5. Peel Sub-basin

Introduction

Geography

The Peel River sub-basin encompasses an area of 74,000 square kilometres, from its headwaters in the Yukon to its confluence with the Mackenzie River near Fort McPherson in the Northwest Territories (Figure 5–1). The Peel River has a mainstream length of approximately 350 kilometres beginning at the confluence of the Blackstone and Ogilvie rivers.[161] Downstream of this confluence, there are several major tributaries draining the Ogilvie and Selwyn Mountains. These alpine rivers include the Hart, Wind, Bonnet Plume and Snake rivers. Further downstream, the Caribou, Trail, Road and Vittrekwa rivers drain the Peel Plateau. Mountainous terrain and permafrost, both of which cover vast areas of the sub-basin, control the flow of water in most of the rivers of the Peel sub-basin.[114]

Upstream of its confluence with the Wind River, the Peel River passes through the spectacular Aberdeen Canyon. This canyon is cut into thick limestone and is a continuous series of rapids and cascades over several kilometres.[162] The Peel sub-basin includes portions of the Taiga Cordillera Ecozone and the Taiga Plains Ecozone.[163] Wetlands such as bogs and fens are abundant in the areas of the sub-basin within the Taiga Plains Ecozone.

As a condition of the *First Nation of Nacho Nyak Dun Final Agreement*, the Bonnet Plume River was designated as a Heritage River under the Canadian Heritage Rivers System, mainly because of its natural beauty and recreational and cultural value.[164]

Human Populations

The Peel sub-basin overlaps with the traditional territories of four First Nations: the Nacho Nyak Dun First Nation (Mayo), the Tetlit Gwich'in (Fort McPherson), the Tr'ondek Hwech'in (Dawson), and the Vuntut Gwitch'in (Old Crow). The

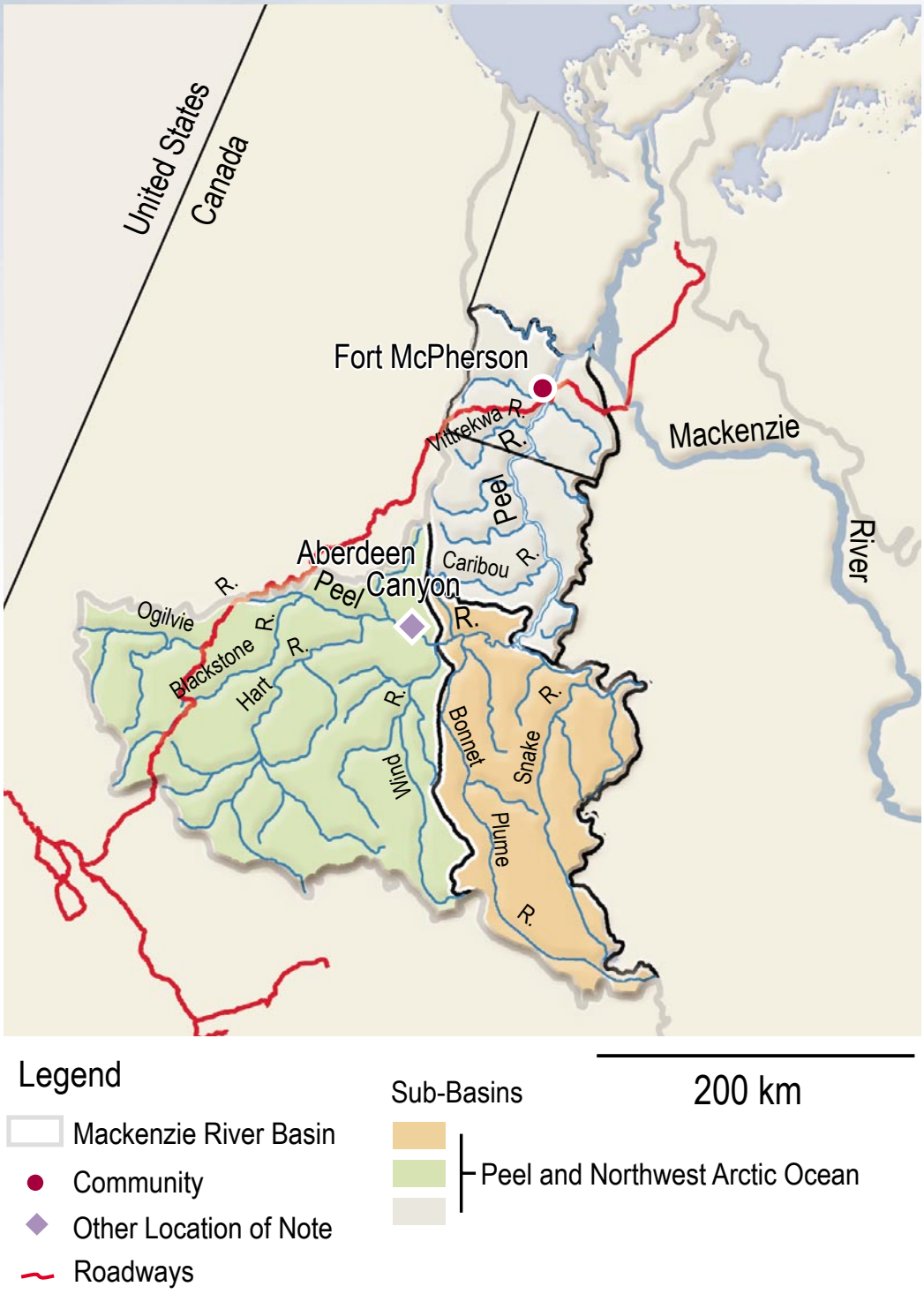

Figure 5–1.
Map of the Peel sub-basin

importance of the Peel River watershed to First Nations was recognized in land claim agreements which required the creation of the Peel River Watershed Advisory Committee. This committee was empowered to provide recommendations about land use planning, transboundary water management agreements, and special management areas.

The only permanent community in the Peel sub-basin is Fort McPherson, and nearly all inhabitants of the sub-basin live in this community. The population of Fort McPherson was estimated to be 760 in 2001. About 90% of these people are Aboriginal.[165]

Natural Resource Deposits

The Peel sub-basin contains one base metal deposit with reserves of 1.4 million tonnes of zinc ore, two iron deposits totalling more than five billion tonnes of iron ore, and seven coal deposits totalling over 400 million tonnes. Most of these deposits were identified many years ago, but none have been developed. Exploitation of any of these deposits would require construction of an efficient modern transportation system.

Potential oil reserves in the Peel sub-basin are estimated to be 3.4 million cubic meters and potential gas reserves are estimated at 65 billion cubic meters. In 2002, the Yukon Government issued a permit to Hunt Oil Canada for exploration rights on 40,200 hectares of the Peel Plateau. To date, no work has taken place under this permit, but Hunt Oil proposes to spend $1.2 million doing exploratory work in this area.[166]

Improve Water Quality

Water Quality in the Peel River (1991–2002)

What is happening?

Water quality in the Peel River near Fort McPherson changes dramatically from winter to summer. During winter, the water contains low amounts of suspended solids and metals. This contrasts with the large amounts of suspended sediments and metals that occur during summer. Suspended sediment concentrations can be very high following heavy summer rains. Many trace metals, such as zinc, occur in quite large amounts during the high flow periods of summer. In fact, during the summers of 1991 to 2002, concentrations of zinc in the Peel River at Fort McPherson exceeded the Canadian Council of Ministers of the Environment (CCME) Environmental Quality Guideline for protecting freshwater life 50% of the time (Figure 5–2). In contrast, the guideline for zinc was exceeded less than 10% of the time during winter.

Why is it happening?

Most trace metals bind to small particles of silt, clay or organic matter that are washed into the water during periods of high flow. It is therefore natural that metal concentrations often exceed CCME guidelines during periods of high flow.[167] Figure 5–3 shows that zinc concentrations in the Peel River were usually

high when the suspended sediment load was high, and low when the suspended sediment load was low.

The Peel River at Fort McPherson accumulates its sediment load primarily from surface soil deposits in the lower Peel River. The river cuts through the bed of a large glacial lake near the mouth of the Bonnet Plume River. Erosion of frozen ice-rich silt from this lakebed is the major source of sediments to the lower Peel Basin.

What does it mean?

The quality of water in the Peel sub-basin is determined primarily by natural conditions and processes related to the climate, geology, vegetative cover and physical characteristics of the watershed. Although the basin has been explored for mineral, coal and oil deposits, none of those resources have been exploited. Regardless, resource deposits and the associated regional geology naturally release metals and other substances into the river. These substances have natural effects on water quality.

The naturally high levels of suspended sediments may limit water use by people during the open water season. The large amounts of suspended solids lead to naturally high concentrations of zinc and other metals. However, since most of the metals are bound to sediments, aquatic plants and animals do not readily pick them up.

What is being done about it?

Proposals for industrial developments in the Peel sub-basin, when they arise, will be evaluated carefully through a regulated environmental assessment process to identify potential impacts on the aquatic ecosystem.

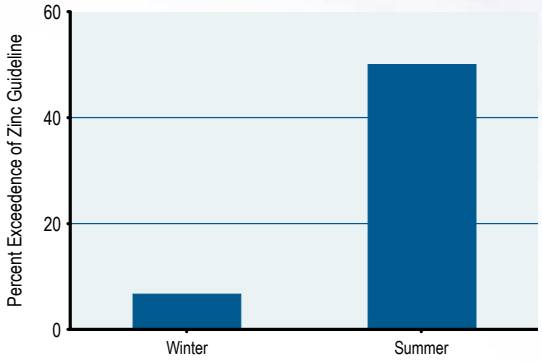

Figure 5–2.
During the high flows of summer, concentrations of zinc in the Peel River often exceed the Canadian Environmental Quality Guideline for protecting freshwater aquatic life. However, during the low flows of winter, zinc concentrations rarely exceed the guideline.

Data Source: Environment Canada.

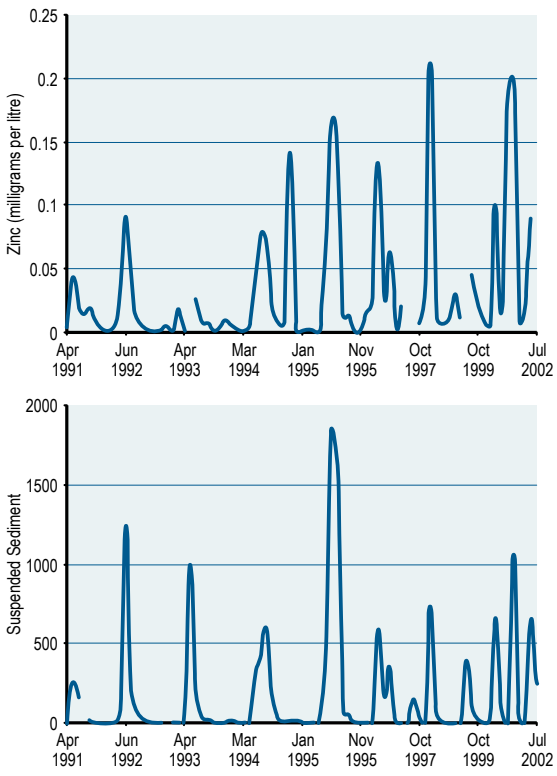

Figure 5–3.
High zinc concentrations in the Peel River usually occur when suspended sediment loads in the river are also high.

Data Source: Environment Canada, Water Survey of Canada.

Recently, the governments of the Yukon, Northwest Territories and Canada signed an agreement that deals with the sharing of water resources of the Peel River. The agreement covers several aspects of water management, including those related to water quality and quantity. It will be important to continue monitoring water quality and quantity on the Peel River above Fort McPherson to assess whether the terms of the bilateral agreement are being met.[167]

Overall Assessment – Favourable

There are no major releases of wastewater to the Peel River and its tributaries. Water quality in the Peel River is determined by natural processes and conditions. The Peel River carries high loads of suspended sediments during much of the spring and summer. Concentrations of certain metals are also elevated at that time of year. Most of the metals bind to particles of sediment in the water. This inhibits them from being picked up by, and harming, aquatic plants and animals.

Ensure Sufficient Water Quantity

Peak Flow in the Peel River

Stream flow in the mountain rivers of the Peel sub-basin is very low in winter, and then rises to a peak in May or June due to snowmelt.[168] Stream flow on the small, headwater streams can increase rapidly, especially in response to intense summer rainstorms. Such storms may trigger large mudflows on some streams. The Peel Plateau and Fort McPherson Plains are quite flat and runoff from these areas is comparatively low. In general, stream flow in rivers that drain these areas is lower than in the mountain areas to the south and west. However, rainstorms result in dramatic increases in stream flow in rivers of the Peel Plateau. There, maximum flows following summer storms are similar to those that occur in mountain rivers in the sub-basin.

What is happening?

Over the past four decades, the annual maximum stream flow measured at Canyon Creek in the Peel River has decreased. The very high maximum stream flows that occurred in 1964, 1971, 1979 and 1982 have rarely been matched in recent years (Figure 5–4).

Why is it happening?

Much of the Peel sub-basin has been warmer than usual in recent years. During warm winters, periodic melting is more likely to occur during early and late winter, thus reducing the build-up of a winter snow pack. This lessens the amount of runoff entering rivers during the spring melt. Summers have also been warmer and drier than usual, leaving less water to enter runoff. This results in reduced peak summer flows in the rivers of the sub-basin.

What does it mean?

Large peak runoff events shape river channels,

flood backwater areas and affect plant succession on islands and floodplains of rivers. They also scour river bottoms and flush large quantities of sediment towards the mouth of the river.[18] Reductions in annual peak flows could affect the shape of river channels, alter the dynamics of sediment transport and affect plant succession on islands and floodplains. Aquatic biota, such as invertebrates and fish, would ultimately be affected by reduced peak flows. Large peak runoff events can also cause floods. Floods rarely occur in Fort McPherson, however, and they are caused more often by ice jamming than by peak flows in the Peel River.[169]

It is not known to what extent the Peel River ecosystem has felt the impact of the reductions in peak flows that have occurred in recent years. Such information is required to understand how climate change may affect ecosystems through its effects on river flow.

What is being done about it?

River flow is monitored continuously at a long-term monitoring site on the Peel River upstream from Fort McPherson. Recently, the governments of the Yukon, the Northwest Territories and Canada concluded an agreement with respect to water management in the Peel sub-basin. The agreement commits the governments to ensure that any human activities that take place within the basin do not change stream flow to such an extent that the aquatic ecosystem could be affected.

Overall Assessment – Mixed Signals

Annual peak flows on the Peel River have been somewhat smaller in recent years than they were in the 1960s and 1970s. The very high peak flows that occurred four times during the period 1964–1982 have rarely occurred since then. The size of peak annual flows are important in shaping river channels, transporting sediment and affecting plant and animal communities within the river and on the floodplain. However, whether the reduced frequency of very high peak flows on the Peel River has affected the Peel River ecosystem remains unknown. Such information is required to understand how climate change could affect river ecosystems through its impact on river flow.

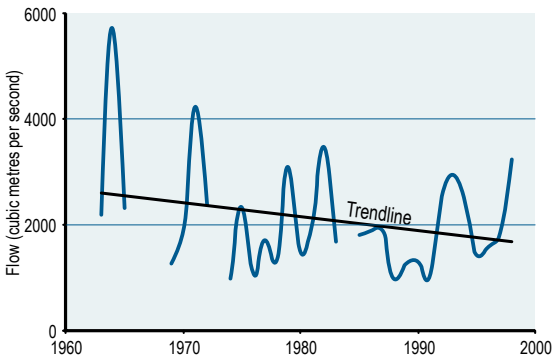

Figure 5–4. The very high maximum flows on the Peel River that occurred in 1964, 1971, 1979 and 1982 have rarely been matched in recent years.

Data Source: Environment Canada, Water Survey of Canada.

Figure 5–5.
Guided and commercial wilderness canoe trips have increased in the Peel sub-basin recent years.
Data Source: Yukon Parks Branch.

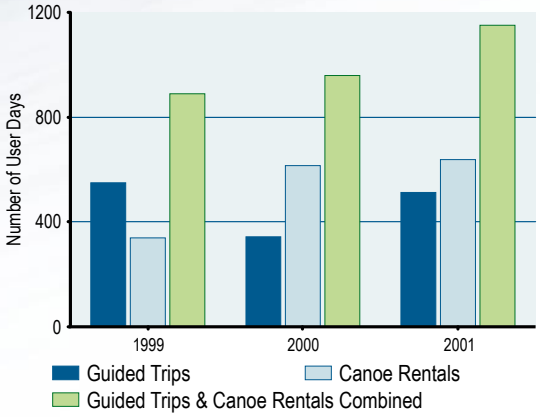

Figure 5–6.
There is little public recreational use (non-guided canoe trips) of the major tributaries of the Peel River.
Data Source: Tompkins 1996.

Sustain In-Stream Water Uses

In the Peel sub-basin, important in-stream water uses include river tourism, subsistence harvest of aquatic species, and ferry and ice-bridge highway crossings. Each of these activities can have impacts on the aquatic ecosystem, and can be impacted by changes in the environment.

River Tourism

What is happening?

Wilderness tourism and outfitting in the Yukon has increased substantially since the 1970s.[170] Most wilderness tourists take guided trips or rent canoes to travel on the sub-basin's many scenic whitewater rivers. The Yukon Government reported a 23% increase in such trips between 1999 and 2001 (Figure 5–5). In addition, some ecotourists take non-guided trips, using their own equipment. In any given year, fewer than 100 such ecotourists take trips on the mountain tributaries of the Peel River (Figure 5–6).

Why is it happening?

The Peel River watershed offers excellent opportunities for water-based adventure in a highly scenic wilderness environment. The Snake, Bonnet Plume and Wind rivers, major tributaries of the Peel, are popular canoeing destinations that offer varying levels of whitewater. The Bonnet Plume River was

designated as a Canadian Heritage River in 1998, and "is becoming known as one of the premier whitewater wilderness-canoe rivers in Canada."[170] With increasing interest in ecotourism and wilderness travel, it is likely that use of the area will continue to increase in the coming years.

What does it mean?

By the mid-1990s, some people were complaining that the number of ecotourists on certain rivers was beginning to detract from the wilderness experience sought by many of the users.[170] Such complaints may increase if the use of wilderness rivers for recreational activities continues to rise. High levels of recreational use, and the associated human waste, may result in some deterioration of the aquatic environment, but there are no data currently available to evaluate whether such impacts are occurring. The ecotourism industry will have to be carefully managed in order to protect the wilderness and prevent deterioration of the wilderness experience sought by ecotourists.

What is being done about it?

In 1998, the Yukon Government enacted the *Wilderness Tourism Licencing Act*. The purpose of this legislation is "to help sustain the wilderness quality of Yukon lands and waters, to require operators to obtain a licence to conduct wilderness tourism activities, and by so doing, enhance the quality of the wilderness tourism sector. " [171]

Overall Assessment – Favourable

River tourism activities in the Yukon have become more popular over the past few decades. In particular, there has been an increase in the use of remote rivers, such as those in the Peel sub-basin. There are concerns regarding the social and environmental impacts of river tourism, but territorial legislation, which was developed to sustain the wilderness quality of rivers, should help to address these issues.

Subsistence Fish Harvest

What is happening?

The Tetlit Gwich'in of Fort McPherson catch fish from the Peel River to use as food. Since 1995, the Gwich'in Renewable Resources Board has been studying the harvest of fish, game, waterfowl and furbearers. Broad whitefish is the most important species in the catch, but several other species are also harvested (Figure 5–7). The total harvest has been as high as 18,000 fish per year. It is important to

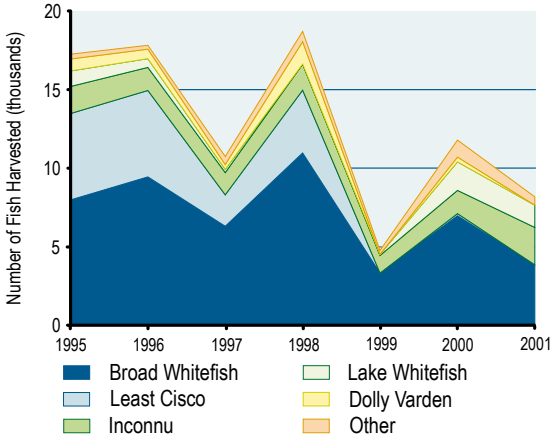

Figure 5–7.
Broad whitefish is the most important species in the catch, but several other species are also harvested. The total harvest has been as high as 18,000 fish per year.

Data Source: Gwich'in Renewable Resources Board.

recognize that some of this harvest occurred downstream of Fort McPherson, an area that is considered to be outside the Peel sub-basin.

Why is it happening?

Tetlit Gwich'in have traditionally relied on local fish populations as an important source of food. Although some aspects of their lifestyle have changed dramatically, subsistence fishing continues to be important.

What does it mean?

Harvest studies such as those conducted by the Gwich'in Renewable Resources Board are valuable in determining the subsistence use of fisheries resources. The harvest can be evaluated for its sustainability and possible effects on the aquatic ecosystem. Any changes in fish harvest over time may be due to changes in the environment, but they could also reflect social or economic changes.

What is being done about it?

The Gwich'in Renewable Resources Board's harvest study is ongoing and data continue to be collected.

Overall Assessment – Favourable

Broad whitefish and other fish species caught from the Peel River continue to be an important source of food for the Tetlit Gwich'in of Fort McPherson.

Ensure Healthy, Abundant and Diverse Aquatic Species and Habitat

Traditional Knowledge of Aquatic Species and Habitat

Tetlit Gwich'in people from Fort McPherson reported that in 2000 the whitefish and coney (inconnu) were in good health, of average size, had flesh of the appropriate firmness and colour, and that the timing of their run was normal.[27] They also observed an increase in the numbers of ducks, geese, and swans that year. People explained that beaver have moved back up the Peel River because recently there are fewer people in that area hunting beaver.[58]

Overall Assessment – Favourable

First Nations people in the Peel sub-basin have observed that local fish stocks are healthy, that migratory waterfowl are abundant, and that the beaver population is becoming re-established.

Rat River Dolly Varden[i]

What is happening?

The Rat River Dolly Varden stock is an important resource for the Gwich'in of Aklavik and Fort McPherson. In response to concerns that the stock was being over-harvested, the *Rat River Charr Monitoring*

[i] Locally known as Dolly Varden Charr. "Charr" is a local spelling.

Study was initiated in 1995. It was a multi-year study whose goals were to estimate relative population size and collect biological information about the fish. The Rat River Dolly Varden stock is estimated to number around 10,000 to 15,000 fish. The federal Department of Fisheries and Oceans has suggested that an annual harvest of 10 to 15% is sustainable, and the recommended maximum harvest of Dolly Varden from the Rat River is 2,000 fish per year. The actual harvest in the mid- to late-1990s exceeded this recommended limit but, more recently, the catch has been less than 2,000 fish per year (Figure 5–8).[172]

Why is it happening?

The Rat River contains one of the region's few populations of Dolly Varden, a highly-desired species of fish. Because of the popularity of this fishery, too many fish may have been harvested in some recent years. Community concerns that the stock was being over-fished led to the development of the Rat River Charr Fishing Plan in 1997. Fishers agreed to a voluntary 30% reduction in their catch in 1998 at the Rat River Charr Workshop.

What does it mean?

Harvests of Dolly Varden from the Rat River were within the recommended limit in the two years following the voluntary reduction. It is predicted that the Dolly Varden population will do well if harvest is maintained at or below this level.

What is being done about it?

Fish are managed through co-operative arrangements amongst land claim Renewable Resources Boards, the federal Department of Fisheries and Oceans, and Renewable Resource Committees in each of the communities. Together, these agencies make decisions related to allowable harvests, licensing of sport and commercial fishers and studies of fish stocks.

Overall Assessment – Favourable

Although Dolly Varden in the Rat River may have been over-fished in the past, recent harvest levels have been below the recommended limit of 2,000 fish per year. The continued involvement of key stakeholders bodes well for fish management in the future.

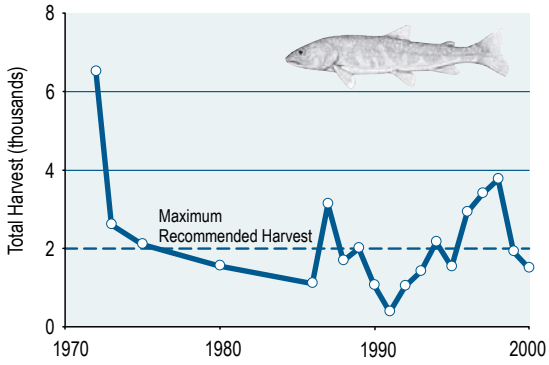

Figure 5–8. The harvest of Dolly Varden in the Rat River exceeded the recommended maximum harvest of 2,000 fish in some years, but the harvest was below that level in 1999 and 2000, the most recent years for which data were available. The harvest was reduced as a conservation measure aimed at sustaining the population.

Data Source: Department of Fisheries and Oceans.