilled) and compostables (Figure 4.3.3).



- Overall diversion rate in Whitehorse based on the total waste landfilled (domestic; institutional/commercial/industrial [ICI]; construction and demolition [C&D] wastes) and the total waste diverted (composting, recycling and 7-year average for scrape metal removed from the landfill) (Figure 4.3.4).



What is happening?

- The overall diversion rate in Whitehorse remains at approximately 16 percent. This does not include hazardous waste diverted through household hazardous waste (HHW) days and the Yukon government commercial hazardous waste program.
- Curbside compostable collection from single family households has stabilized at a 30 percent diversion. This is an underestimate of the full diversion from households, as there is no estimate of the amount recycled by these households, or the contribution of backyard/worm composting and the use of garburators.

Why is it happening?

Despite increases in recycling diversion, there has been a corresponding increase in the waste landfilled. However, diversion data are incomplete and therefore indicate a minimum diversion rate. Privately run operations do not reliably submit recycling data, larger retail outlets may ship cardboard directly through backhauls, and backyard composting and the use of garburators add to the total composted but is to date unaccounted for.

Commercial waste is likely high because landfilling remains the cheapest and easiest option for waste management. Several businesses have taken the initiative to voluntarily reduce waste through composting and recycling. This is likely to increase in the years to come.

Diversion from single family households has stabilized with an estimated 56 percent participation rate (Citizen survey, 2006). The key to increasing diversion will be to increase participation.

Whitehorse residents and businesses have the opportunity to recycle over 30 commodities at one of five recycling organizations: Raven Recycling, P&M, Helping Hands, Computers for Schools and Salvation Army. In addition, the Yukon government offers a collection program for commercial businesses and households to properly dispose of hazardous materials.

Why is it significant?

Waste generation can negatively affect the quality of land, air and water, especially when it results in disposal to landfills or is burned. Individuals can mitigate these impacts by reducing, reusing, recycling and composting their waste as much as possible. At the same time, recycling has the potential to generate income and employment as well as prolonging resource supplies. Waste diversion creates employment opportunities. For example, Raven Recycling Society directly employed over 20 people in 2006.

Taking action in 2006

The City of Whitehorse continued its citywide curbside compost collection program, which has a goal to divert at least 50 percent of solid waste from the landfill site. In partnership with the City and FCM Green Municipal Funds, the Canada Winter Games Committee is striving to hold a zero-waste Canada Winter Games in 2007. In preparation for the event to be held in early 2007, 650 green compostable carts and 550 black garbage carts were purchased and the collection trucks outfitted with hydraulic lifters. Each Canada Games venue will be supplied with sorting stations to divert recyclables and compostables from the garbage landfilled. After the games, the carts will be used for a curbside pilot project to test the effect of supplying carts on the participation and diversion rates.

The Yukon government and City of Whitehorse collaborated to hold three hazardous waste collection days.

Raven Recycling Society continued its PaperSave program that offers a collection service for office paper and cardboard on an “as-needed” or regularly scheduled basis.

Data quality

The City of Whitehorse is improving its waste stream tracking methods. The curbside collection data is of high quality. Commercial, construction and domestic waste streams are more challenging to allocate to a specific waste stream as they arrive at the landfill co-mingled. Data for waste diversion are a minimum.

Data is for the City of Whitehorse area only and does not represent what is happening in the communities. Community solid waste data is not available on a regular, consistent basis.

5. Nature

5.1 Contaminants in the Environment

What is the issue?

Heavy metals, persistent organic pollutants (POPs) (including organochlorines) and radionuclides are contaminants that can persist in the environment. These contaminants can become concentrated along the food chain through bioaccumulation and biomagnification causing serious health implications for wildlife as well as people – especially those who depend on traditional foods. Many contaminants found in the north have never been used in the region or, in some cases, 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?

1. Mercury levels in Yukon caribou

Mercury levels have been measured in Yukon caribou since 1994. Most samples are from the Porcupine herd which has allowed a thorough analysis of changes in mercury over time.

2. POP and mercury concentrations in lake trout and burbot

Between 1993 and 2006, a study examined mercury and organochlorine (OC) concentrations in lake trout and burbot from Lake Laberge, Kusawa Lake and other lakes sampled on a rotational basis. These studies are ongoing in Lake Laberge and Kusawa Lake, and have expanded to include newly discovered contaminants such as fluorinated and brominated compounds.

3. Cadmium levels in Yukon caribou and moose

Through the volunteer hunter survey program, the Yukon Contaminants Committee and Environment Yukon annually collect livers, kidneys and muscle samples from moose and caribou for contaminant analysis. Cadmium was also measured in caribou teeth as part of a different study.

What is happening?

- Mercury concentrations are changing over time in the Porcupine caribou (as well as several other Arctic barren-ground caribou herds). This may be part of a natural cycle, but it appears that the overall trend is increasing over time, particularly in female caribou.
- After declining since 1993, OC and mercury concentrations appear to have started rising again since 2001/2 (mercury) and 2003/4 (OCs) in lake trout from both Lake Laberge and Kusawa Lake. Brominated compounds (PBDEs) have been measured in trout from both

lakes from 1993 to 2006 and although there is considerable variation in concentrations among years, there is no clear trend over time. Fluorinated compounds were measured in trout from 2006. We'll need a few more years of data to see if concentrations are changing over time.

- After thirteen years of testing, the Northern Contaminants Program has concluded that cadmium levels in moose and caribou are stable and do not appear to be changing. Cadmium concentrates in the liver and kidneys of moose and caribou and not to any great extent in the meat (muscle). Cadmium concentrations tend to be higher in Yukon moose than barren land caribou, and are variable in woodland caribou due to diet. Cadmium concentrations in teeth from modern Aishihik and Southern Lakes caribou are actually lower than concentrations in fossilized teeth from caribou from the same areas, supporting the theory that cadmium in caribou is naturally occurring and stable over time.

Why is it happening?

- Caribou feed on lichen that can directly absorb atmospheric contaminants, including mercury, which is very volatile and carried easily through the atmosphere. The changes over time may reflect atmospheric changes in mercury. It is unclear why females show more of an increase over time than males, but it may be related to increased deposition of mercury along the Arctic coast in the spring when females are calving there (and the males are farther south). Research into this phenomenon is ongoing.
- Biotic factors, such as fish lipid content and body mass changes caused by fish population variations or lake plankton productivity may affect contaminant levels in trout and burbot. In addition, long-range atmospheric deposition levels of contaminants affect the availability of these contaminants to the fish. Concentrations of some OCs 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 OCs are human-made, the mercury that makes its way into fish comes from a combination of naturally occurring sources as well as industrial activity that liberates additional mercury into the environment.
- Cadmium is present in Yukon's underlying geology, especially in the southeast region, so the relatively high concentrations found in moose and caribou are more likely the result of local sources rather than global transportation. Moose feed primarily on willows, which are hyperaccumulators of cadmium from the soil, whereas the diet of woodland caribou also includes lichen, which has no root system to allow the absorption of local cadmium through the soil. Barren-ground caribou feed almost exclusively on lichen, so their cadmium levels tend to be lower.

Why is it significant?

- The concentration of mercury in caribou – a traditional food source for many Yukon First Nations people – is very low and below health guidelines. However, the apparent increase in mercury in caribou over time is of concern and is continuing to be studied in the Porcupine caribou herd, as well as other barren-ground herds across the Arctic.
- OCs and mercury are found in fish across the Arctic (as well as southern areas). While OCs are not at levels thought to cause health concerns, average mercury concentrations in lake trout in both Lake Laberge and Kusawa Lake are just below recommended guidelines for commercial sale of fish.
- Because the high levels of cadmium in our 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. Because ingesting too much cadmium can be harmful, Health Canada has recommended limiting the intake of Yukon moose and caribou liver and kidney. The recommendation for moose is one liver or kidney per year, and the recommendation for caribou ranges from seven to 32 kidneys or four to 16 livers depending on the herd.

Taking action in 2006

Indian and Northern Affairs Canada (INAC) - Northern Contaminants Program guides and funds contaminants research and monitoring in the Canadian Arctic. The program has prompted a wide range of contaminant studies and is a storehouse of contaminant data and information. The program has committed to monitoring contaminants in the Porcupine caribou herd, and lake trout in Lake Laberge and Kusawa Lake on an annual basis, and in moose and one Yukon woodland caribou herd every five years.

5.2 Species at Risk

What is the issue?

While species extinction can be a natural process, the variety of earth's animal and plant life is threatened when rates of extinction and the number of endangered species are driven by human activities.

The recovery of species at risk and the reduction of extinction risk require different mechanisms at the local, regional, national and global levels. A species may be locally healthy but globally at risk, therefore coordinated action across borders would be necessary to recover the species and ultimately to sustain biodiversity.

Currently, a major threat to species at risk, including some that live in Yukon, is habitat loss through modification or outright destruction by human activities. The Yukon government works in coordination with different levels of governments and land claims organizations towards ensuring that we are doing our part in tracking and managing species at risk.

What are the indicators?

The number of species at risk is used as an indicator of the status of national and global biodiversity. It can also be used to measure biodiversity on a smaller scale. There are many potential ways to categorize and measure Yukon's species at risk. Conservation status ranks developed by NatureServe are used for this purpose since they focus on Yukon data that is comparable from year to year. This system ranks species, subspecies, varieties and ecological communities on a scale from 1 (Critically Imperiled) to 5 (Secure) and puts risk levels in geographic context by incorporating global, national and provincial/territorial status ranks.

What is happening?

Across the globe, thousands of plant and animal species are at risk of becoming extinct. Habitat destruction and loss are major reasons these species are at risk, along with genetic and reproductive isolation, environmental contamination, overharvesting, climate change, disease and the presence of invasive species. A relevant Yukon example is loss of sea ice habitat in the Beaufort Sea, which will result in population decline and redistribution of polar bear.

According to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), at the end of 2006 there are 552 plant and animal species at risk in Canada. Across the country, species specialists and community members are working hard to protect species at risk.

In 1998, the Yukon government signed the national *Accord for the Protection of Species at Risk* (National Accord) signifying its commitment to designate species at risk, develop plans for their management, and enact legislation for their protection.

In 2003, the federal *Species at Risk Act* (SARA) came into effect. Under this act, COSEWIC assesses species considered to be at risk and makes recommendations on their status to the federal government. The species can be listed as Special Concern, Threatened, Endangered, Extirpated or Extinct. The federal Cabinet makes the final decision on whether a species is added to the List of Wildlife Species at Risk.

Recovery and management plans are being developed for three nationally-listed species that occur in Yukon: Wood Bison, Northern Mountain Caribou, and Baikal Sedge.

In Yukon, the territorial government undertook a review of amending the *Wildlife Act* to address species at risk. By doing so, the territory could meet the obligations set out in the National Accord. This will ensure that responsibility for monitoring and managing these species is carried out within the territory's wildlife management framework. However, it was determined that addressing plants and other forms of wild species in the *Wildlife Act* was not a good fit.

As of 2006, 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.

**Table 5.2.1 National Species at Risk that Occur in Yukon
(as identified by COSEWIC, 2006)**

| Taxonomic Group | Common Name / Population | COSEWIC Status | Recovery Strategy or Mangt. Plan in Place? |
|-----------------|---|-----------------|--|
| Mammals | Wood Bison | Threatened | In Progress |
| Mammals | Grizzly Bear (Northwestern population) | Special Concern | No |
| Mammals | Polar Bear | Special Concern | No |
| Mammals | Woodland Caribou (Northern Mountain population) | Special Concern | In Progress |
| Mammals | Wolverine (Western population) | Special Concern | No |
| Mammals | Bowhead Whale (Western Arctic Ocean) | Special Concern | Yes |
| Birds | Eskimo Curlew | Endangered | Yes |
| Birds | Peregrine Falcon | Special Concern | In Progress |
| Birds | Short-eared Owl | Special Concern | No |
| Amphibians | Western Toad | Special Concern | In Progress |
| Fish | Bering Cisco | Special Concern | No |
| Fish | Squanga Whitefish | Special Concern | No |
| Plants | Baikal Sedge | Threatened | In Progress |

Why is it happening?

In order to ensure the effective protection of species at risk, different tools are required at the territorial, national and international level. Finalizing the Species at Risk legislation will better enable Yukon government to participate in species at risk management with other governments.

Why is it significant?

By creating its own legislation for species at risk, the Yukon will have significant input into how these species will be listed and managed within the territory. It will also ensure that traditional and local knowledge will play a role in these processes. This will help recovery plans and management strategies clearly reflect the realities of the Yukon environment and the values of Yukon people.

Taking action in 2006

The Yukon government is currently considering issues raised through the consultation processes regarding a proposed stand-alone Yukon *Species at Risk Act*. It is expected that the proposed legislation will be redrafted in 2009, with careful consideration given to the issues raised.

5.3 Ecosystems: Wetlands

What is the issue?

Bogs, fens, swamps, marshes and shallow open water areas – collectively categorized as wetlands – are productive ecosystems that cover only three percent of Yukon’s land base. While small wetlands are scattered throughout the territory, the largest are concentrated in low-lying permafrost terrain north of the Arctic Circle. Due to their limited scope and isolated locations, these relatively scarce habitats do not generally face the same immediate risks from human development that wetlands in other jurisdictions do. However, because of their scarcity, they are even more important and in need of planning to anticipate any resource development. Ducks Unlimited Canada, for one, is optimistic that important wetland areas can be conserved with timely, and proper planning.

What are the indicators?

- The number of wetlands inventoried and designated as critical, sensitive or important depending on habitat values, especially for migratory birds.
- The conservation status of designated wetlands, as determined by protection under a SMA such as a national wildlife area, national or territorial park, or HPA.

What is happening?

More than fifty Yukon wetlands have been recognized as important by the Yukon Wetland Technical Committee, based mostly on their value as habitat for migratory birds, including some that are rare or of restricted distribution in Yukon. Several of the important wetlands will become HPAs under the terms of Final Agreements. Wetland inventory is ongoing by various governments and non-government organizations.

Management plans were approved in 2006 for Old Crow Flats Special Management Area and Lutsaw Habitat Protection Area. Both of these areas are important regionally for waterfowl and other fish and wildlife.

Why is it happening?

- Inventories, designations and notations of wetlands are occurring because governments and non-governmental interests recognize the high value of these ecosystems.
- Land claims agreements with Yukon and other First Nations often include provisions to create or nominate new SMAs that can protect important wetlands. The process for establishing an SMA can take years.

Why is it significant?

Wetlands are important for plants, animals, migratory birds, fish, and water quality. Some are culturally important for human communities. Inventory data helps us appreciate what is happening in wetlands so that we can ensure their ongoing viability.

5.4 Interesting Stories for 2006

Monitoring Black Guillemots at Herschel Island

The Black Guillemot is a seabird with a circumpolar breeding distribution. The Yukon's only nesting colony is on Herschel Island off the Yukon's North Coast. Black Guillemot monitoring began at Herschel Island Territorial Park in the mid-1980s and is now a key part of the park's long-term ecological monitoring program.

The objectives of this project are to monitor long-term changes in Black Guillemot population and nesting success at Herschel Island; and investigate how the population is affected by changes to the marine ecosystem brought about by climate change. Concerns about the species and ecosystem health have arisen due to population declines at Herschel Island, and a large colony near Barrow, Alaska.

Alaskan researchers have found that sea ice conditions affect nesting productivity such that climate warming may be impacting guillemot population health. Black Guillemot monitoring at Herschel Island provides an important measure of the ecological integrity of the park and contributes to understanding ecosystem function and the impact of climate change in the Beaufort Sea region.

In 2006, Herschel Island park rangers conducted regular Black Guillemot counts and nest checks through the season. Yukon government biologist Cameron Eckert conducted field work focusing on the Black Guillemots from August 14 to 20 when chicks are in the nests.

In 2006, we recorded a high count of 40 adult Black Guillemots. We recorded a total of 12 nests: three nests failed (eggs never hatched), and nine nests contained 13 chicks on 19 August. This was down from 2005 totals of 60 adults and 12 successful nests with 22 chicks. In 2006, we colour-banded all 13 chicks and six adults, which provides information on yearly survival and dispersal of individuals and enhances our understanding of population fluctuations. Dominant prey species of the Black Guillemot were Arctic Cod (*Arctogadus glacialis*) and Short-horned Sculpin (*Myoxocephalus quadricornis*); other prey included Slender Eelblenny (*Lumpenus fabricii*), Arctic Lamprey (*Lethenteron japonicum*), and Capelin (*Mallotus villosus*).

BIGFOOT littlefoot Conservation Education Game

Through programs and teaching tools, the Conservation Education team at Environment Yukon actively looks for new ways to engage young people and encourage the development of an environmental ethic. After searching unsuccessfully for existing tools, in 2006 they created a board game called *BIGFOOT littlefoot*.

The game addresses several objectives—it's Yukon-based, relevant to a diverse age range of students, and a stimulating group activity with serious messaging communicated in a fun way. The game's creators consulted extensively with environmental professionals including wildlife and fisheries biologists, water quality inspectors, environmental monitors, conservation educators and park planners. They hosted a full-day workshop with teachers to explore themes and key concepts, and they sought advice from students to determine what worked.

“Ecological footprint” emerged as the game's core concept. Ecological footprint measures how much area in land and water that a human population requires to produce the resources it consumes and to absorb its wastes. The game's creators selected ten important species of Yukon wildlife, including mosquitoes, for “wild cards” and they designed an attractive 1.5-metre-long canvas game “board.” In addition to communicating Ecological Footprint, the game also incorporated the key themes of stewardship and cooperation.

During the game, players answer questions about ecological principles, collect wooden puzzle pieces of Yukon eco-regions and assemble a complete habitat while moving their footprint playing pieces around the board. Depending on their knowledge, strategy and luck, players' footprints increase or decrease in size.

BIGFOOT littlefoot is now found in every school in Yukon. The game was designed for grades 4 to 7 and based on the school curriculum, but it has been successfully played by children as young as four as well as adults. *BIGFOOT littlefoot* is engaging and unique to the Yukon, and the game's creators have been pleased to see young people foster cooperation, support stewardship and integrate ecological principles during play.

Yukon Invaders – Invasive Species Booklet

To help communicate the negative effects of invasive species to the Yukon public, in particular gardeners and the horticulture industry, in 2006 the Biodiversity branch of Environment Yukon developed a brochure entitled *Yukon Invaders*.

An invasive alien species is a plant, animal, fungus or bacterium that is responsible for habitat damage, loss of subsistence resources and economic loss. In Canada invasive alien plants and animals are the third greatest threat to biodiversity after exploitation and habitat loss. Twenty non-native species are considered invasive in Yukon.

This publication was the first of its kind produced in the territory. It was developed to help satisfy requests for more information on Yukon invasive plants and to raise awareness of the issues around cultivating invasive plants. The brochure highlights eight of the territory's twenty invasive plants with detailed descriptions and information about how people can help.

The Yukon Invasive Species Committee wrote and produced the brochure, and it was distributed to garden centres, government offices and visitor information centres throughout the Yukon.

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<www.environmentyukon.gov.yk.ca/mapspublications/plansreports.php>

Hassol, Susan Joy. *Impacts of a Warming Climate: Arctic Climate Impacts Assessment (ACIA)*.

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<www.amap.no/acia>

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Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge

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Specific:

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<www.ec.gc.ca/pdb/GHG/inventory_report/2006_report/a4_eng.cfm>

1.2 Primary Indicators of a Changing Climate

General:

Canadian Council of Ministers for the Environment (CCME). *Climate, Nature, People: Indicators of Canada's Changing Climate*. 2003.

<www.ccme.ca/assets/pdf/cc_ind_full_doc_e.pdf>

Environment Canada, Climate Research branch. *Climate Trends and Variations Bulletin*.

<www.msc-smc.ec.gc.ca/ccrm/bulletin/national_e.cfm>

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Hassol, Susan Joy. *Impacts of a Warming Climate: Arctic Climate Impacts Assessment (ACIA)*. 2004: Cambridge University Press, United Kingdom and New York, NY, USA.
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Specific:

Figures 1.2.1: Source: Environment Canada, Climate Research branch. *Climate Trends and Variations Bulletin*. <www.msc-smc.ec.gc.ca/ccrm/bulletin/national_e.cfm>

1.3 Examples of Environmental Impacts

Government of Yukon. *A Snapshot: Yukon Government Actions on Climate Change during 2006 and 2007*. 2007.
<www.environmentyukon.gov.yk.ca/mapspublications/plansreports.php>

Government of Yukon. *Government of Yukon Climate Change Strategy*. 2006.
<www.environmentyukon.gov.yk.ca/mapspublications/plansreports.php>

Chapter 2 Air

2.1 City of Whitehorse Air Quality

General:

Whitehorse NAPS Station data, Standards and Approvals, Environmental Programs branch, Environment Yukon.

Environment Canada NAPS Network <www.etc-cte.ec.gc.ca/NAPS/index_e.html>

Environment Yukon and City of Whitehorse. *Let's Clear the Air: about Wood Smoke and Vehicle Exhaust*

Chapter 3 Water

3.1 Water Quality Index (WQI)

General:

B.C. Water Quality Index <www.env.gov.bc.ca/wat/wq>

British Columbia and Yukon Territory Water Quality Report (2001-2004)

Canadian Environmental Sustainability Indicators 2007 <www.environmentandresources.ca>

Pacific/Yukon Water Quality Monitoring Program <www.waterquality.ec.gc.ca>

Chapter 4 Land

4.1 Land Use and Resource Management Planning

Specific:

Figure 4.1.1: Sources:

Regional Land Use Plans (RLUPs)—update provided by Yukon Land Use Planning Council.

Official Community Plans (OCPs) and Local Area Plans (LAPs)/Area Zoning Regulations—update provided by Community Affairs, Community Development branch, Yukon department of Community Services.

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

Fish & Wildlife Plans—update provided by Fish and Wildlife branch, Environment Yukon.

Protected Area and Other plans—data provided by Yukon Parks branch and Fish and Wildlife branch, Environment Yukon.

4.2 Interesting Stories for 2006

Commercial Bear Viewing at Bear Cave Mountain

Dave Ladret, Special Projects Officer, Yukon Parks branch, Environment Yukon.

Habitat Suitability Mapping

Bruce McLean, Senior Biologist—Habitat Protection, Environment Yukon.

4.3 City of Whitehorse Solid Waste Management

General:

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

Canada's State of the Environment Infobase <www.ec.gc.ca/soer-ree/english/Indicator_series/highlights.cfm#high_pic>

Environment Canada's Pacific and Yukon Region Environmental Indicators <www.ecoinfo.ec.gc.ca/env_ind/indicators_e.cfm>

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

Specific:

Figures 4.3.1, 4.3.2, 4.3.3 and 4.3.4: Sources: Data provided by Engineering & Environmental Services, City of Whitehorse

Chapter 5 Nature

5.1 Contaminants in the Environment

General:

Wildlife Management, Fish and Wildlife branch, Environment Yukon.

www.environmentyukon.gov.yk.ca/fishwild/index.html

Northern Contaminants Program www.ainc-inac.gc.ca/ncp/index_e.html

Specific:

Kristinsdottir, S.M. *Ancient mandibles tell of the industrial revolution*. The Yukon News, page 3, Wednesday, September 8, 2004.

Gamberg, M., *Contaminants in Yukon Moose and Caribou - 2003*. Unpublished report prepared for Indian and Northern Affairs, Northern Contaminants Program, July 2004, 16 pages.

Gamberg, M., Braune, B., Davey, E., Elkin, B., Hoekstra, P., Kennedy, D., Macdonald, C., Muir, D., Nirwal, A., Wayland, M., Zeeb, B., 2005. *Spatial and temporal trends of contaminants in terrestrial biota in the Canadian Arctic*. Science of the Total Environment. In Press.

Ryan, M. J., Stern, G.A., Diamond, M., Croft, M.V., Roach, P., Kidd, K. *Temporal Trends of Organochlorine Contaminants in Burbot and Lake Trout from Three Selected Yukon Lakes*. Science of the Total Environment. In Press.

5.2 Species at Risk

General:

NatureServe, Fish and Wildlife branch, Environment Yukon.

www.environmentyukon.gov.yk.ca/wildlifebiodiversity

NatureServe www.natureserve.org

CESC Wild Species 2000 Report www.wildspecies.ca/wildspecies2000/en/Report.pdf

5.3 Ecosystems: Wetlands

General:

www.wetlands.cfl.scf.mcan.gc.ca/accueil-home-eng.asp

www.ec.gc.ca/default.asp?lang=En&n=540B1882-1

www.wetkit.net/modules/1

5.4 *Interesting Stories for 2006*

Monitoring Black Guillemots at Herschel Island

Cameron Eckert, Conservation Biologist, Environment Yukon.

BIGFOOT littlefoot Conservation Education Game

Remy Rodden, Conservation Education Coordinator, Environment Yukon.

Morris Lamrock, Youth Programs Coordinator, Environment Yukon.

Yukon Invaders – Invasive Species Booklet

Bruce Bennett, Wildlife Viewing Biologist, Environment Yukon.

environmentyukon.gov.yk.ca/wildlifebiodiversity/invasivespecies.php

