northern rivers ecosystem initiative

1998 - 2003

first progress report

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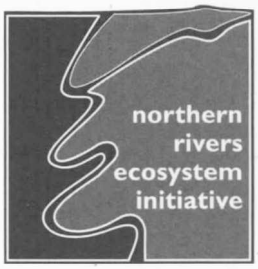

first progress report

november, 1999

Canada

Alberta
ENVIRONMENT

Northwest Territories

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the northern rivers ecosystem initiative

"The Ministers, for a five-year period following completion of the Northern River Basins Study, report annually on the progress of implementing the research and management recommendations of this Report to the Ministers and the synthesis reports; that the annual summaries clearly describe the results of the ongoing research and management initiatives; and that the report be made available to the general public."

Northern River Basins Study, Recommendation 14, 1996

first progress report (November 1999)

Actions to address the commitments made by Ministers in the *Canada-Alberta-Northwest Territories Response to the Northern River Basins Study* are being undertaken through the **Northern Rivers Ecosystem Initiative (NREI)**. The Initiative, which began in 1998, is a cooperative 5-year endeavor by the three governments. The various follow-up actions to protect the northern rivers involve both policy initiatives and scientific research.

The governments agreed that reporting progress on implementing the responses to the recommendations was very important. This first NREI Annual Report addresses this commitment. As well, progress is reported periodically to basin stakeholders through the NREI newsletter, *River News*.

Several recommendations of the Northern River Basins Study were conveyed to the Mackenzie River Basin Board. This Board was formally established in 1998 under the *Mackenzie River Basin Transboundary Waters Master Agreement*. The Steering Committee of the NREI met with the Mackenzie River Basin Board in the fall of 1999 to discuss progress and issues of common interest.

The ***Northern River Basins Study*** (NRBS) was a 5-year initiative launched by governments in 1991 to obtain further scientific information regarding the existing conditions in, and the effects of development on, the aquatic ecosystem of the Peace-Athabasca-Slave river basins. The NRBS was directed by a multi-stakeholder Study Board that made a number of recommendations to governments at the conclusion of the Study to help guide the management of the natural resources in the basins.

The Northern Rivers Ecosystem Initiative is undertaking actions that address residents' concerns about the health of the aquatic ecosystem of the basins. Specific actions focus on priorities such as pollution prevention, endocrine disruption in fish, hydrology, contaminants, nutrients, drinking water and enhanced environmental effects monitoring. Studies are also continuing to address issues such as the incidence of fish abnormalities in the basins and the effects of land use on the aquatic ecosystem. The NREI involves scientists and resource managers from governments, universities, industry, and other organizations, and will be completed by March 31, 2003. As results of the new scientific research become available, they will be communicated to the residents of the river basins.

Progress since 1996

In collaboration with industry, universities, Aboriginal Peoples, and other interested groups, governments have addressed most of the recommendations of the Northern River Basins Study. Highlights of progress since 1996 include:

- The renewed *Canadian Environmental Protection Act*, which received Royal Assent in the fall of 1999, will enhance Canada's ability to deal with toxic substances, and will make pollution prevention a national goal. (NRBS Recommendations 1.1, 1.2)
- Alberta has applied more stringent effluent discharge limits to pulp mills as the mills' operating licences have been renewed. Improvements in pollution prevention technologies have made this feasible. (NRBS Recommendation 1.1)
- Between 1990 and 1998, pulp mill effluent loadings to the northern rivers declined substantially, even though pulp production more than doubled (NRBS Recommendations 1.1, 2.4, and 10.1)
- The oil sands industry, governments and other stakeholders are designing and implementing a management system to control airborne emissions associated with oil sands development. (NRBS Recommendation 1.1)
- Airborne sulphur dioxide emissions from Syncrude Canada and Suncor Energy were reduced by 42 percent between 1989 and 1998 while oil production increased by 49 percent during the same period. (NRBS Recommendation 1.1)
- The four bleached kraft pulp mills in Alberta did not have detectable levels of dioxin (the regulated and most toxic form, 2,3,7,8-TCDD) in 1997 or 1998. The levels of furans at the mills have remained below the limit set by the federal government (50 parts per quadrillion). (NRBS Recommendation 1.2)
- Improved sewage treatment facilities at Grande Prairie and Jasper will reduce the amount of nutrients discharged to the rivers. (NRBS Recommendations 1.3 and 2.5)
- Since 1996, the regulation of all waste management facilities in Alberta has been the responsibility of Alberta Environment. Municipal waste management facilities adhere to the *Code of Practice for Landfills* under the *Environmental Protection and Enhancement Act*. Included in the Code are specifications for landfill liners and leachate collection systems, proper run-off control systems, and ongoing monitoring to ensure containment of the wastes. (NRBS Recommendation 1.4)
- The Alberta Environmentally Sustainable Agriculture (AESA) program was announced in March 1997. As part of AESA, selected streams in the northern river basins are being monitored to assess trends in stream water quality in relation to trends in agriculture. (NRBS Recommendation 1.4)
- Alberta Environment has adopted "water quality" as a departmental *performance measure* that is reported to the public on an annual basis. (NRBS Recommendation 1.4)
- Alberta formally adopted the Canadian Council of Ministers of the Environment dissolved oxygen guideline of 6.5 mg/L in August 1997. (NRBS Recommendation 2.2)
- From 1989 to 1998, dissolved oxygen concentrations in the Athabasca River system have remained at or above the Canadian Council of Ministers of the Environment minimum guideline of 6.5 mg/L. (NRBS Recommendation 2.2)
- Alberta is developing an *Analytical Data Quality Assurance Policy* to ensure that analytical data reported by industrial and municipal facilities are reliable and consistent with national and international standards. (NRBS Recommendation 2.3)
- Alberta's *Water Act* came into force on January 1, 1999. Under the Act, the Minister of Environment must establish, by 2002, a *Framework for Water Management Planning* and a *Strategy for the Protection of the Aquatic Environment*. Through these Framework and Strategy initiatives, water management plans will be developed to provide long-term protection of the northern rivers. (NRBS Recommendation 4)
- Canada, Yukon, Northwest Territories, Saskatchewan, British Columbia and Alberta signed the *Mackenzie River Basin Transboundary Waters Master Agreement* in 1998, and established the Mackenzie River Basin Board. (NRBS Recommendation 7.2)
- New policy initiatives begun in 1998 and 1999 will ensure that land use planning and water use planning are integrated throughout the northern river basins. These include:
  - *The Regional Sustainable Development Strategy for the Athabasca Oil Sands Area.*
  - Alberta's *Commitment to Sustainable Resource and Environmental Management* (the policy recognizes the interdependence of all natural resources).

- Alberta's *Water Act*.
- *Intensive Livestock Regulatory Review Process* (a regulatory framework for the livestock industry that is intended to become legislation during the fall 1999 sitting of the Alberta Legislature has been developed).
- *Alberta Forest Legacy* (supports an adaptive ecological management approach to forest management that encompasses both terrestrial and aquatic values).
- *Interim Forest Management Planning Manual* (supports incorporation of watershed and fisheries considerations into forest management planning). (NRBS Recommendation 8)

• Environment Canada completed an Endocrine Disruption study design for fish and secured collaborative funding from the federal Toxic Substances Research Initiative. (NRBS Recommendation 15.1)

• In 1998, Environment Canada began a four-year research project to define the relative contributions of natural versus manmade sources of oil sands contaminants in surface waters. The project is funded through Natural Resources Canada's *Panel on Energy Research and Development* (PERD), and will assess and predict potential impacts of hydrocarbon extraction activities occurring in the Alberta oil sands area. (NRBS Recommendation 16)

• The Government of the Northwest Territories has developed a discussion paper on the Great Slave Lake fishery for public review. (NRBS Recommendation 19)

• The *Slave River Environmental Quality Monitoring Program* (SREQMP) is considered to be the most comprehensive water quality study ever completed in the NWT. The purpose of the SREQMP was to assess the current status of the river, to discover any hazards to human health or the aquatic environment, and to establish a solid baseline to see if conditions change in the future. (NRBS Recommendation 10.2)

Continuing Challenges

Although significant progress has been realized, the governments acknowledge that challenges still remain:

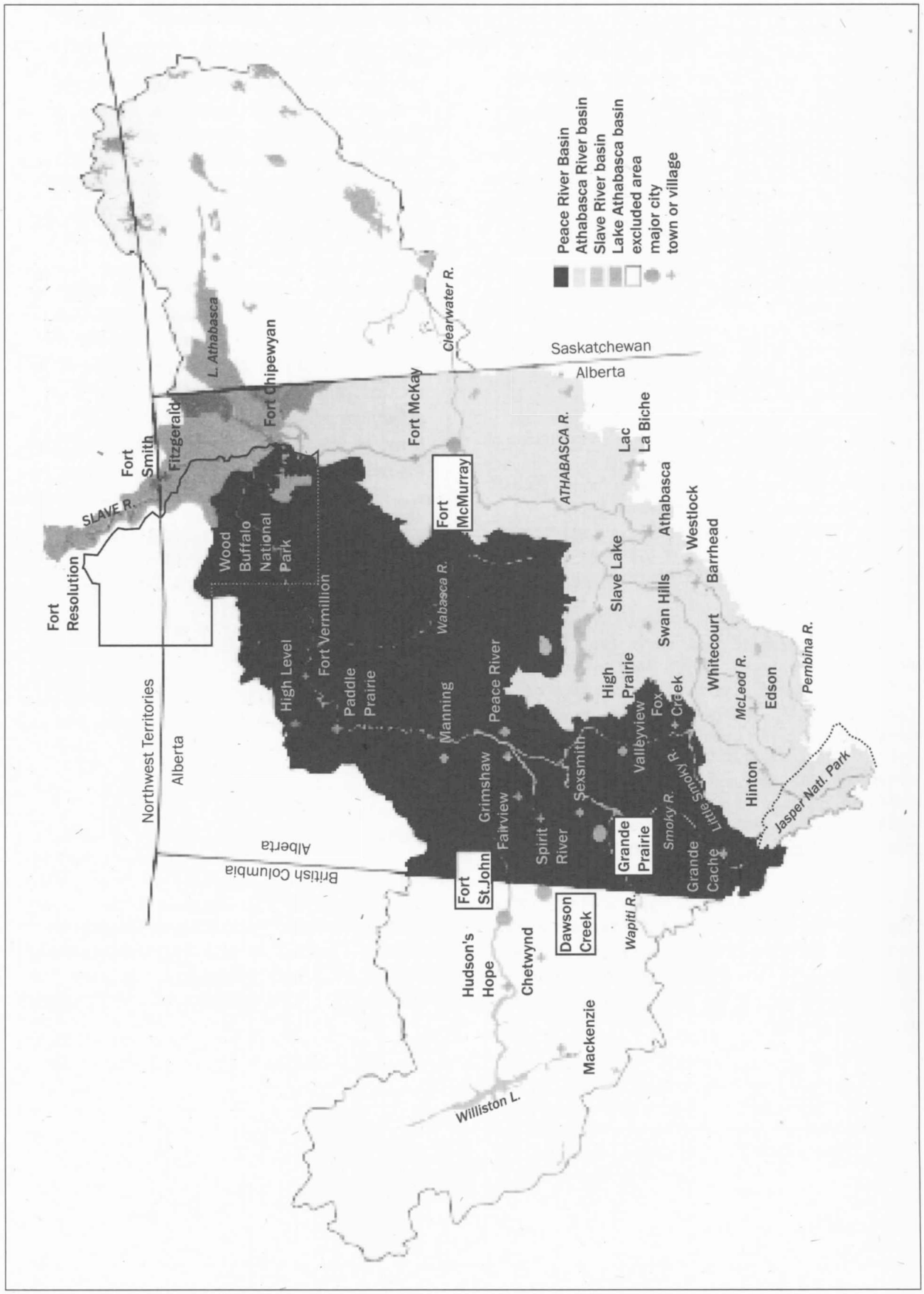
• Levels of PCB contaminants in fish remain at similar levels to those reported during the Northern River Basins Study. Work continues in order to determine the source of the PCB contaminants in the river systems.

• Phosphorus loadings from pulp mills increased by approximately 49 percent during the period between 1995 and 1998. Nutrient additions are necessary to reduce **"biochemical oxygen demand"** in effluents. Alberta Environment will continue to work with pulp mills to evaluate all options for nutrient control.

Biochemical Oxygen Demand (BOD):
a measure of the amount of oxygen consumed in the biological processes that break down organic matter in water, or in the oxidation of reduced forms of substances such as iron, sulphur, and nitrogen.

The following pages contain the recommendations from the Northern River Basins Study, the response to those recommendations by the governments of Canada, Alberta and the Northwest Territories, and the detailed progress reports for the individual recommendations. Updated progress reports will be provided each year until the conclusion of the Northern Rivers Ecosystem Initiative in 2003.

The Peace - Athabasca - Slave river basins



NRBS Recommendation 1.1 (1996)

Regulatory agencies for the northern rivers declare and implement, through law, policy and practice, pollution prevention, including but not limited to zero discharge, as a primary environmental objective and as an important component of sustainable development.

Governments' response to the recommendation (1997)

The governments of Canada, Alberta, and the Northwest Territories declare pollution prevention as a primary environmental objective and as an essential component of sustainable development. All three governments endorse the Canadian Council of Ministers of the Environment document *A National Commitment to Pollution Prevention (November 1993).*

Pollution prevention is implemented by means of federal, provincial, and territorial laws, regulations, and practices. Canada implements this commitment through its policy entitled *Pollution Prevention - A Federal Strategy for Action (1995).* Alberta manages wastewater discharges through its *Industrial Effluent Limits Policy (December 1995):*

"Limits for effluent discharges will be based on the most stringent of two approaches: either that required to meet ambient water quality objectives or that based on best available technology. Discharges are further minimized by optimizing the operation of individual treatment systems".

It is recognized that zero discharge is one means of achieving pollution prevention. However, zero discharge for all wastes in liquid effluents would be very difficult to achieve, and could result in other waste disposal challenges. Nevertheless, pollution prevention practices are becoming ever more stringent with time, resulting in the progressive reduction of point source contaminant discharges. The governments commit to maintaining this trend (see recommendations 1.2, 1.3, 1.4, 1.5 below).

The governments also acknowledge that non-point source inputs and atmospheric deposition of pollutants can be important, and commit to addressing these in pollution prevention strategies.

NREI Progress Report (1998/99)

The principles of pollution prevention and continuous improvement continue to guide regulatory activities to control pollution and protect the environment. "Zero discharge" for all wastes in effluents is acknowledged as a desirable goal, but is difficult to achieve. Air and water releases from industrial and municipal sources in Alberta are regulated by Canada's *Fisheries Act* and *Environmental Protection Act*, and comprehensive approvals under Alberta's *Environmental Protection and Enhancement Act*. In the Northwest Territories, licences to discharge to surface waters are issued by the NWT Water Board under the provisions of the Northwest Territories *Water Act and Regulations*. These licences are site-specific and address the conservation and protection of the water resources as an underlying principle.

A revised Canadian *Environmental Protection Act* (CEPA Bill C-32) was passed by the House of Commons in June 1999, and received Royal Assent on September 14, 1999. The goal of the new CEPA is to protect the environment and the health of Canadians from toxic substances and other pollutants. The pollution prevention thrust of the new CEPA will help Canada contribute to sustainable development and make Canadian industry more competitive internationally. Because science is constantly evolving, the Act will be reviewed by Parliament every seven years. The new CEPA makes pollution prevention a national goal, and includes:

- powers to require pollution prevention planning for substances declared toxic under CEPA,
- a national pollution prevention information clearinghouse through which industry can share knowledge and technology on pollution prevention activities, and
- an awards program to recognize pollution prevention.

The approvals under Alberta's *Environmental Protection and Enhancement Act* are considered **"living documents,"** and address performance, monitoring and reporting requirements. Examples of such "living documents" are the approvals issued to the Weyerhaeuser Canada mill in Grande Prairie in 1997 and to the Daishowa-Marubeni International Ltd. mill in Peace River in 1998.

Approval limits allow Alberta Environment to regulate the amount of substances that are released into the environment. Approval limits have become more stringent since 1990 for Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS), as shown in Figure 1, for Weyerhaeuser Canada and for Daishowa-Marubeni International Ltd. Weyerhaeuser's BOD limit has decreased by 65% and the TSS has decreased by 50% from the 1990 limits. Alberta Environment applied the *Industrial Effluent Limits Policy* to set TSS and BOD limits for Daishowa-Marubeni International Ltd. on the Peace River. Technology-based limits were applied that were more stringent than water quality-based limits would have been, due to the large size (dilution capacity) of the Peace River. By setting limits according to pollution control technology, an added level of protection is achieved for the river system. Daishowa-Marubeni International Ltd.'s current limits for BOD are 26% lower than in 1992 and the TSS limits are 53% lower. Each of these mills is also required to conduct pollution prevention programs. Similar approval processes apply to the other pulp mills in Alberta.

The effluent loadings of the seven pulp mills in Alberta have been reduced as shown in Figure 2 (page 11). Data are shown for Total Suspended Solids (TSS), Biochemical Oxygen Demand (BOD), and Adsorbable Organic Halides (AOX) (a measure of chlorinated organic compounds).

"living document"

- the duration of the approval is sufficiently long to allow industry to plan in an orderly way to meet future requirements
- Alberta Environment has the flexibility to modify the requirements, if deemed necessary, during the life of the approval

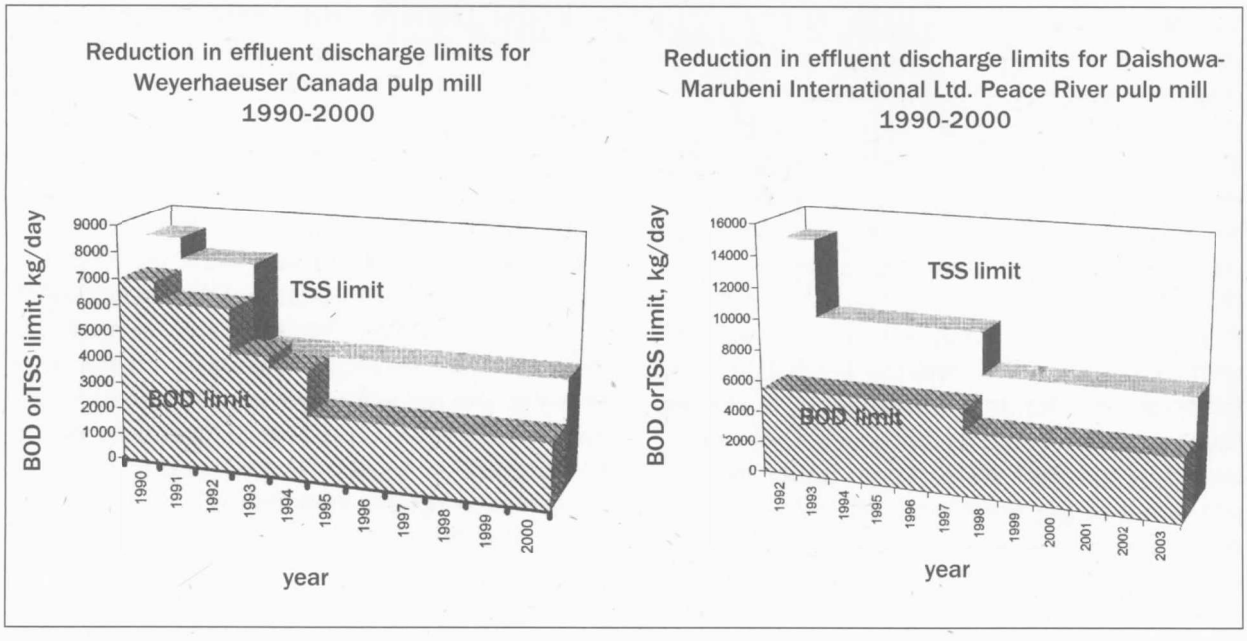


Figure 1 - The regulatory process in Alberta is contributing to pollution prevention by imposing more stringent limits on effluent discharges.

As shown in the figure, effluent loadings to the rivers declined during the period 1990 to 1998, although the total tonnage of pulp produced in Alberta more than doubled during the same time period.

Another industrial sector, oil sands operations, are required through their *Environmental Protection and Enhancement Act* approvals to report annually on initiatives to minimize and reduce all atmospheric emissions, such as nitrogen oxides (NO_x), from their mobile equipment and plant sources. Air emissions from the oil sands operations are a concern because the airborne deposition of compounds derived from sulphur dioxide (SO_2) or nitrogen oxides can acidify soil and water and damage vegetation. A NO_x/SO_2 subcommittee was created under the industry-led Cumulative Environmental Effects Management Initiative. The subcommittee encourages industry, government and public stakeholders to design and implement an air emissions management system. This system will establish environmental capacity guidelines, environmental management objectives, and an action plan to manage and control regional NO_x and SO_2 emissions associated with oil sands development.

Annual emissions of sulphur dioxide from the oil sands plants of Syncrude Canada and Suncor Energy for the period from 1989 to 1998 are shown in Figure 3 (page 12). Continuous improvements have been made at both oil sands plants. In particular, the Flue Gas Desulphurization unit installed at Suncor Energy and the improvements made to their upgrader plant have reduced sulphur dioxide emissions by over 60% from their previous annual average. Table 1 (page 12) shows that efficiency has increased at both facilities since 1989. Both Syncrude and Suncor have decreased the tonnes of SO_2 emitted per unit of petroleum product shipped.

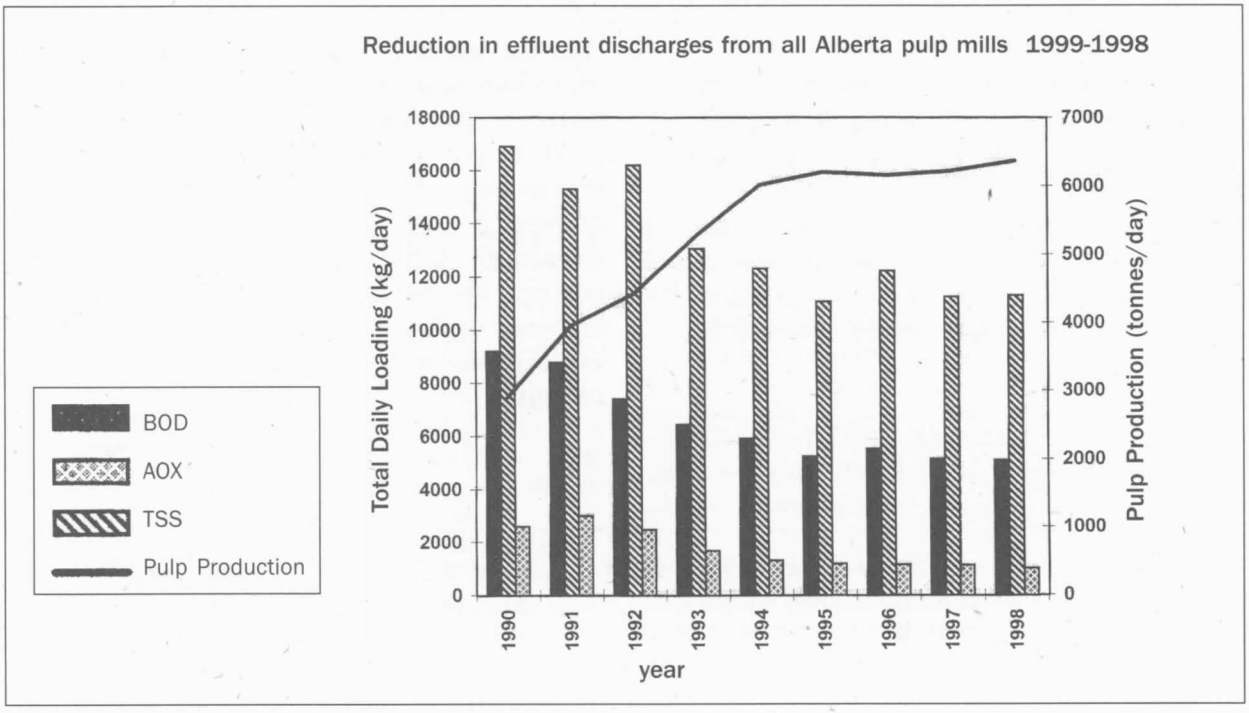


Figure 2 - Effluent loadings have declined while pulp production has increased.

Percentage change for the period 1990 to 1998

Total Suspended Solids	decreased by 33%	**Adsorbable Organic Halides**	decreased by 61%
Biochemical Oxygen Demand	decreased by 45%	**Pulp Production**	increased by 119%

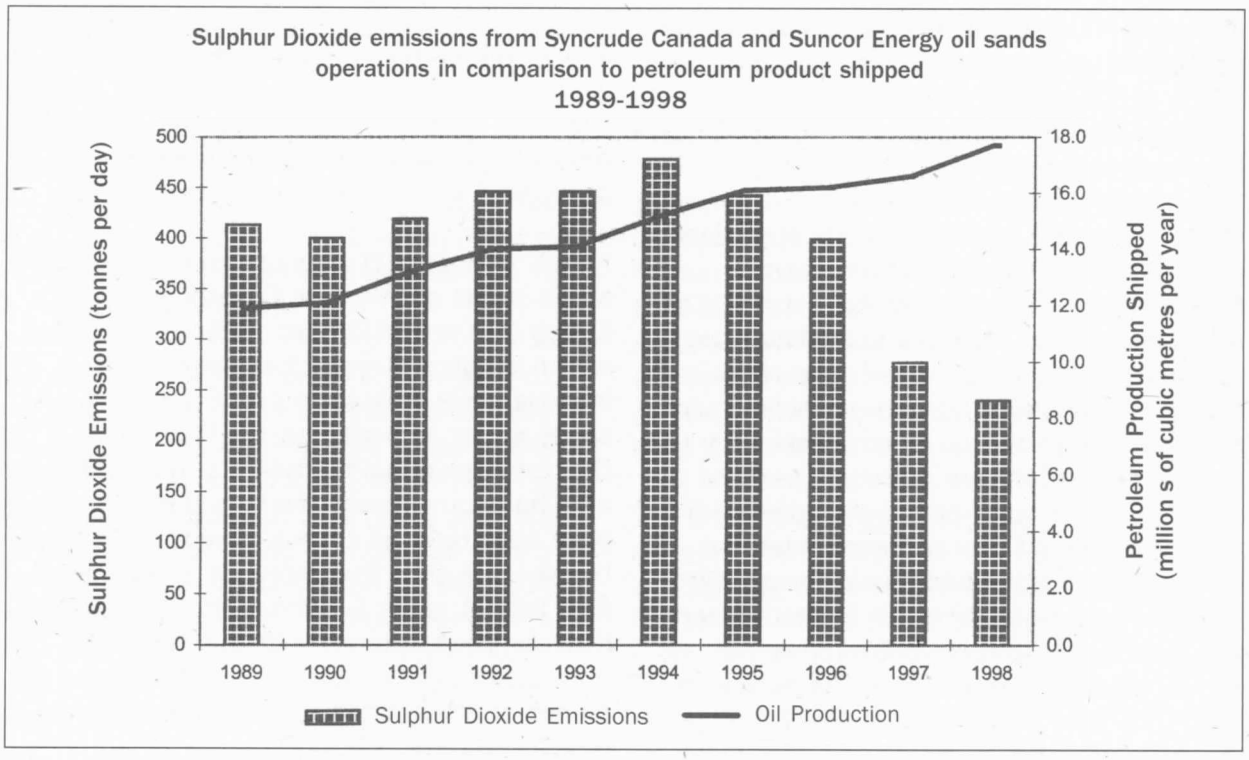


Figure 3 - Oil sands Sulphur Dioxide emissions have declined while petroleum product shipped has increased.

Oil sands tailings ponds currently cover large areas near the oil sands plants, and contain large volumes of contaminated water. The oil sands industry has initiated considerable research and development to minimize the toxicity and reduce the volumes of these conventional tailings ponds. A new process, consolidation of tailings, shows potential for pollution control.

Another pollution prevention initiative involves municipalities. Many small industries discharge chemical waste to municipal sewage systems, which can upset the operation of wastewater treatment plants and result in higher operating costs for the municipalities. Through the NREI, it is proposed to undertake a pilot project with an Alberta municipality that would lead to enhanced municipal bylaws to promote pollution prevention within a particular small business sector. If successful, the pilot project would be expanded to include other municipalities.

year	Syncrude SO_2 emissions per unit of petroleum product shipped (tonnes $SO_2/1000m^3$)	Suncor SO_2 emissions per unit of petroleum product shipped (tonnes $SO_2/1000m^3$)
1989	8.2	24.3
1994	7.6	22.1
1998	5.6	3.5

Table 1 - Alberta oil sands facilities have reduced emissions per unit of petroleum product shipped from 1989 to 1998.

NRBS Recommendation 1.2 (1996)

For contaminants;

a. The objective be achieved within ten years for persistent toxic substances, to eliminate their use, generation or discharge with respect to the northern rivers.
b. Implementation begin by "capping" direct loadings into the rivers of persistent toxic substances at 1996 levels.
c. An open, credible process be employed to:
(i) identify substances or test for substances within the category;
(ii) develop a timetable for a step down to elimination; and
(iii) determine ways in which the step down may be achieved. This should be accomplished with reference to the definition of persistent toxic substances and process contained in the Canada Toxic Substances Management Policy (June 1995).

Governments' response to the recommendation (1997)

The governments agree that elimination is the ultimate goal for persistent and bioaccumulative toxic substances, and note that work toward this goal has already been implemented for dioxins, furans and PCBs. Persistent toxic substances refer to those compounds that are toxic, accumulate in plants and animals, do not readily breakdown in the environment and originate as a consequence of human activities.

Direct loadings of dioxins and furans to the northern rivers have come mainly from bleached kraft pulp mills. In Alberta, the generation and discharge of these contaminants have been significantly reduced in the last several years as a result of technology improvements, specifically at the Weldwood plant at Hinton and the Weyerhaeuser plant at Grande Prairie. Further reductions are being sought from the Daishowa-Marubeni mill at Peace River. The Alberta Pacific mill near Athabasca does not have detectable amounts of these substances in its effluent. The net result is that direct loadings of these substances to the northern rivers will continue to decline, even from 1996 levels. NRBS studies have confirmed that levels of dioxins and furans have now been significantly reduced in fish tissue as a result of these improvements.

Toxaphene, a persistent toxic pesticide, was also reported by NRBS to occur in the food chains of the northern river basins. It probably reaches the basins by long-range atmospheric transport. The sources of this pesticide are external to the basins and believed to be external to Canada. Therefore, control of toxaphene will be pursued by Canada through international mechanisms (see Recommendation 1.5).

Mercury is bioaccumulative and persistent, and was detected by NRBS in several fish species at various locations throughout the basins. NRBS was unable to characterize any significant, single, point source of mercury. The governments commit to long-term monitoring of mercury and other contaminants in fish tissue and to the associated assessments of human health implications (see Recommendation 12).

The governments also note the concern expressed by the NRBS Board concerning polychlorinated biphenyls (PCBs). This class of contaminants is currently regulated and there are no known point sources in the northern basins. Therefore, the generation or discharge of these contaminants appears to have been eliminated. Nevertheless, Alberta and Canada will conduct further site-specific investigations of PCB contamination issues identified by NRBS (see Recommendation 13).

The objective of the federal *Toxic Substances Management Policy* is the virtual elimination of persistent, bioaccumulative, toxic substances. Alberta will use its *Environmental Protection and Enhancement Act* and its *Industrial Effluent Limits Policy* to implement reductions of these contaminants and to continue to progress toward elimination. Canada will use the *Canadian Environmental Protection Act*, the *Fisheries Act* and the *Toxic Substances Management Policy*.

The Alberta *Environmental Protection and Enhancement Act* process and the federal Policy both allow for public review and input to the regulatory control of such contaminants. Alberta reports on the effectiveness of effluent discharge regulation by issuing periodic data summaries entitled *Alberta Industrial and Municipal Effluent Quality Monitoring*.

NREI Progress Report (1998/99)

A number of policy, regulatory, monitoring and research actions have been undertaken with regard to persistent bioaccumulative toxic substances, as outlined below.

Policy/Regulatory Actions

In January 1998, all jurisdictions of the Canadian Council of Ministers of the Environment, including Alberta and the Northwest Territories, signed the *Policy for the Management of Toxic Substances*[1]. This initiative builds upon the *Canada Toxic Substances Management Policy (June 1995)*, and provides a coordinated approach for priority-setting and management of toxic substances.

A revised *Canadian Environmental Protection Act* (CEPA Bill C-32) received Royal Assent on September, 1999. The ability to deal with toxic substances under the new CEPA is enhanced by:

- implementing a fast-track approach to evaluation and control of toxics,
- ensuring that the most harmful contaminants are phased out,
- improving enforcement of regulations,
- providing "whistle-blower" protection, and
- enhancing effective cooperation with other governments.

In 1998/99, Alberta began an evaluation of its industrial point-source regulatory standards for a wide range of contaminants in reference to the requirements of other jurisdictions. As part of this evaluation, the best pollution prevention and control technologies now available will be assessed. Point source standards will be reviewed, and lowered where appropriate. A report on the evaluation is expected in 2000.

Under the Environmental Effects Monitoring (EEM) provisions of the *Canada Fisheries Act*, pulp mills are required to monitor and report on the impacts of their effluents on the receiving streams. A number of possible alternatives for further actions may be required depending upon the results of these studies. These alternatives include:

- development of remedial action plans,
- regulatory action (national or site-specific),
- revision of the EEM requirements, and
- implementation of further research and development programs jointly by industry and government.

Oxygen delignification and elemental chlorine-free bleaching are two process technologies available to bleached kraft pulp mills. Both of these technologies substantially reduce, or eliminate, the formation of dioxins and furans during the pulping process. Weldwood and Alberta Pacific Forest Industries already use these technologies. Weyerhaeuser Canada, in Grande Prairie, has elemental chlorine-free bleaching in place and the implementation of oxygen delignification is under review. In 1998, Daishowa-Marubeni International's approval was renewed under the *Environmental Protection and Enhancement Act*. It requires the company to install an elemental chlorine-free bleaching process by the year 2000. This pulp mill already uses oxygen delignification technology. In 1997 and 1998, levels of the regulated and most toxic form of dioxin (2,3,7,8-TCDD) were not detectable in effluents from the four bleached kraft mills in Alberta. The levels of furans at the mills have remained below the limit set by the federal government (50 parts per quadrillion). The three thermomechanical pulp mills in Alberta do not produce dioxins or furans in their pulping process. At the national level, the Canadian Council of Ministers of the Environment is working to establish Canada-wide standards for dioxins and furans present in soil, sediment, and biota.

Monitoring/Research Actions

In 1998, Alberta and Canada undertook further site-specific investigations of the PCB contamination issues identified by NRBS (see recommendations 10.3 and 13). Both governments and industry have conducted additional monitoring of sediments, fish, and effluent discharges to locate potential sources and to determine temporal trends of this contaminant. To date, no sources have been identified, but work on this initiative is continuing. As well, under the NREI, Canada and Alberta are conducting a study of persistent contaminants (PCBs, dioxin, furans, mercury, etc.) in fish. The study, which began in the fall of 1998, examines contaminant concentrations in fish resident in river reaches downstream of the pulp mills at Hinton and Grande Prairie. Contaminant concentrations will be compared with those observed during the NRBS studies.

Alberta Environment (AENV) uses ongoing river monitoring data to assess the effectiveness of its regulatory processes in protecting the rivers from persistent toxic substances. AENV maintains a large number of sites in the northern basins for water quality testing. In addition to ongoing testing for conventional variables (nutrients, metals, etc.), detailed scans for man-made trace organic contaminants (extractable and volatile priority pollutants, chlorophenolics, and pesticides) are being regularly conducted.

Persistent Bioaccumulative Toxic Substances: toxics that accumulate in plants and animals, do not readily break down in the environment, and which originate as a consequence of human activities.

The *Toxic Substances Management Policy* has two key management objectives:

- virtual elimination from the environment of toxic substances that result predominantly from human activity, and that are persistent and bioaccumulative
- management of other toxic substances and substances of concern, throughout their entire life cycles, to prevent or minimize their release into the environment

The ***Canadian Environmental Protection Act*** (CEPA) is intended to protect the environment and the health of Canadians from toxic substances and other pollutants. The Act requires the federal Ministers of the Environment and of Health to establish a ***Priority Substances List***. The Priority Substances List (PSL) identifies substances to be assessed, on a priority basis, to determine whether they pose a significant risk to the health of Canadians or to the environment. Assessments of the first 44 substances placed on the PSL were completed in 1994. In 1995, an additional 25 substances were added to the list and are now undergoing assessment. For substances that are determined to be toxic, management options are identified and implemented to reduce or eliminate the risks the substances pose to human health or the environment.

[1] For further information contact:
CCME Publications, c/o Manitoba Statutory Publications
Lower Level, 200 Vaughan Street, Winnipeg, MB, R3C 1T5
telephone 1-800-805-3025 email spccme@chc.gov.mb.ca

NRBS Recommendation 1.3 (1996)

For nutrients;

a. The objective be achieved within a reasonable period of time for nutrients, to eliminate or substantially reduce their discharge to the northern rivers, consistent with environmental management objectives.
b. Implementation begin by "capping" direct nutrient loadings into specific reaches of the rivers, as indicated by the Study's findings.
c. An open, credible process be employed to:
(i) identify environmental management objectives with respect to nutrients; and
(ii) develop a plan to reach those environmental management objectives.

Governments' response to the recommendation (1997)

The governments agree with the need for nutrient control and will continue to seek reductions in point-source discharges of nutrients. Through its *Environmental Protection and Enhancement Act* approvals process, and under the *Industrial Effluent Limits Policy (1995)*, Alberta is requiring pulp mills to develop and implement nutrient reduction programs.

Nutrients are added to pulp mill wastewater treatment systems to optimize microbial breakdown of organic wastes. There will, therefore, always be small concentrations of nutrients in effluents but the reduction programs will bring these amounts down to levels equivalent to those typically obtained by tertiary treatment.

The governments will develop water management plans for the long-term protection of these rivers which will include reach-specific objectives for controlling nutrients (see Recommendation 10.1). The development of these plans will include consultation with stakeholders and the general public.

To ensure the long-term protection of selected river reaches identified by NRBS, certain municipalities will also be required to implement tertiary treatment for nutrients. This requirement will be applied to Grande Prairie during its forthcoming *Environmental Protection and Enhancement Act* Approval renewal. The sewage treatment plant at Jasper townsite is also undergoing review and modification to improve nutrient control (see Recommendation 2.5). In the Northwest Territories, the NWT Water Board has issued environmental management objectives for municipal sewage discharges and sets site-specific requirements in water licences. The approval processes for controlling all of these discharges are open to the public.

The relationships between river biota and nutrient concentrations are very complex. The governments agree that such knowledge is a fundamental component of water management plans. Accordingly, Canada and Alberta have agreed to pursue joint research efforts to understand and quantify these relationships (see Recommendations 2.5 and 10.1). The federal government is conducting an extensive review of the impacts of municipal effluents and nutrients on Canadian aquatic ecosystems. The results of this review will be pertinent to the northern rivers and the development of water quality guidelines.

NREI Progress Report (1998/99)

The addition of nutrients to the rivers promotes the growth of plant material, which can contribute to a more productive biological community. Excessive plant biomass, however, may have a detrimental effect on oxygen concentrations and thus the ability of the rivers to support crucial biological processes, such as the maturation of fish eggs. Studies undertaken as part of the NRBS reported elevated nitrogen and phosphorus concentrations in the Athabasca River downstream of Jasper, Hinton, Whitecourt and Fort McMurray, and on the Wapiti River downstream of Grande Prairie. The NRBS studies also identified the need for reach-specific nutrient objectives for the northern rivers. The elevated nutrient concentrations identified by the NRBS coincided with increased benthic algal biomass and benthic invertebrate densities.

Current research being undertaken by Environment Canada and Alberta Environment through the NREI is examining whether these elevated nutrient concentrations are indirectly affecting dissolved oxygen concentrations to a degree that is detrimental to the rivers.

In 1999, the City of Grande Prairie announced plans to improve its treatment system to reduce both nutrients and organic discharges; these plans will be reflected in the city's wastewater approval renewal to be issued in the fall of 1999. Nutrient discharges from the Jasper townsite wastewater treatment plant will be reduced when the facility completes its upgrade to tertiary treatment standards in 2000.

Recent pulp mill approvals in Alberta have required the mills to conduct studies into ways to reduce or eliminate their industrial wastewater pollutants, including nutrients. Potential options include recycling, treatment, pollution prevention, or introduction of new technology and disposal techniques. Recent nutrient discharge rates from the five pulp mills on the Athabasca River are shown in Figures 4 and 5 (page 18). Although total nitrogen loadings have shown no particular trend from 1995 to 1998, total phosphorus loadings have increased during this period. Alberta Environment will continue to work with the pulp mills to evaluate all options for nutrient control. Further discussion of pulp mill-related nutrient discharges is included under recommendation 2.4.

In the Northwest Territories limits for nutrients, such as total nitrogen, are included in mining licences, and other nutrient limits are included in municipal water licences. The NWT Water Board has also established guidelines for industries releasing effluent into municipal wastewater systems.

As previously noted, the NRBS identified the need for reach-specific nutrient guidelines that reflect the particular flow conditions and level of industrial development on individual river reaches. Since the conclusion of the NRBS, considerable data collection and interpretation have been undertaken that are relevant to developing nutrient objectives. On the northern rivers, Alberta Environment has undertaken the following:

- conducted fall surveys of the Athabasca River for benthic algal biomass and water chemistry,
- conducted a cross-channel survey of benthic algal biomass (i.e. examined depth distribution) upstream and downstream of Whitecourt in fall 1997,
- conducted fall surveys of the Wapiti and Smoky rivers for benthic algal biomass and water chemistry in 1997 and 1998,
- undertaken a nitrogen assessment on the Wapiti River to assess the need for nitrogen removal from Grande Prairie sewage, and
- required all pulp mills to collect nutrient and benthic algal biomass data in addition to the federal Environmental Effects Monitoring program requirements.

Additional work in support of nutrient guideline development includes Alberta Environment's examination of long-term trends between nutrients and primary biological production in the Bow River, and the effects of agricultural nutrient inputs on streams in Alberta (undertaken under the *Canada-Alberta Environmentally Sustainable Agriculture Agreement*). In addition, Environment Canada has examined nutrient and plant biomass relationships in prairie rivers for the Prairie Provinces Water Board, and assessed the effects of nutrients on bacterial, algal and invertebrate abundance in northern British Columbia.

Under the NREI, Environment Canada is conducting several studies to provide scientific support for nutrient guideline development for the northern rivers, with the objective of preventing or minimizing "**eutrophication**". Building on the findings of NRBS, Environment Canada initiated a literature review and scientific assessment of the relationship between

Eutrophication:
the process whereby water bodies become biologically more productive due to an increased nutrient supply. This frequently results in oxygen depletion that can affect the survival of aquatic organisms.

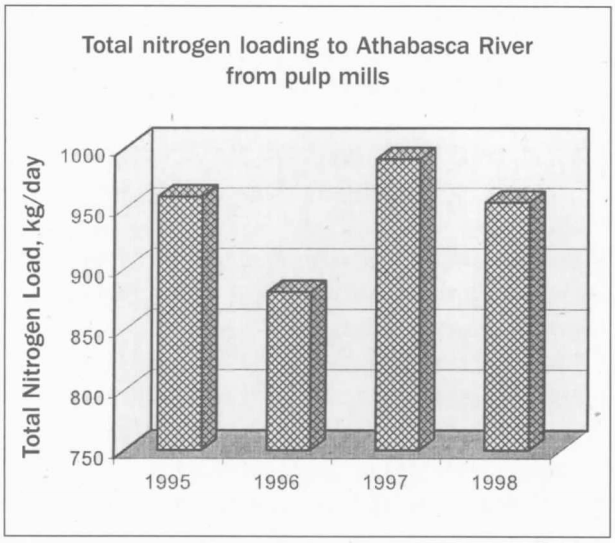


Figure 4 - Average nitrogen loadings have shown no specific trend during the period from 1995 to 1998

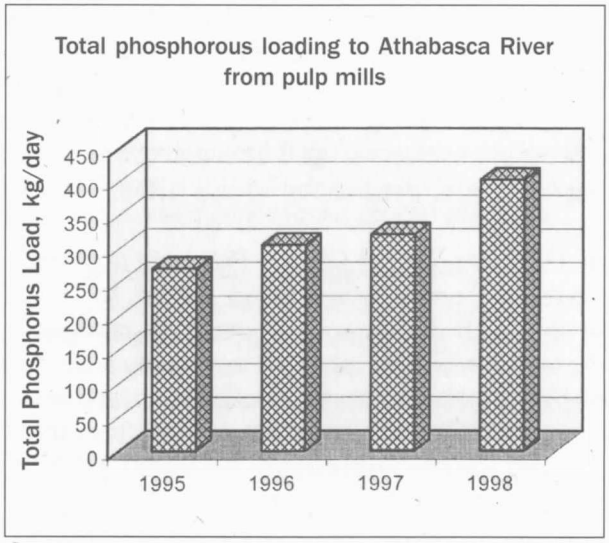
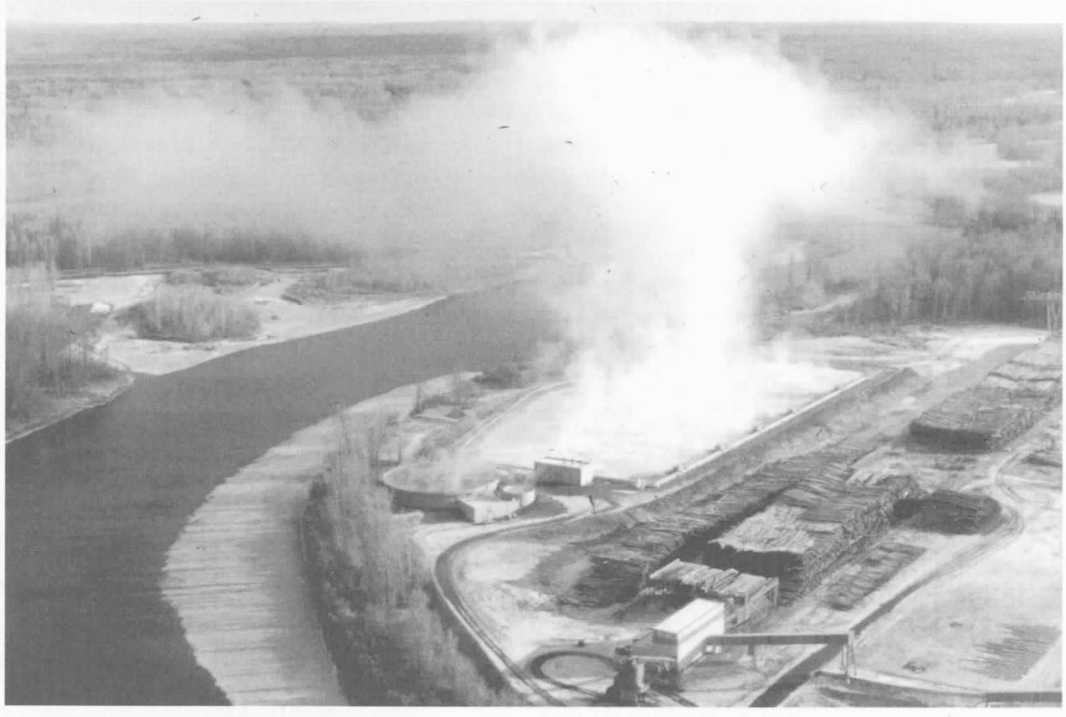


Figure 5 - Average phosphorus loadings have increased over the period from 1995 to 1998

nutrient concentrations and the resulting impacts on primary and secondary biological production in northern river systems. A final report on this study will be produced in spring 2000. As well, a four-year study was initiated on the Wapiti River to assess benthic algal growth in relation to water chemistry for forested, agricultural, or urban sites in the basin.

The federal government is also conducting an extensive review of the impacts of municipal effluents and nutrients on Canadian aquatic ecosystems. The objective of the review is to determine the degree to which nutrients resulting from human activities are causing negative environmental effects. Environment Canada leads the scientific study, which will be completed in the fall of 1999.



Steam rising from a pulp mill effluent treatment pond along the Athabasca River.

NRBS Recommendation 1.4 (1996)

For other wastes;

a. The objective be achieved within a reasonable period of time for other wastes, to eliminate or substantially reduce their discharge to the northern rivers.
b. An open, credible process be employed to develop a plan for achieving waste reduction or elimination.

Governments' response to the recommendation (1997)

The governments agree that other wastes should be restricted, with a view to reduction or eventual elimination of their discharge to rivers. Canada and Alberta have been pursuing this goal by placing high priority on the reduction of other wastes discharged from pulp mills. These wastes affect colour, odour and other aesthetic characteristics, and have been shown to negatively impact the use of receiving waters. For example, the older pulp mills (Weldwood and Weyerhaeuser) are presently on a compliance schedule to reduce the amount of colour in their effluents.

Continuing technological developments will allow further reductions in waste discharges from other industrial sectors. For example, technology is being developed in the oil sands industry that promises to reduce and eventually eliminate the existing large tailings ponds, and reduce existing discharges from plant operations. These reductions are also handled under the *Alberta Environmental Protection and Enhancement Act* approvals process, which allows for full public disclosure and input. The federal government is committed to work cooperatively with the provinces and industry to continue to pursue such reductions and to achieve improved waste management overall.

Canada and Alberta will soon complete a province-wide evaluation of agricultural impacts on the aquatic environment. This work was conducted under the *Canada-Alberta Environmentally Sustainable Agriculture Agreement*, which was a federal-provincial cost-shared program operating from 1992 to 1997. The program has yielded substantial information which can be used in the future to minimize water pollution from agricultural non-point sources. A successor program, called the *Alberta Environmentally Sustainable Agriculture Program*, will ensure that research continues on this topic.

NREI Progress Report (1998/99)

Discharges of other types of wastes to the northern rivers continue to be reduced through pollution prevention practices and technological upgrades at industrial and municipal treatment facilities (see Recommendation 1.1).

"Colour" discharges to the Wapiti River are being reduced by Weyerhaeuser Canada, as required under their *Environmental Protection and Enhancement Act* approval.

Since 1990, Alberta Environment has set increasingly stringent limits on colour discharges from this mill, as shown in Figure 6 on page 20. Colour discharge limits will be decreased by 87% between 1990 and 2007.

Weldwood of Canada upgraded their process technology in the late 1980s, and in 1993 switched to elemental chlorine-free bleaching to improve the environmental performance of the mill. Weldwood's renewed provincial approval, issued in 1998, also reduced the loading limits for both colour and chlorinated organics. Daishowa-Marubeni International Ltd. also received a renewed approval in 1998 that set more stringent limits for colour and chlorinated organics. These limits take effect in January 2000, the date by which the mill is required under their approval to convert to elemental chlorine-free bleaching. The Alberta Pacific mill already has more stringent limits on its discharges than other mills. Limits for the remaining pulp mills will be reviewed when their approvals are renewed over the course of the next decade.

In September 1996, the regulation of all waste management facilities, including those owned and operated by waste management companies, municipalities, and regional authorities, was transferred from the *Public Health Act* to the *Environmental Protection and Enhancement Act*, and became the responsibility of Alberta Environment. Municipal waste management facilities adhere to the *Code of Practice for Landfills* under the *Environmental Protection and Enhancement Act*. The Code outlines minimum requirements for the construction, operation, and reclamation of landfills to promote environmentally sound management practices. Included in the Code are specifications for landfill liners and leachate collection systems, proper run-off control systems, and ongoing monitoring to ensure containment of the wastes. In addition, the shift towards the development of regional landfills has reduced the number of small landfills operating without the safeguards required of the larger facilities.

Another source of potential pollutants in the northern river basins is the agricultural sector. The continued development and adoption of management practices and technologies that make the agricultural production and processing industries more environmentally sustainable is the objective of the Alberta Environmentally Sustainable Agriculture (AESA) program. AESA is an ongoing provincial program that relies on the partnership between Alberta Agriculture, Food and Rural Development (AAFRD), Alberta Environment, Alberta Health and Wellness and the private sector. The AESA initiative was announced in March 1997, after the conclusion of the five-year *Canada-Alberta Environmentally Sustainable Agriculture Agreement*.

"Colour":
the visible colour of a wastewater in comparison to a standard solution. Colour in water is a result of metal ions, naturally occurring materials, such as algae, leaves or bark, and industrial and municipal wastewaters.

As part of AESA, selected streams in the northern river basins and elsewhere in Alberta are being monitored to assess trends in stream water quality in relation to trends in agriculture. In 1999, AAFRD adopted water quality as a departmental performance measure; its goal is to maintain or improve water quality in agricultural watersheds. Alberta Environment has assisted AAFRD in the formulation and testing of a water quality index for agricultural streams. The index, applied to the AESA water quality database, will form the basis of this performance measure.

Another long-term commitment to water quality management is demonstrated by the new water quality *performance measure* reported annually by Alberta Environment. This is presented in *"Measuring Up,"* part of the Government of Alberta's Annual Report. The *performance measure* is presented as a water quality index calculated at key river locations throughout the province, and the target is to bring river water downstream of developed areas in line with upstream (i.e., more pristine) conditions by the application of appropriate regulatory controls.

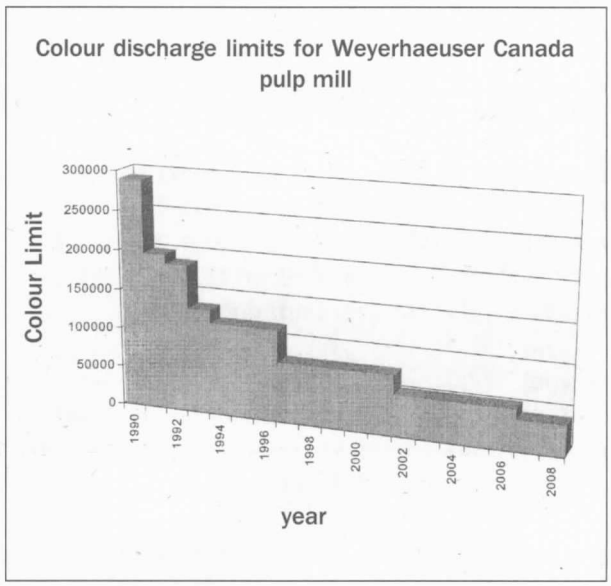


Figure 6 - Colour discharge limits are becoming increasingly stringent

NRBS Recommendation 1.5 (1996)

Regarding international agreements;

a. The Government of Canada should vigorously pursue the development of international agreements, treaties or protocols consistent with the elimination or reduction of the use, generation or discharge of airborne pollutants.

Governments' response to the recommendation (1997)

Canada is committed to addressing the transboundary movement of hazardous air pollutants and is involved in the management of chemicals through the 1991 *Canada-United States Air Quality Agreement*. Canada is also a participant in the *Partnership for Pollution Prevention* developed by the Organization of American States to advance continental action to reduce the atmospheric transport and deposition of lead and pesticides.

Through the United Nations Economic Commission for Europe's *Convention on Long-Range Transboundary Air Pollution*, Canada works towards the development of new protocols on persistent organic pollutants and heavy metals. The global management of persistent organic pollutants is being pursued through the *United Nations Environmental Program*.

Canada and Alberta are involved internationally in the sound management of chemicals as partners in the *North American Agreement on Environmental Cooperation* under the *North American Free Trade Agreement*.

NREI Progress Report (1998/99)

Canada continues to address transboundary air pollutants through a commitment to the 1991 *Canada-US Air Quality Agreement* and the *North American Agreement on Environmental Cooperation*. Hazardous air pollutants are being managed globally through the United Nations Environmental Program (UNEP). Canada has been actively working toward the development of an international *Convention on Persistent Organic Pollutants*, and hosted the first negotiating meeting to draft the Convention in the summer of 1998. Completion of negotiations for this global agreement are anticipated by 2000. Toxaphene, which was identified by the NRBS as a substance of concern, is one of the persistent organic pollutants that will be addressed under the Convention. North American action plans have been developed for PCBs, chlordane, DDT and mercury.

Specific to the North, Canada is a member of the eight-country circumpolar **"Arctic Council"**. Through the *Arctic Environmental Protection Strategy*, the Council is addressing subjects of common interest to the members, including long-range transport of airborne pollutants. Environment Canada and other federal departments participating in the Northern Contaminants Program are studying the effects of airborne chemical pollutants (such as mercury) reaching the Canadian Arctic. The Northern Contaminants Program is coordinated by Indian and Northern Affairs Canada. Scientific results from this program form Canada's contribution to the international Arctic Monitoring and Assessment Program, a component of the *Arctic Environmental Protection Strategy,* which monitors long-range transport of pollutants to all circumpolar nations.

The **Arctic Council** is an international forum which provides a mechanism to address the common concerns and challenges faced by the Arctic governments and the people of the Arctic. The members of the Council are Canada, Denmark, Finland, Iceland, Norway, the Russian Federation, Sweden, and the United States of America. The main activities of the Council focus on the protection of the Arctic environment, and on sustainable development as a means of improving the economic, social and cultural well-being of the north.

NRBS Recommendation 1.6 (1996)

And with respect to performance evaluation;

a. The Ministers and their governments make a report to the public in five years (after this Study) on the progress achieved in implementing these recommendations.

Governments' response to the recommendation (1997)

The federal and provincial governments regularly report on the state of the aquatic environment and pollution control effectiveness by means of interpretive technical reports, annual reports, performance measures, State-of-the-Environment Reports, and public meetings. These communication mechanisms will be continued and will cover actions taken in response to the NRBS recommendations. The task of addressing progress on the NRBS recommendations will also be referred to the Board to be constituted under the *Mackenzie River Basin Transboundary Waters Master Agreement* (see Recommendation 23).

NREI Progress Report (1998/99)

A final report will be prepared at the conclusion of the Northern Rivers Ecosystem Initiative in 2003. The Mackenzie River Basin Board, which was officially empowered in 1998, will also be reporting to the public by 2004 on the state of the aquatic ecosystem of the entire Mackenzie River Basin, including the Peace, Athabasca, and Slave rivers.

Athabasca River near Hinton

NRBS Recommendation 2:1 (1996)

The Government of Alberta and Canada initiate and complete the necessary studies to determine the winter dissolved oxygen requirement for fish and other aquatic species as per the CCME Guidelines Protocol, and subsequently assess the oxygen requirements for the organisms in the various reaches of the northern rivers.

Governments' response to the recommendation (1997)

Canada and Alberta have committed to develop a joint three-year research plan to further assess the dissolved oxygen requirements of aquatic biota, and initiated preliminary studies in March, 1997 on this issue. In the Athabasca River, benthic invertebrates at the location of lowest dissolved oxygen levels were monitored to gather direct information on the biological effects of winter dissolved oxygen conditions.

NREI Progress Report (1998/99)

Working with Alberta Environment, Environment Canada has developed a three-year work plan to assess the dissolved oxygen (DO) requirements of aquatic biota in the Smoky, Wapiti and Athabasca river systems. Through the NREI, Environment Canada will conduct research to determine if the current Canadian Council of Ministers of the Environment guideline of 6.5 mg/L is effective in protecting aquatic organisms in the northern rivers, particularly in specific river reaches identified by the NRBS. A key issue is to determine the DO concentrations necessary for the successful incubation of fish eggs. Another question to be addressed is whether spawning and rearing habitats downstream of effluent discharges are more at risk from contaminants when low dissolved oxygen conditions are present.

Initial studies were conducted on the Smoky, Wapiti, and Athabasca rivers during the past two winters to develop appropriate field study designs, test and validate field sampling methodologies, and select appropriate sampling locations for future field work. The studies also further evaluated the potential for using stable-isotope techniques for determining the sources of dissolved oxygen in these systems.

Building on information collected from the initial surveys, and using knowledge of the spawning locations for key fish species (such as mountain whitefish) in these river systems, a sediment and water column sampling program will be conducted next winter to assess the DO gradients. Sampling of bottom-dwelling organisms will also continue in order to assess the effects of low winter DO.

Winter sampling of invertebrates in the Athabasca River.

NRBS Recommendation 2.2 (1996)

Alberta adopt the CCME Dissolved Oxygen Guideline of 6.5 mg/L as an overall provincial approach in making decisions on future development proposals.

Governments' response to the recommendation (1997)

Alberta accepts this recommendation and is adopting the 6.5 mg/L guideline province-wide. It is noted that winter dissolved oxygen concentrations in the Athabasca River have met the existing *Canadian Council of Ministers of the Environment* guideline of 6.5 mg/L throughout this decade. The federal government also applies this guideline for use in the National Parks and the Northwest Territories.

NREI Progress Report (1998/99)

Alberta formally adopted the *Canadian Council of Ministers of the Environment* dissolved oxygen "**guideline**" of 6.5 mg/L in August 1997. This guideline may be adjusted if research currently being conducted by Environment Canada through the NREI determines that the 6.5 mg/L concentration limit is not sufficient to protect aquatic life in the northern rivers.

Guideline: numerical concentration limit, or narrative statement, recommended to protect aquatic life.

Objective: a numerical concentration limit or narrative statement that has been established to support and protect the designated uses of water at a specified site.

Alberta Dissolved Oxygen Guideline

Chronic (7-day mean): 6.5 mg/L
Acute (1 day minimum): 5 mg/L
The chronic guideline is increased to 8.3 mg/L from mid-May to the end of June to protect emergence of mayfly species into adults.
The chronic guideline is increased to 9.5 mg/L for those areas and times when embryonic and larval stages of some salmonids (from spawning to 30 days after hatching) develop within gravel beds.

NRBS Recommendation 2.3 (1996)

Throughout the basin, nutrient and biological oxygen demand monitoring be improved, especially for municipal sewage treatment facilities and some pulp mills. Standards for Quality Assurance /Quality Control requirements be enhanced for existing and future effluent licences and permits. These data be logged in a central database and linked to provincial water quality data.

Governments' response to the recommendation (1997)

The governments agree that monitoring, quality control, and data management are very important.

A large amount of performance data is available for municipal and pulp mill effluent treatment systems, so that governments now have a good understanding of the expected levels of biochemical oxygen demand and nutrients in these effluents. Alberta will examine these data regularly as nutrient management strategies are developed for the northern rivers and will improve effluent monitoring as required. Nutrient and biochemical oxygen demand monitoring in the northern river mainstems will also receive regular reviews and upgrades (see Recommendation 11).

A new data management system (ENVIRODAT) is being implemented by both Canada and Alberta. It will store effluent and surface water quality data together, thereby improving data access and sharing among all users. Ready access to stored quality assurance/quality control data is a feature of ENVIRODAT.

NREI Progress Report (1998/99)

As wastewater treatment facilities in the larger communities are upgraded to the **"tertiary treatment"** level, both the number of variables monitored in their effluent and the frequency of measurement will typically be increased. As well, the requirements of the federal Environmental Effects Monitoring Program have resulted in increased monitoring of in-stream effects of nutrients discharged by pulp mills.

To enhance the standard for Quality Assurance and Quality Control, Alberta is currently developing an *Analytical Data Quality Assurance Policy* to ensure data reliability through the accreditation of labs and analytical procedures. The policy will enable Alberta Environment to be confident that analytical data reported by industrial and municipal facilities are reliable and consistent with national and international standards.

The implementation of the ENVIRODAT data management system is mostly complete. ENVIRODAT is one of several modules within Alberta Environment's new computerized data system. This new data system currently stores inorganic and organic chemical data, as well as simple biotic measures, such as coliform bacteria counts and algal concentrations. The data system is intended to store more complex biological data, and this capability is under development. Wastewater information reported to the province on a monthly or annual basis is entered into a separate data system, the Water Data System, to check compliance with wastewater standards and to maintain historical records on performance. Opportunities for making federal and provincial data systems more compatible continue to be explored.

Tertiary wastewater treatment:
also known as "advanced treatment." Additional operations and processes are used to disinfect wastewaters and/or to remove constituents such as nitrogen and phosphorus that are not significantly reduced by secondary treatment.

NRBS Recommendation 2.4 (1996)

Phosphorus concentrations in pulp mill effluents be reduced to minimal levels. Alberta require pulp mills to monitor and assess their operations to ensure that phosphorus additions are not in excess of what is needed to minimize BOD of effluent.

Governments' response to the recommendation (1997)

Alberta is actively seeking nutrient reductions through the pollution prevention and minimization initiatives stipulated in pulp mill approvals under the *Environmental Protection and Enhancement Act*. The objective is to ensure that mills do not use any more phosphorus than is required to optimize the performance of their wastewater treatment systems (see also Recommendation 1.3).

NREI Progress Report (1998/99)

Nutrients such as phosphorus are added to pulp mill wastewater treatment systems to optimize microbial breakdown of organic wastes and to reduce the toxicity of the wastewater. The goal is to reduce the Biochemical Oxygen Demand (BOD) of the wastewater discharged and thereby maintain adequate dissolved oxygen levels in the rivers. Alberta Environment monitors winter dissolved oxygen concentrations in the Wapiti and Athabasca rivers on a continuous basis to ensure that water quality protection strategies continue to be effective.

Reductions in pulp mill BOD loadings to the Athabasca River have occurred as a consequence of improved wastewater treatment or process changes, even though pulp production has increased (see Figure 7). Alberta Environment's strategy to minimize BOD discharges, and thereby protect winter dissolved oxygen levels in the Athabasca River, has been successful. Winter dissolved oxygen concentrations in the Athabasca River upstream of Grande Rapids for the period 1989 to 1998 are illustrated in Table 2. The data indicate that dissolved oxygen concentrations have remained at or above the Alberta chronic Dissolved Oxygen Guideline of 6.5 mg/L.

To ensure the optimum balance between nutrient addition and adequate dissolved oxygen levels, Alberta Environment has requested the development of nutrient minimization plans in many pulp mill operating approvals issued under the *Environmental Protection and Enhancement Act*. These plans are required to demonstrate the reduction in the amount of nutrients, BOD, and toxicity in their effluents. Submission of the plans is required at staged intervals over the term of an approval to allow regular review of new technology and pollution prevention or control options.

A basin-wide evaluation of phosphorus loadings and dynamics will be initiated under the NREI to understand and improve our management strategies for nutrients. The use of a computer-based decision-support model will be an innovative feature of this project. As well, research being conducted by Environment Canada on nutrient-plant relationships in the northern rivers will provide the science necessary to support the development of reach-specific nutrient objectives.

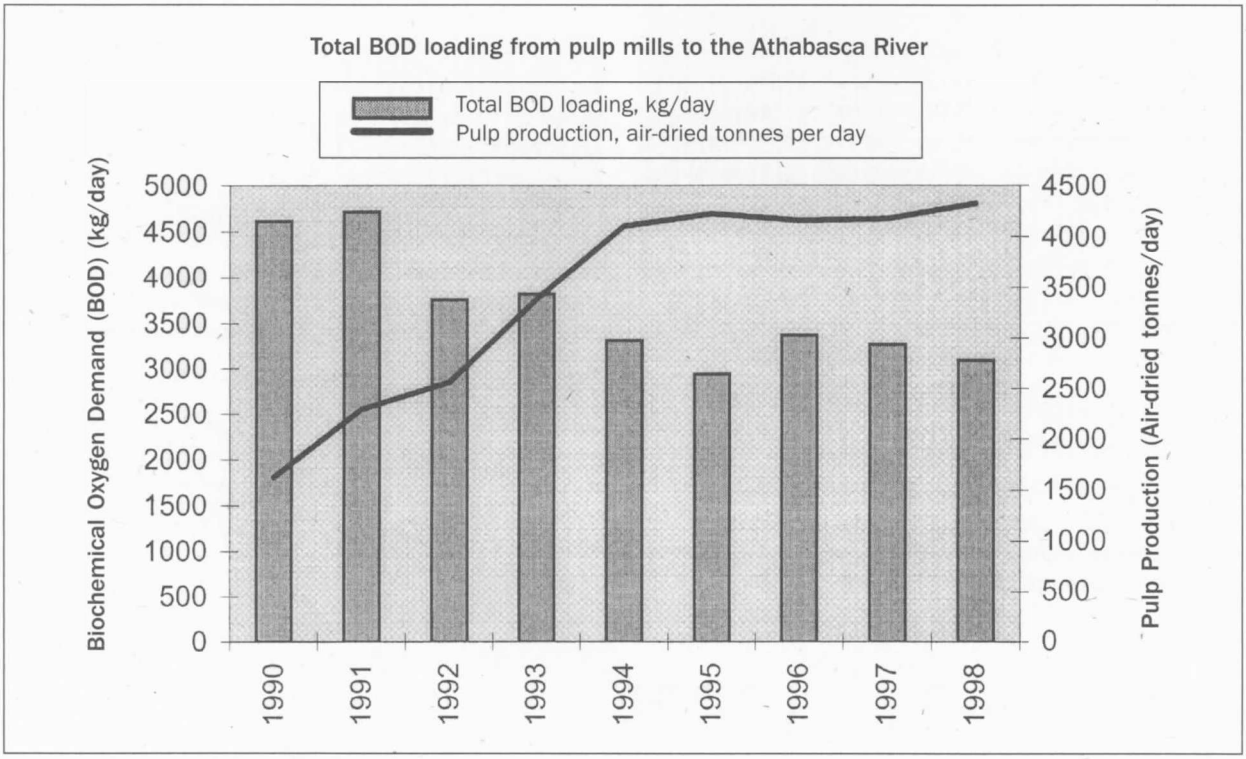


Figure 7 - BOD loading has declined substantially since 1990 while in the same period pulp production has increased from the five pulp mills on the Athabasca River.

Date of Absolute Minimum Hourly [DO] Each Winter	Minimum [DO] Concentration (mg/L)	Date Range	Minimum 7-Day Mean [DO] (mg/L)
March 1, 1989	6.89	March 1-7, 1989	7.06
March 24, 1990	8.15	March 20-26, 1990	9.19
February 8, 1991	7.75	February 3-9, 1991	8.19
February 24, 1992	9.44	February 14-20, 1992	9.62
February 5, 1993	6.42	February 4-10, 1993	6.58
March 5, 1994	6.70	March 1-7, 1994	6.84
February 22, 1995	7.26	February 20-26, 1995	7.38
February 24, 1996	7.95	February 19-25, 1996	7.99
January 21, 1997	8.77	January 20-26, 1997	8.94
February 13, 1998	9.56	February 10-16, 1998	9.62
Acute[1] guideline (5.0 mg/L)		Chronic[2] guideline (6.5 mg/L)	

Table 2 - Minimum winter dissolved oxygen concentrations [DO] in the Athabasca River upstream of Grand Rapids.

[1] "acute" guidelines are established to protect organisms during short-term exposure to specific environmental conditions
[2] "chronic" guidelines are established to protect organisms during long-term exposure to specific environmental conditions

NRBS Recommendation 2.5 (1996)

Municipal sewage effluent may require tertiary treatment to reduce phosphorus additions at certain locations. The Board recognizes the significant cost implications but emphasizes the importance of reducing phosphorus inputs over the long-term. Particular attention is drawn to the Wapiti /Smoky system at Grande Prairie, and to the inadequately treated municipal sewage entering the upper Athabasca River from the town of Jasper in Jasper National Park.

Governments' response to the recommendation (1997)

The governments agree with the importance of reducing phosphorus discharges at certain locations within the northern river basins. Alberta will require the City of Grande Prairie to implement tertiary treatment for phosphorus reduction at its municipal sewage treatment plant (see Recommendation 1.3).

Canada, in cooperation with the Jasper Town Committee, is currently designing a new sewage treatment plant for that community. Tertiary treatment for phosphorus has been agreed upon and the target date for completion of the plant is the winter of 1999.

Canada and Alberta will develop a joint research plan in the autumn of 1997 to further refine reach-specific water quality objectives used to regulate nutrient discharges in the Wapiti/Smoky and upper Athabasca river systems.

NREI Progress Report (1998/99)

Alberta Environment will issue an approval renewal under the *Environmental Protection and Enhancement Act* for the City of Grande Prairie Wastewater Treatment Plant in the autumn of 1999. This new approval, covering the period 1999-2009, will require the implementation of Biological Nutrient Removal technology to reduce phosphorus concentrations in the municipal effluent.

Heritage Canada is working to bring the Jasper townsite wastewater treatment plant up to the tertiary treatment level. Construction of the sewage treatment facility is scheduled to begin in the autumn of 1999, with completion by the end of 2000. The upgrades will reduce both nutrient and organic discharges to the Athabasca River.

Reach-specific water quality objectives, developed through Environment Canada research under the NREI, will be used to regulate nutrient discharges in the Wapiti, Smoky and upper Athabasca river systems. Further details are discussed under Recommendation 1.3.

NRBS Recommendation 3.1 (1996)

The federal, provincial and territorial governments increase their efforts in the smaller communities to educate facility owners regarding the need to properly operate the water treatment facilities including the use of the existing programs for operator training, certification and assistance.

Governments' response to the recommendation (1997)

The governments acknowledge that a concerted, ongoing effort is required to educate operators and maintain drinking water facilities in small communities. The governments will work together to maximize efficiency in this regard. Alberta will maintain its programs of communication, assistance, training, and certification for operators. As well, Alberta will continue to work with the Plant Operator's Association in the preparation of an operator's manual for small treatment systems.

Canada will provide assistance for First Nations to run training and certification programs. Canada will continue to assist First Nations with the monitoring of water quality and with advice on human health. The Government of the Northwest Territories will cooperate with associations such as the NWT Water and Wastewater Association to raise the standard and expertise for operator training and certification.

NREI Progress Report (1998/99)

Health Canada, Alberta Environment, and Alberta Health and Wellness are working cooperatively to train qualified water treatment plant operators and, where necessary, to upgrade water treatment plant systems in off-reserve communities in northern Alberta.

Drinking water and wastewater facilities for First Nations' communities, depending upon their location, are either owned and operated by the community, or managed in agreement with adjacent municipal governments. Indian and Northern Affairs Canada (INAC) has been working cooperatively with First Nations and with municipal governments to provide training to facility operators.

For First Nations communities in northwestern Alberta, INAC and the North Peace Tribal Council created a "Circuit Rider" program in 1997 to deliver on-site training to community water treatment plant operators to ensure they meet provincial standards. In northeastern Alberta, a series of individual agreements have been negotiated among INAC, First Nations and the Municipal District of Wood Buffalo to operate water treatment plants, monitor drinking water quality, and provide training for treatment plant operators in First Nations communities.

The Government of the Northwest Territories has contracted the NWT Water and Wastewater Association to deliver training programs to water treatment plant operators in northern communities. As well, INAC district staff work with smaller communities with regard to the requirements of water licences and the best practices for minimizing water-related health problems.

NRBS Recommendation 3.2 (1996)

The federal, provincial and territorial governments ensure that there are adequate treatment facilities, equipment and operating standards for their constituents.

Governments' response to the recommendation (1997)

The governments agree with this recommendation and will work closely with local governments and First Nations to ensure this is always the case.

NREI Progress Report (1998/99)

Drinking water quality in Canada is measured in terms of compliance with the latest edition of the *Guidelines for Canadian Drinking Water Quality*. Compliance with these guidelines is a function of system design and the competency of water treatment plant operators.

Health Canada, Alberta Environment, and Alberta Health and Wellness are currently assessing all existing water systems in northern Alberta to determine where improvements are needed, and to address operator training needs.

In cooperation with First Nations and municipal governments, Indian and Northern Affairs Canada in Alberta has strengthened its capital planning and allocation activities. Within the last several years, new drinking water and wastewater treatment facilities have been built at Chipewyan Prairie and Garden River. Existing facilities at Fox Lake are being expanded and upgraded to meet present standards. Other facilities are currently being planned for construction or improvements, such as those in the community of Fort McKay. The Mikesew Cree at Allison Bay on Lake Athabasca are cost-sharing the installation of drinking water and sewage systems with Indian and Northern Affairs Canada, and will operate and maintain the new systems.

NRBS Recommendation 4 (1996)

The proposed Alberta *Water Act* make specific provision for the integration of water quantity and water quality planning and administration.

Governments' response to the recommendation (1997)

The governments concur with this recommendation. The new Alberta *Water Act* includes provisions that recognize the importance of integrating water quantity and water quality planning and administration, and therefore addresses this concern.

NREI Progress Report (1998/99)

Alberta's *Water Act* came into force on January 1, 1999. The Act broadens the focus of water management to address multiple uses. It upholds existing commitments to water users, while including provisions that promote water conservation, protect water quality and ecological requirements, and allow for more flexible water management. Fundamental to the *Water Act* is the recognition that the protection of the aquatic environment is an important element of sustainable water management.

Under the Act, the Minister of Environment must establish, by 2002, a *Framework for Water Management Planning*, and a *Strategy for the Protection of the Aquatic Environment*. This Strategy will reflect the government's commitment to maintaining, restoring, and enhancing the aquatic environment throughout the province. The anticipated completion date is 2000. The integration of water quality and water quantity requirements will be crucial in the implementation of the Strategy.

It is through these Framework and Strategy initiatives that water management plans will be developed to provide long-term protection of the northern rivers. Public review of the Framework and Strategy began in June 1999. Water management plans will subsequently be developed, as required, to support effective resource management.

NRBS Recommendation 5 (1996)

The Government of Alberta provide leadership in water management planning incorporating, as a first priority in the water management process, instream flow needs for ecological purposes in the northern rivers and their tributaries within the province.

Governments' response to the recommendation (1997)

Alberta commits to providing such leadership. The commitment is demonstrated in specific provisions of Alberta's new *Water Act* which call for the development of water management plans that incorporate aquatic environmental protection strategies. Instream flow needs for the protection of biological communities will be incorporated as a high priority in the planning.

NREI Progress Report (1998/99)

The development of a *Strategy for the Protection of the Aquatic Environment*, including instream flow needs, is a requirement under Alberta's *Water Act* (see Progress Report for Recommendation 4).

Athabasca River near Chisholm

NRBS Recommendation 6 (1996)

Jurisdictions of the northern river basins strengthen and publicize inspection and enforcement activities with respect to protection of water quantity and quality.

Governments' response to the recommendation (1997)

The NRBS Board found that basin residents were not fully aware of the range of inspection and enforcement activities already being undertaken by governments. The governments agree that enforcement of environmental laws is very important. Under federal and provincial laws several enforcement tools are used to accomplish this including: tickets, enforcement orders, administrative penalties, prosecutions, and cancellation of approvals or certificates.

The governments endorse the publicizing of enforcement actions taken and note that both the federal and provincial governments publish annual reports on this topic. In the Northwest Territories the federal government makes inspection reports relating to water licences available to the public on request. The three governments will develop improved mechanisms to inform the public.

NREI Progress Report (1998/99)

Canada and Alberta have agreements in place that ensure minimal duplication in the enforcement of federal and provincial environmental laws. These agreements provide for the free exchange of enforcement and inspection information between the two governments. The revised *Canadian Environmental Protection Act*, which was proclaimed in September 1999, contains strengthened enforcement powers for federal environment officers.

Information on the enforcement of Alberta's *Environmental Protection and Enhancement Act* has been made public on an ongoing basis. The first comprehensive report for the period from September 1, 1993 to December 31, 1995 was published in April 1996. Since then, reports have been released annually. These reports contain specific information on all tickets, warning letters, administrative penalties, prosecutions, enforcement orders, environmental protection orders and contaminated site designations that were issued. News releases are issued with each enforcement order and environmental protection order. In addition, the public is advised once the courts have issued their decision on environmental prosecutions.

In the Northwest Territories, Indian and Northern Affairs Canada water resource officers file annual compliance reports with the NWT Water Board, which has a public registry. Any written directions from inspectors are also on file in the registry.

In May 1998, a new organizational unit, the Compliance Division, was created in Alberta Environment. The Division is responsible for developing a framework for a compliance assurance program for the entire department. In addition, the Compliance Division will track all compliance and enforcement initiatives that are undertaken within the department and report publicly each fiscal year; the first comprehensive report will be released to the public in 2000.

Reports provided by industry to governments, such as spills reports, the National Pollutant Release Inventory, and the federal Environmental Effects Monitoring interpretive reports, are publicly available.

The results of compulsory industry monitoring are important to Alberta Environment. The monitoring results verify the general environmental performance of an industrial operation. The results also help the department assess compliance with specific performance requirements. It is a serious offense to fail to provide the required monitoring information or to provide false information.

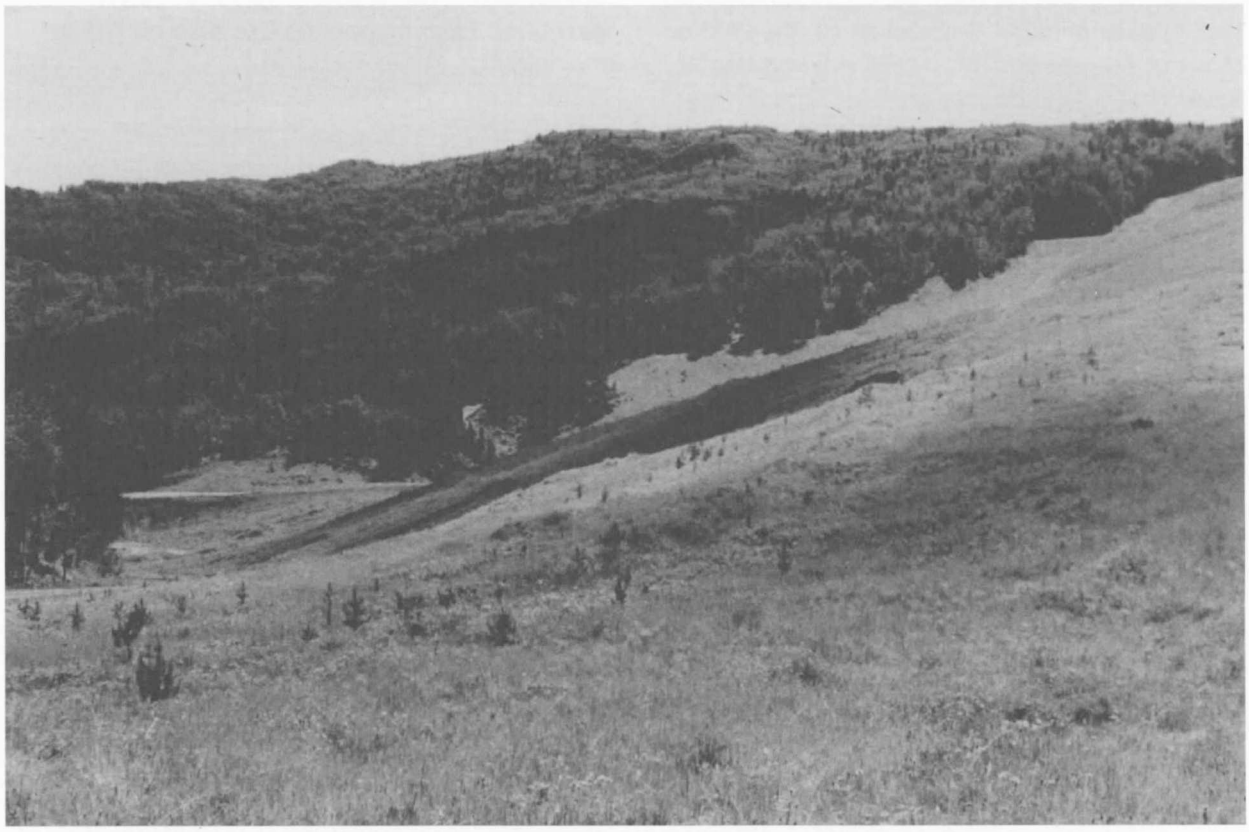
Alberta Environment undertakes the following Quality Assurance and Quality Control activities related to compulsory monitoring data provided by industry:

- establishes specific monitoring protocols, the *Alberta Stack Sampling Code* and the *Air Monitoring Directive*, for example,
- undertakes spot audits of industry monitoring,
- undertakes monitoring programs to verify industry data,
- reviews industry Quality Assurance and Quality Control procedures,
- reviews compulsory monitoring data for anomalies or inconsistencies, and
- takes action immediately to address monitoring reliability issues including enforcement action, if appropriate.

These activities, combined with the internal Quality Assurance and Quality Control activities of industry, will ensure the credibility of the overall industry compulsory monitoring programs.

Additional information can be found in the following documents:

- *Summary of Alberta industrial effluent quality monitoring 1990-1995*. Environmental Regulatory Service, Environmental Assessment Division, Source Standards Branch, Alberta Environmental Protection. April 1996
- *Summary of Alberta limits and monitoring requirements (wastewater discharges)*. [Environmental Regulatory Service, Environmental Assessment Division, Standards and Guidelines Branch, Alberta Environmental Protection. September 1996]



Re-vegetated slope at a coal mining operation in the northern river basins.

NRBS Recommendation 7.1 (1996)

The governments of Canada, Alberta and British Columbia implement an action plan for reclamation of the Peace-Athabasca Delta, the plan to include provisions for environmental impact assessment and public consultation with delta residents and with those that might be affected downstream, such as at the Slave River Delta.

Governments' response to the recommendation (1997)

The governments agree to the long-term protection of the ecologically important deltas of the northern river basins. Furthermore, governments recognize their societal importance. NRBS studies identified several deficiencies in our understanding of the ecological effects of flow regulation and of hydrologic-climatic interrelationships.

Canada and Alberta, in concert with First Nations and BC Hydro, released the final report of the *Peace-Athabasca Delta Technical Studies* in March, 1997. Based on these results and those of the NRBS, Canada, Alberta, and BC Hydro in partnership have initiated a follow-up study to specifically assess the hydrological and climatic conditions in 1996 that resulted in two significant floods of the delta. Based on the findings of all studies, Canada and Alberta will work with stakeholders to develop appropriate action plans for management and research which will include environmental evaluations and public consultation.

NREI Progress Report (1998/99)

Periodic flooding of the northern river deltas is essential to sustaining their ecological health and productivity. During both 1996 and 1997, the Peace-Athabasca Delta received floodwaters which followed a protracted period of drying that began in 1975, following construction of the Bennett Dam. Understanding how the delta will respond to "re-watering" is important for the development of future management plans. Ducks Unlimited Canada, in partnership with BC Hydro and Environment Canada, has conducted population surveys of migratory waterfowl in the Peace-Athabasca Delta during 1998 and 1999 to assess the response of waterfowl to the flood events. The information will help to determine if these species can be used as indicators of delta ecosystem health.

The NRBS and the complementary investigations of the *Peace-Athabasca Delta Technical Studies* (coordinated by Heritage Canada) concluded that further research was necessary to understand the complex interactions between the climate, hydrology, flow regulation, and ecology of these deltas. To this end, four inter-related studies are being conducted under the NREI by Environment Canada with the assistance of Alberta Environment and BC Hydro. The studies will examine:

- the relative roles of climatic variability and flow regulation and how they affect the Peace-Athabasca Delta ecosystem,
- the response of delta vegetation to variations in water level and soil moisture conditions,
- the factors affecting physical changes in the Slave River Delta, and
- the climate-hydrology interactions that trigger flooding of the deltas.

NRBS Recommendation 7.2 (1996)

As a principle for any future negotiations on mitigation of the impacts of the Bennett Dam, that the dam's operating regime be modified to help rehabilitate the Peace-Athabasca Delta and the riparian and aquatic conditions of the Peace River system. Further, that economic considerations of power production from this industry should not take precedence over the environmental stability and natural ecosystem of the Peace River, Peace-Athabasca Delta, Slave River and Delta and the Mackenzie River system.

Governments' response to the recommendation (1997)

The governments agree that the operating regime of the Bennett Dam must consider downstream impacts. Alberta has been negotiating with British Columbia on water management issues in the Peace River for over a decade, particularly with regard to operation of the Bennett Dam. This has had some benefit in terms of mitigating impacts on the town of Peace River and on winter ice bridges along the river. More recently, there has been co-operation in operating the dam in such a way as to enhance spring flows in the Peace-Athabasca Delta with the hope of flooding the unique "perched" basins.

The governments will continue negotiations with the province of British Columbia to mitigate the effects of the Bennett Dam on downstream ecosystems. Any mitigation for the Peace-Athabasca Delta will require careful consideration of the results of all studies, as noted above for Recommendation 7.1 .

NREI Progress Report (1998/99)

In 1998, the *Mackenzie River Basin Transboundary Waters Master Agreement* was signed by Canada, Yukon, Northwest Territories, Saskatchewan, British Columbia and Alberta. This agreement commits the jurisdictions to negotiating **"bilateral agreements"**. Alberta and British Columbia have started their negotiations. Issues related to the Bennett Dam are being discussed.

In addition, studies are under way to examine the role of climatic variability, flow regulation and hydrology that trigger the flooding of the delta. These studies will explore the potential to enhance flooding of the delta by altering operations of the Bennett Dam.

Bilateral Agreements:
As a requirement of the MRBTWMA, each of the pairs of jurisdictions that share a common border in the Mackenzie River Basin are negotiating individual side agreements that will address transboundary water resource management issues.

NRBS Recommendation 8 (1996)

Formal arrangements be made to ensure that land use planning and water use planning are integrated as basin management planning throughout the northern river basins;

a. The effects on surface waters and the mainstem rivers of agriculture, forestry, oil and gas activities and other land clearing be reviewed on a continuing and comprehensive basis;
b. All aspects of land use activities be scrutinized including land clearing, road building, channelization, revegetation, use of fertilizers and biocides and waste disposal;
c. Attention be given to groundwater levels, flow patterns in tributary streams and the integrity of fish spawning areas; and
d. Compounding effects of potential climate change and of atmospheric sources of contaminants be considered as important elements of context.

Governments' response to the recommendation (1997)

The governments agree with these recommendations and note that such formal planning arrangements have now been set out in the Alberta's recently passed *Water Act*. As noted in the response to recommendation 1.1, land use effects (as non-point source inputs), local atmospheric deposition, and long-range transport of air pollutants, are specifically acknowledged as important elements of aquatic ecosystem planning and protection.

Alberta is committed to integrating its natural resource management decision-making. This commitment is supported by the corporate structure of Alberta Environment which includes lands, forests, parks, fish, wildlife, water, air and water approvals, and pollution control enforcement. Canada conducts integrated planning as part of its strategy to manage Wood Buffalo and Jasper National Parks.

Further research is needed to fully understand the ecological effects of land use changes. Governments commit to work with industry and other stakeholders to identify priority research needs. In addition to the Northern Forest Research Centre in Edmonton and forestry research at the Alberta Research Council, Vegreville, Canada and Alberta are supporting the Foothills Model Forest, and the Network Centre of Excellence in Sustainable Forest Management at the University of Alberta. Other research programs at the National Hydrology Research Institute, Saskatoon, and at the Forest Engineering Research Institute of Canada, Vancouver, are continuing forestry-related research in these basins. Alberta has commissioned the *Alberta Forest Conservation Strategy*, and has established a Forest Management Science Council to advise on the best management of forests. Recommendations have been received from these two initiatives and are under consideration.

NREI Progress Report (1998/99)

In 1999, the Government of Alberta adopted a formal policy with regard to sustainable development, entitled *Alberta's Commitment to Sustainable Resource and Environmental Management*. The objectives outlined in the policy will be achieved through a process termed "Integrated Resource Management," an interdisciplinary and comprehensive management approach that recognizes the interdependence of all natural resources. The management approach supports the development of "regional strategies" throughout the province. A new Ecological Landscape Division in Alberta Environment will lead the implementation.

The governments acknowledge the significant interest in the development of Alberta's oil sands. With the active participation of stakeholders, they have developed a regional strategy to sustain resource development. The purpose of this *Regional Sustainable Development Strategy for the Athabasca Oil Sands Area* (RSDS) is to ensure implementation of management approaches that:

- address regional cumulative environmental effects,
- use appropriate monitoring techniques,
- employ resource management science,
- identify knowledge gaps, and
- recommend the research required to address identified gaps.

The RSDS addresses 14 resource themes, including groundwater and surface water quality and quantity. To protect the environment and quality of human health as it relates to the environment, the RSDS will become a management tool that keeps pace with new information, science and technology. A related NREI initiative involving Environment Canada, Alberta Environment, the University of Alberta and Ducks Unlimited Canada is using satellite imagery to establish a landcover classification inventory for the oil sands area.

To address air quality management issues, the Government of Alberta established the Clean Air Strategic Alliance (CASA) in 1991 as a multi-stakeholder committee reporting to the Ministers of Environment, Resource Development, and Health and Wellness. Coordination of monitoring and evaluation of issues related to environmental impacts on air quality and human health is an integral part of CASA's activities. Further, a human health and air quality monitoring framework for Alberta has been developed by CASA, and was forwarded to the appropriate provincial departments and their partners in June, 1999, with a recommendation that the framework be considered for funding and implementation.

Mercury was identified as a substance of concern by the NRBS. In 1997, the Canadian Atmospheric Mercury Monitoring Network (CAMNet) was initiated. This research program was formed to address questions around the spatial and temporal variability of gaseous mercury on a national scale. In addition, studies of atmospheric transport, transformation, and deposition will supplement the basic network. Under the NREI, Environment Canada will conduct research to determine man-made versus natural sources of mercury and the relative contribution of atmospheric inputs of mercury to the aquatic ecosystem.

The Government of Alberta announced two initiatives in 1998 to deal with issues surrounding the expansion of the agricultural sector, and in particular with intensive livestock issues. The first initiative, a scientific evaluation entitled *The Assessment of Potential Environmental Effects of Livestock Expansion in Alberta*, was undertaken to assess the environmental implications of developing a $10 billion pork/beef industry and a $20 billion processing industry. The study was conducted on a provincial scale, and the report was released during the summer of 1999. The second initiative was a detailed review of regulatory options for ensuring the environmental sustainability of intensive livestock operations. An Intensive Livestock Regulatory Review Process is headed by a stakeholder advisory committee. The committee has developed a regulatory framework that is intended to become legislation during the fall 1999 sitting of the Alberta Legislature. The framework is accompanied by a Standards Document that identifies operational regulations for the industry. The Standards Document is being prepared by an Expert Committee consisting primarily of industry and university technical experts. A preliminary draft of the framework was circulated for public review in January 1999. Feedback has been incorporated into the revised draft which, along with the Standards Document, underwent final public review during the summer of 1999.

A number of actions are under way with respect to the impacts of forestry in the northern river basins:

- in October 1998, Alberta released a policy statement on forests, the *Alberta Forest Legacy*, which built upon the *Alberta Forest Conservation Strategy* and other public policy review initiatives. It supports an adaptive ecological management approach to forest management that encompasses both terrestrial and aquatic values.

- Alberta Environment released a comprehensive planning manual for forestry entitled the *Interim Forest Management Planning Manual*, which supports incorporation of watershed and fisheries considerations into forest management planning. Forest Management Agreement holders are applying the

principles in the manual as they prepare their detailed forest management plans.

• the Alberta Forest Biodiversity Monitoring Program is developing ecological indicators for a long term monitoring program that will measure the success toward the goal of sustainable development in Alberta's forests.

Several forestry research programs have begun to show substantial results:

• the Network Centre of Excellence in Sustainable Forest Management (centred at the University of Alberta) held a major conference in Edmonton in February 1999. Numerous papers reported on the effects of forest fires and timber harvesting on water quality, biodiversity, and other non-timber resources.

• the Terrestrial and Riparian Organisms, Lakes and Streams program at the University of Alberta is funded by the governments of Alberta and Canada, and by the forest industry. It is investigating the implications of forested buffer strips adjacent to lakes and streams on terrestrial and aquatic biological communities.

• Alberta Environment, Alberta Research Council, the forest industry, the energy industry and the Alberta Conservation Association have established a partnership to develop the Northern Watershed Program. The program is examining the relationship between watershed landscape characteristics and aquatic communities to help resource managers understand the impact of land-use activities. The program is also measuring natural disturbance and forest structure in riparian areas. Another component is developing empirical and simulation models of the cumulative impact of land-use activities on aquatic systems.

• the Alberta Research Council is conducting research comparing forest fires and forest harvest differences in their effects on biodiversity at a stand level. Through an NREI study, Environment Canada and the Alberta Research Council are examining the impacts of various forest harvesting methods on the biological integrity of the boreal forest.

NRBS Recommendation 9 (1996)

The government of Canada, the Northwest Territories, Alberta, British Columbia and Saskatchewan exercise their legislative powers to the fullest in preventing major diversions of basin water outside of the northern river basins.

Governments' response to the recommendation (1997)

Canada, Alberta, and the Northwest Territories will exercise their powers to the fullest to prevent major diversions of water out of the basin. In Alberta, the recently passed *Water Act* prohibits the transfer of water between major river basins. Also, the *Federal Water Policy (1987)* prohibits the export of water through inter-basin diversions.

NREI Progress Report (1998/99)

As noted above, Alberta's *Water Act* prohibits the transfer of water between major river basins. Similarly, it prohibits the export of water. The federal government, the provinces and territories have initiated discussions on a strategy to prohibit the bulk removal of water, including water for export, from Canadian watersheds.

NRBS Recommendation 10.1 (1996)

The Ministers direct action to be undertaken to protect the Smoky and Wapiti Rivers from further dissolved oxygen, nutrient and contaminant stress, and undertake to develop and apply reach-specific guidelines and associated regulatory requirements relevant to the small size of these rivers.

Governments' response to the recommendation (1997)

The governments concur with this recommendation and acknowledge the need to carefully manage water quality in this river system. Alberta has obtained reductions in loading to the Wapiti River for several contaminants, and is working with the City of Grande Prairie and the Weyerhaeuser pulp mill on further reductions. Any new developments on the Wapiti/Smoky River system will be subject to stringent discharge restrictions and will have to work with the existing facilities to ensure that water quality is protected. In 1997, Alberta will initiate the development of a water quality management strategy for the Wapiti River, which will include reach-specific objectives for nutrients. Alberta is also preparing updated provincial water quality guidelines for other pollutants, which will be stringent enough to protect aquatic life in all rivers. Canada and Alberta, in cooperation with industry, will conduct further studies on the relationship among nutrients, dissolved oxygen, contaminants, and the biota in these systems.

NREI Progress Report (1998/99)

Alberta has initiated the development of a water management plan for the Wapiti River. Alberta's *Water Act*, proclaimed in January 1999, enables the province to develop water management plans that may include an integrated approach to planning for water, land and other resources. Work has been initiated to define the scope of the plan, membership of committees and water issues in the basin. The plan will evaluate the application of reach-specific water quality objectives for nutrients. This component will use information from Alberta Environment's monitoring programs on the Wapiti and Smoky rivers as well as new research being conducted by Environment Canada under the NREI to better understand the relationship among nutrients, dissolved oxygen, contaminants and the biota in these systems. An integral component of developing a water management plan is public consultation and involvement of key stakeholders.

The water quality guidelines of both the Canadian Council of Ministers of the Environment and the United States Environmental Protection Agency have been updated and new documents will be released in 1999. Alberta Environment will review both documents to ensure that the guidelines being used in Alberta offer the maximum protection to the rivers.

Since 1990, when the Northern River Basins Study was initiated, significant reductions of effluent loadings to the Wapiti River from the Weyerhaeuser Canada pulp mill at Grande Prairie have been achieved. The actual reduction in effluent loadings for Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), Adsorbable Organic Halides (AOX) and colour achieved by the Weyerhaeuser mill are illustrated in Figure 8. Biochemical Oxygen Demand has been reduced by 56% between 1990 and 1998, Total Suspended Solids by 64%, Adsorbable Organic Halides by 72%, and colour by 57%. Alberta is continuing to review nutrient reduction plans for the Weyerhaeuser Canada pulp mill.

Monitoring is currently under way to quantify nutrient contributions from the City of Grande Prairie wastewater treatment system. As described in the Progress Report for Recommendation 1.3, the City's new operating approval will be issued in the fall of 1999, and will specify the timeframe for nutrient reductions.

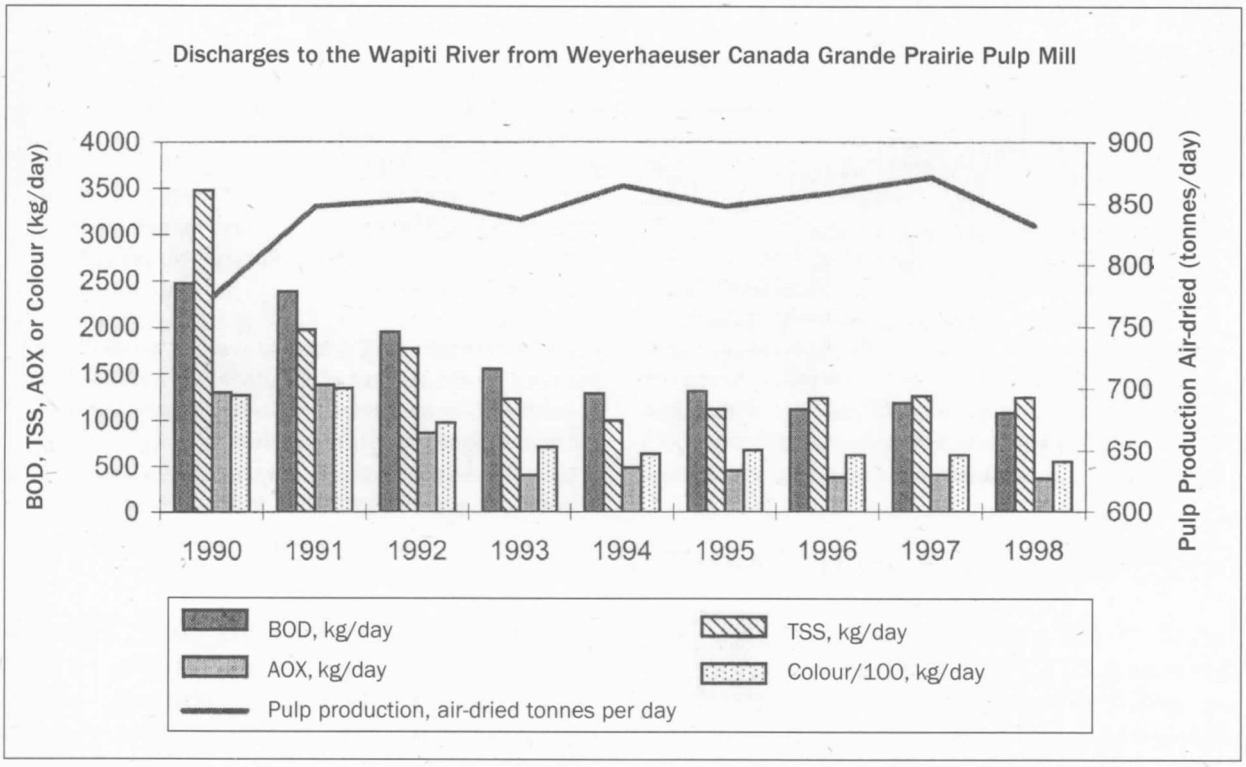


Figure 8 - Significant reduction of effluent loading to the Wapiti River has been achieved.

Weyerhaeuser Canada, in cooperation with Alberta Health and Wellness and Alberta Environment, is conducting additional fish contaminant sampling to facilitate the review of the existing fish consumption advisories for dioxin and furans on the Smoky and Wapiti rivers.

NRBS Recommendation 10.2 (1996)

Fish contamination and fish health effects be assessed for the populations of fish in the Slave River Delta ecosystem.

Governments' response to the recommendation (1997)

Canada and the Northwest Territories agree that deficiencies exist in our knowledge base concerning fish contaminants and fish health for the Slave River Delta fish populations. Therefore, they agree to conduct studies to address these information gaps. Through the cooperation and funding support of several federal government departments, contaminant investigations (metals, organochlorine compounds, and metallothionein) focusing on water, sediments and fish were conducted during 1996. The investigations will be completed and reports prepared by 1998/99.

Canada will maintain its food inspection program for fisheries to ensure that all commercially caught fish in the NRBS area meet human health consumption guidelines (see Recommendation 12).

NREI Progress Report (1998/99)

The NRBS recognized that deltas of major rivers such as the Peace, Slave and Athabasca are among the most productive and environmentally sensitive components of riverine systems in cold region environments. Consequently, these deltas are of great ecological importance. Much of their productivity depends on the transport and input of nutrient-rich sediments from upstream sources. Such sediments can also be the source of contaminants, and deltas may become critical sinks or zones of retention because they tend to accumulate sediments.

Results of a five-year study on the Slave River released in August 1998 are favourable and indicate only very low levels of contaminants.

The *Slave River Environmental Quality Monitoring Program* (SREQMP) is considered to be the most comprehensive water quality study ever completed in the NWT. The purpose of the SREQMP was to assess the current status of the river, to discover any hazards to human health or the aquatic environment, and to establish a solid baseline to see if conditions change in the future. Over the course of the program, water, sediment and fish samples were tested for approximately 240 different chemicals, particularly those associated with pulp and paper mills, agricultural development, and oil and gas development. Fish tissue data from the SREQMP have been submitted to GNWT Health and Health Canada for an assessment of human health implications.

NRBS Recommendation 10.3 (1996)

Monitoring activity be intensified in the reach of the Athabasca River from Hinton to below Whitecourt.

Governments' response to the recommendation (1997)

The governments of Canada and Alberta agree that this reach of the Athabasca River requires intensive surveillance. Accordingly, Alberta has expanded its monitoring in this reach to include more detailed surveys of nutrients and benthic algae, while at the same time maintaining the existing year-round networks of water quality and quantity stations, some of which are run in conjunction with the federal government. A report summarizing the results of this enhanced monitoring work will be produced in 1998.

Follow-up on PCB contamination will be done (see Recommendation 13), and joint investigation of fish health in this reach will also be undertaken (see Recommendation 15). As well, intensive monitoring in this reach is being undertaken by the pulp and paper mills in accordance with the federal *Pulp and Paper Mills Environmental Effects Monitoring Guidelines*, and provincial regulations.

NREI Progress Report (1998/99)

Intensive monitoring and investigation have been maintained on the reach of the Athabasca River from Hinton to below Whitecourt. Five river water quality monitoring sites are operated in this reach by Alberta Environment in addition to the joint federal-provincial hydrometric network. The McLeod River will be sampled intensively throughout its length during 1999 to assist Alberta Environment's regulatory activities with respect to coal mines. A winter network that monitors the levels of dissolved oxygen under river ice cover has provided continuous surveillance of the river for 10 years.

Detailed investigations of nutrients and benthic algae were also carried out in this reach by Alberta Environment between 1994 and 1998. The status and initial findings of this work were summarized and reported to the NREI planning workshop held in Edmonton in May, 1998. These data are being compiled and will be used in conjunction with one of Environment Canada's NREI projects in support of the development of nutrient guidelines for selected reaches of the northern rivers.

Several additional investigations are being led by Environment Canada under the NREI to resolve issues identified in this reach. These investigations include a study dealing with contaminants in water and sediments. Other projects will investigate endocrine disruption in fish and nutrient-contaminant interactions.

As required under the federal *Pulp and Paper Mills Environmental Effects Monitoring (EEM) Guidelines*, and provincial approvals, the pulp and paper mills monitored water quality, benthic algae, zoobenthos, and fish populations during 1998. Reports are due early in the year 2000. The five mills along the Athabasca River worked cooperatively in their sampling program. The data will provide a comprehensive view of the cumulative effects of these pulp mills. During the EEM sampling, fish samples were collected from the Athabasca River to support the fish contaminants project being conducted through the NREI. The fish are being analyzed for organochlorine pesticides, chlorophenolics (as anisoles/veratroles), PCBs and chlorinated dioxin/furans, with findings expected in 1999.

Weldwood is also conducting additional fish contaminant sampling, and is conferring with Alberta Health and Wellness and Alberta Environment to re-evaluate the fish consumption advisory currently in effect on the Athabasca River.

NRBS Recommendation 11 (1996)

The Alberta and Northwest Territories Governments invite representatives of the governments of Canada, British Columbia and Saskatchewan, municipalities, industry, universities, First Nations and other agencies involved in monitoring activities, in consultation with an advisory committee involving members of all stakeholder groups concerned with or affected by monitoring activities, to participate in an Integrated Ecosystem Monitoring Committee (IEMC). The role of the IEMC would be to coordinate and oversee technical and scientific aspects of water quality, water quantity and biota monitoring in the northern river basins to ensure minimal duplication of effort and greatest collective efficiency. The IEMC would adopt an ecosystem approach to environmental monitoring (see Synthesis Report #10).

Governments' response to the recommendation (1997)

The governments agree that an integrated monitoring committee is in the best interests of northern basins stakeholders and will refer this recommendation to the Board to be established under the *Mackenzie River Basin Transboundary Waters Master Agreement*. The Board would determine the membership of any such monitoring committee, taking into account the stakeholders and the agencies with monitoring responsibilities.

The Integrated Ecosystem Monitoring Committee would serve to coordinate and optimize aquatic ecosystem monitoring, particularly with regard to transboundary waters. The committee would identify issues and problems, promote standardization of methods, ensure quality control, minimize duplication, and provide for public input into the development of monitoring programs. It may set up expert subcommittees to deal with specific aspects such as hydrology, water quality, and fisheries. Governments would participate fully in such a committee, providing technical and scientific support, and would submit their monitoring programs to it for scrutiny and feedback.

NREI Progress Report (1998/99)

The Mackenzie River Basin Board is in the process of evaluating monitoring requirements. The Board will review this recommendation, which calls for the establishment of an Integrated Ecosystem Monitoring Committee, and assess its proposed duties.

The Northern Rivers Ecosystem Initiative has established an interim Monitoring Subcommittee with representatives from the governments of Canada, Alberta and the Northwest Territories. The committee's Terms of Reference include direction to undertake the following:

- organize technical workshops to facilitate coordination with other environmental data collection programs,
- promote the development of common databases and quality assurance programs,
- promote standardization of methods to ensure the compatibility of sampling and analytical protocols, and
- identify research needs pertinent to the protection of the northern rivers ecosystem.

The first meeting of the Subcommittee, held in the spring of 1999, evaluated the various agency data collection programs. It concluded that there is minimal overlap in these programs. Contact is also maintained with various industry-led monitoring groups such as the oil sands industry's Regional Aquatic Monitoring Program.

NRBS Recommendation 12 (1996)

Alberta Health, Alberta Environmental Protection and Northwest Territories Health and Social Services, together with Health Canada and First Nations Health Authorities be charged with the responsibility of leading and coordinating the development of new, human health-based fish consumption policies, standards and guidelines for the Northern River Basins. This will require close collaboration and cooperation with other provincial, territorial and federal agencies, to rationalize and harmonize the extent of advisories across administrative boundaries. The process should build on the data and information generated by periodic surveys of fish contaminants. An improved mechanism should include the timely interpretation of findings, dissemination of information in a meaningful and culturally sensitive fashion, and contemporary population health risk assessment, risk management and risk communication concepts.

Governments' response to the recommendation (1997)

The Governments of Canada, Alberta and the Northwest Territories are cooperating to review the NRBS contaminant and dietary information for people who live within the basin, and to evaluate the applicability of the existing human health consumption advisories for the basins. The review of contaminant data by Canada and Alberta is underway and will be completed in 1997. The current fish consumption advisories will be amended as necessary. The review of fish consumption policies, standards and guidelines will involve First Nations and Métis communities and the results will be communicated directly back to them.

Canada and Alberta will design and implement routine fish-tissue testing programs for key species and reaches of the northern rivers. The data collected in these programs will be regularly evaluated against tissue consumption guidelines established for the protection of human health.

NREI Progress Report (1998/99)

A Fish Consumption Advisory project was launched under the NREI in 1998 by Health Canada in partnership with the Treaty 8 Environmental Secretariat and Health Authority. The goal of the project is to develop a computer-based program that First Nation representatives in the northern river basins can use to determine safe levels for fish consumption. The objectives of the project include the following:

- the collection of information on fish consumption, fishing locations, and fish contaminant levels for each relevant fishing area in the basins,
- the development of a set of comprehensive fish consumption advisories, and
- the identification of individuals who are potentially at risk to contaminant exposure above Health Canada guidelines.

The fish consumption guidelines will be calculated using:

- the frequency of consumption,
- the amount consumed,
- the body weight of the consumer,
- the location where the fish was caught, and
- the Tolerable Daily Intake (TDI) for each contaminant evaluated in the fish samples.

By using this computer-based program, individuals will be able to make safe fish consumption choices.

With respect to the development of routine fish tissue-testing programs, Alberta Health and Wellness and Alberta Environment are evaluating the most appropriate means of acquiring and handling fish contaminant data, and of subsequent use of the data to prepare fish-consumption health advisories. As noted previously, Weyerhaeuser Canada and Weldwood are cooperating in this initiative.

Environment Canada, with the assistance of Alberta Environment, is conducting a fish tissue-sampling project under the NREI to enable comparison with fish contaminant data gathered during the Northern River Basins Study.

NRBS Recommendation 13 (1996)

The Ministers direct further investigation to be undertaken into defining the extent of PCB contamination and their sources in the Wapiti, Smoky, Peace and Athabasca river systems.

Governments' response to the recommendation (1997)

Canada and Alberta agree to undertake investigations of PCB contamination in the priority reaches identified by the Northern River Basins Study. Alberta is reviewing all NRBS data on this topic, and is undertaking a complete review of known PCB incidents, atmospheric transport and deposition phenomena, storage sites, and utilization sites in the northern basins (including British Columbia).

In consultation with the federal government, follow-up sampling is being designed and will be carried out in 1997 and 1998. A report on this work will be prepared in 1999. If significant PCB sources or problems are identified, remediation will be undertaken.

NREI Progress Report (1998/99)

The NRBS found that concentrations of PCBs are generally absent or low in the northern rivers, but relatively high concentrations were observed in fish and sediment at a few locations. Although these higher concentrations were below established guideline levels for PCBs, the NRBS recommended follow-up work to determine their sources. Studies to follow up on this issue have been undertaken by Alberta Environment, Environment Canada and industry.

Alberta Environment reviewed known PCB spills and contamination in the Wapiti River area, noting that the main occurrence was a transformer-related spill at a pulp mill over 20 years ago. Other contamination sources may exist, and investigations are continuing.

Alberta Environment collected a set of river bottom sediments from the Wapiti/Smoky/Peace river systems during the autumn of 1997. A subset of these samples was analyzed for PCBs to assess spatial patterns of contamination. All sediment PCB concentrations were well below the interim CCME guideline. Slight contamination of sediments in the lower Wapiti and Bear rivers was found, consistent with the spatial pattern found in burbot livers during the NRBS. In 1998 Alberta Environment also carried out PCB analyses on Grande Prairie sewage effluent and all Alberta bleached kraft mill effluents, but did not detect PCBs.

A Northern Rivers Ecosystem Initiative project is being undertaken by Environment Canada on contaminants in water, suspended particles, and bottom sediments from specific reaches of the Peace-Athabasca system. Sampling was carried out during the autumn of 1998. River water upstream and downstream of effluent discharges was sampled, and is now being analyzed for PCBs and other contaminants.

Initial results from a NREI project being conducted by Environment Canada on the temporal trends of contaminants in fish indicate no decline in burbot liver PCBs since the initial NRBS sampling, even though other chlorinated organics (dioxins and furans) have declined.

A government-industry workshop was held in May 1999 to share information and findings on PCB contamination levels in the northern rivers. Further follow-up work is being designed and is likely to include additional bottom sediment analyses from the Wapiti and Bear rivers, further water and suspended solids contaminants analyses, further fish-PCB analyses, and additional investigation of potentially contaminated sites in the watershed.

Weyerhaeuser analyzed their effluent for PCBs in 1999 as part of their provincial approval requirements; they found levels near or below the detection limit. Daishowa-Marubeni International Ltd. on the Peace River is also conducting PCB analyses on their effluent during 1999.

NRBS Recommendation 14 (1996)

The Ministers, for a five-year period following completion of the Northern River Basins Study, report annually on the progress of implementing the research and management recommendations of this Report to the Ministers and the synthesis reports; that the annual summaries clearly describe the results of the ongoing research and management initiatives; and that the report be made available to the general public.

Governments' response to the recommendation (1997)

The governments agree that reporting progress on implementing the responses to the recommendations is important. This task will be referred to the Board to be established under the *Mackenzie River Basin Transboundary Waters Master Agreement* (see Recommendation 23, page 56). The results of research and management initiatives will be reported by the agencies responsible, and will also be made available to this Board.

NREI Progress Report (1998/99)

As an integral part of its activities in addressing the recommendations of the NRBS, the Northern Rivers Ecosystem Initiative will report annually on progress. These progress reports will be provided to the Mackenzie River Basin Board for circulation to adjacent provinces and territories, and will be soon be accessible to the public on the NREI web site. As well, progress will be reported in the NREI newsletter, *River News*, which will be published periodically during the course of the NREI.

Peace River near Carlson Landing.

NRBS Recommendation 15.1 (1996)

The Ministers initiate an intensive and comprehensive study of endocrine disruption and reproductive biology of fishes throughout the basins, and the implications for the fish populations and the integrity of the aquatic ecosystems.

Governments' response to the recommendation (1997)

The governments are concerned about endocrine disruption compounds, the lack of information about their sources and occurrence in these basins, and their potential effects on aquatic biota. Canada is addressing the issue of endocrine disruption and its implications to aquatic ecosystems on a national basis and will include the pulp mills and other sources in the Peace and Athabasca river basins within the study design. Alberta will support this work and industry cooperation will also be sought. Specifically, Canada will:

- conduct research into the development of bioassays capable of predicting the effects of pulp mill effluent on the reproductive biology of fishes;
- utilize the bioassays to identify the compounds responsible for the effects;
- identify pulp mill processes and technologies that generate these compounds;
- survey effluents nationally to describe the concentrations of the responsible compounds.

This assessment is targeted for completion by the year 2001.

NREI Progress Report (1998/99)

During the Northern River Basins Study, several issues were highlighted regarding the health of resident fish populations. Preliminary evidence of sex hormone depressions in some fish species in specific reaches of the basins was presented. Research also indicated a higher incidence of tissue abnormalities (lesions, tumours, etc.) in some river reaches, particularly downstream of pulp mills.

Internationally, endocrine-disrupting compounds (EDCs) and their effects on aquatic and terrestrial organisms have been recognized as a priority research area and are being intensively studied, particularly in Europe and North America. Because of the growing concern over EDCs, Canada is currently developing a national endocrine research strategy. As part of this strategy, Environment Canada, with the assistance of Alberta Environment, pulp mills and university partners, is assessing potential implications for fish populations within the Peace-Athabasca river basins. In particular, this NREI study will address whether there is evidence of hormone disruption and reproductive impairment in fishes resident to these basins. The study complements other NREI contaminant investigations related to pulp mills.

During 1998/99, the study design was completed and collaborative funding was secured from the federal Toxic Substances Research Initiative. Work was also initiated on the development of a new fish egg protein bioassay to assess exposure to EDCs. Initial field collections will begin in the fall of 1999 to determine the extent of endocrine disruption in the fish populations of the Peace River basin. The Athabasca River fish populations will be sampled in 2000.

NRBS Recommendation 15.2 (1996)

The Ministers initiate a complementary study to assess the increased incidence of fish abnormalities in reaches immediately below pulp mills.

Governments' response to the recommendation (1997)

Canada and Alberta agree that the Northern River Basins Study results concerning the incidence of fish abnormalities below pulp mills warrant further study. Such studies will be undertaken collaboratively with industry and will attempt to make use of fish collected as part of the existing *Environmental Effects Monitoring* program prescribed under the federal *Fisheries Act*. The studies will be designed in 1997/98 and implementation will begin in 1998/99.

NREI Progress Report (1998/99)

The incidence and extent of fish abnormalities within the basin, particularly downstream of pulp mills, is being investigated.

The five Athabasca River pulp mills (Alberta Pacific, Miller Western, Alberta Newsprint, Slave Lake Pulp, and Weldwood) have conducted sampling in a coordinated manner as part of their federal Environmental Effects Monitoring (EEM) Program. This cooperative endeavour will provide a basin-wide assessment of fish health. As part of their fall 1998 adult fish survey programs for the EEM, the mills included provisions for recording the occurrence of fish abnormalities. Weyerhaeuser Canada Ltd. also recorded information on fish abnormalities during their EEM work on the Wapiti and Smoky rivers during the fall of 1998. Other fisheries studies undertaken through the NREI will also compile information on fish abnormalities. A report will be prepared on all findings.

Complementary to these investigations is the intent to devise a standard procedure for documenting fish abnormalities, to be used as part of Alberta Environment's ongoing fisheries resource management programs, and by other parties operating under a fish collection permit. Alberta's Fisheries Management Information System will be modified to store and handle the accumulated data in a systematic way. The data will be reviewed and used for assessments of the status of fisheries resources within Alberta.

NRBS Recommendation 16 (1996)

The Ministers draw on such expertise as necessary to undertake research on the effects on aquatic biota of exposure to substances arising from oil sands, both naturally and as a result of oil sands industry development, giving particular attention to establishing monitoring requirements.

Governments' response to the recommendation (1997)

The governments agree that, given the scale of the industrial developments in the oil sands area, it is necessary to improve our understanding about potential impacts to aquatic ecosystems. Governments will ensure that the relative importance of natural versus industrially-derived contaminants is examined.

In this regard, there are several completed and ongoing evaluations of industry, government, and universities on oil sands aquatic issues. These include surveys of existing aquatic conditions in the oil sands area, research on tailings pond reclamation, development of new technology to minimize tailings, research on oil sands-related contaminants in existing water bodies and tailings ponds, and evaluation of fish-tainting potential of wastewaters. A technical environmental advisory group of the Canadian Oil Sands Network for Research and Development, which includes industry, government, and universities, has been established to facilitate issue identification, research, coordination, and communication on this general issue. Several reports on these topics were released as part of the environmental impact assessments and applications recently submitted by Suncor Inc. and Syncrude Canada Ltd.

Alberta and Canada commit to maintaining a broad level of cooperative research, monitoring, and communication on this issue and to ensuring that industry is involved. This commitment to environmental protection is demonstrated by the recent Suncor Inc. Steepbank Mine development. The company conducted environmental research, described existing conditions, assessed impacts, and submitted the information as part of the impact assessment and application process under Alberta's *Environmental Protection and Enhancement Act*. After wide-ranging government and public review, residual issues were identified and requirements for further research and environmental effects monitoring were included in the Approval.

Alberta commits to applying this process to further oil sands developments. As well, Canada and Alberta will continue to conduct monitoring and research on the effects of oil sands developments, such as the ongoing contaminant and toxicity work under the federal *Panel on Energy Research and Development*.

NREI Progress Report (1998/99)

In 1998, Environment Canada began a four-year research project to define the origins of oil sands contaminants in surface waters. The project is funded through Natural Resources Canada's Panel on Energy Research and Development. It will assess and predict potential impacts of hydrocarbon extraction activities in the Alberta oil sands area. The scope of the research includes:

- determining the extent (spatial and temporal) and environmental effects of natural hydrocarbon releases to the aquatic environment,
- distinguishing these effects from those produced by refinery processes and related effluents, and
- integrating these findings into an environmental monitoring and assessment framework for the oil sands industry.

In 1997, the oil sands industry established the Regional Aquatic Monitoring Program (RAMP) to collectively carry out its aquatic survey and monitoring needs in the area. In 1998, RAMP was expanded to include representation from the federal and provincial governments, and from stakeholders in the oil sands area. Steering and technical committees have been established to further develop and guide the program.

The updated mandate of RAMP is to determine, evaluate, and communicate the state of the aquatic environment as may be affected by cumulative oil sands developments. RAMP reports its monitoring and aquatic survey information in an annual report[1].

Alberta Environment has developed a *Regional Sustainable Development Strategy* for the Athabasca Oil Sands Area. This strategy, developed in conjunction with stakeholders, will ensure implementation of management approaches that address cumulative environmental effects in the oil sands region. As well, the Strategy will address appropriate monitoring techniques, identify knowledge gaps, and indicate the research needed to address the identified gaps.

NRBS Recommendation 17.1 (1996)

A study be undertaken by the federal and territorial governments to determine the causes for physical changes in the Slave River Delta and their environmental impact. Elements of the study would include:
a) history of the Delta
b) recent changes to the Delta, including erosion and deposition processes
c) the influence of lake levels and shore processes to wind, waves, current and ice conditions; and
d) evaluation of the effects of the Bennett Dam, climatic factors and other natural causes on recent changes to the Delta.

Governments' response to the recommendation (1997)

In addition to its regular monitoring programs, Canada is undertaking new scientific investigations in 1997 on the Slave River Delta to address flow regulation and climate-related effects, the spatial distribution of erosional and depositional zones, and riverine processes in both the Delta and nearshore areas (see Recommendations 7.1 and 17.2). The study will be completed by the year 2000.

NREI Progress Report (1998/99)

During 1997, Environment Canada and Indian and Northern Affairs Canada began field work on the Slave River Delta. The history and evolution of the delta is being examined using remote-sensing techniques, field site visits, and historical records of lake conditions. As well, the relative role of wave and ice action on the development of the delta will be addressed. The high summer flow event of 1996, resulting from prolonged releases from Bennett Dam, have provided a unique opportunity to study how the delta responds and evolves under variable flow conditions.

Field work under the NREI will continue for three years and will focus on sites of major new erosion and deposition, and the data from these sites will be related to observed changes to the dominant vegetation. An aerial photography survey of the delta will begin as the leaves change colour at the end of the summer of 2000. Fine-grained sediment deposition sites will be identified, which will provide a foundation for the proper design of any future contaminant sampling within the delta's distribution network.

To assist in the examination of historical records and improve our understanding of inter-relationships between river flow conditions and the evolution of the Slave River Delta, scientific collaborations were established with Wilfrid Laurier University and University of Waterloo.

[1] Oil Sands Regional Aquatics Monitoring Program (RAMP) 1998, Golder and Associates

NRBS Recommendation 17.2 (1996)

The federal and Northwest Territories governments undertake a study of the limnology of Great Slave Lake with emphasis on sediment deposition and contaminant distribution.

Governments' response to the recommendation (1997)

Canada and the Northwest Territories agree that a limnological investigation of Great Slave Lake would be of value.

Canada will take the lead in the preparation of an environmental overview which will address the current understanding of the Great Slave Lake ecosystem. This report will be completed by 2000. Subsequent studies would depend on the results arising from the overview and consultations with stakeholders.

In addition, Canada has instituted new scientific investigations to specifically address contaminant transport and deposition within the Slave River Delta and nearshore areas. Further bottom sediment and fish samples will be obtained to investigate the concentration and effects of various contaminants identified during NRBS.

NREI Progress Report (1998/99)

A sediment transport and contaminant study was initiated in the delta by Environment Canada and Indian and Northern Affairs Canada in 1997 under the Northern Contaminants Program. The results of the study indicated that concentrations of chlorophenolic, dioxin/furan and PCB contaminants were higher in the distributary channels of the Slave River Delta than in the mainstem of the river or in the lakebed. Consequently, it was concluded that future contaminant assessments in the Slave Lake/Slave River Delta system should focus on delta habitats. Experts will review the data to determine the full significance of the contaminant concentrations observed.

The Department of Fisheries and Oceans and Environment Canada will host a workshop during the year 2000 to consolidate known information on the Great Slave Lake ecosystem and identify future research needs.

NRBS Recommendation 18 (1996)

Federal, provincial and territorial governments give priority to ensuring that scientific resources (including personnel) be maintained at levels necessary for long-term protection of the northern rivers and that the national granting councils provide increased funding for the support of multi-sectoral sponsored research on environmental problems through their various partnership programs.

Governments' response to the recommendation (1997)

Governments acknowledge that sound science is central to environmental policy and decision-making. Canada and Alberta are continuing their commitment to environmental research in the basins, as explicitly indicated in this report.

National granting councils, such as the Natural Sciences and Engineering Research Council, and the Province of Alberta are currently providing funding for joint university-government-industry research programs in the basins. For example, the National Centre of Excellence for Sustainable Forestry (led by the University of Alberta) was initiated in 1995-96 to examine forest management procedures and related ecosystem impacts. In 1996, Alberta announced the creation of the Forest Management Science Council to help integrate forest management research findings.

The *Alberta Environmentally Sustainable Agriculture Program* will continue to provide information concerning the effects of agriculture on aquatic ecosystems. Studies will continue in the watersheds of the Peace and Athabasca rivers.

Canada is conducting further research in the Mackenzie Basin under the *Panel on Energy Research and Development* (see Recommendation 16), the *Northern Contaminants Program* and the *Global Energy and Water Cycle Experiment*.

In addition to the research outlined above, governments commit to the ongoing application of scientific and engineering resources to support regulatory and monitoring functions.

NREI Progress Report (1998/99)

Significant scientific research resources continue to be allocated by governments, industry, and universities to improve the understanding of the effects of development on the northern river basins and to ensure the sustainability of the environment. In particular, research is being conducted into the impacts of petroleum resource extraction, forestry, and agricultural activities in the basins, as is discussed in the progress reports of numerous other recommendations. In 1998/99, Alberta Environment allocated $25 million to natural sciences research or related scientific activities to address environmental issues.

Specific follow-up actions to address the recommendations of the Northern River Basin Study are being implemented through the Northern Rivers Ecosystem Initiative (NREI). The NREI is a cooperative five-year undertaking by Canada, Alberta, and the Northwest Territories that began in 1998. These follow-up actions to protect the northern rivers involve both policy initiatives and scientific research. They focus on priorities such as pollution prevention, hydrology, contaminants, nutrients, drinking water, enhanced environmental effects monitoring, fish abnormalities and land use effects on the aquatic ecosystem.

NRBS Recommendation 19 (1996)

The governments of Canada, Alberta and the Northwest Territories prepare a comprehensive review of the use, condition and sustainability of fish stocks in the Slave River basin and Great Slave Lake that are used for domestic and commercial purposes.

Governments' response to the recommendation (1997)

The governments agree with the need to monitor fish stocks. The government of Canada, with co-operation from the Northwest Territories, will prepare a comprehensive review of current knowledge on the use, condition, and sustainability of commercial fish stocks in the Northwest Territories portion of the Slave River Basin and in Great Slave Lake. Domestic fishery information, although much more limited, will also be reviewed.

Alberta monitors commercial fish stocks extensively and also shares information on domestic fisheries with users. This program will be maintained and expanded where feasible.

NREI Progress Report (1998/99)

The governments of Canada and the Northwest Territories work cooperatively with the Great Slave Lake Advisory Committee (GSLAC) on issues related to the management of the Great Slave Lake fishery. Jointly with the GSLAC, the federal Department of Fisheries and Oceans has been conducting a study to determine the effects of changing the fishing net mesh size in the commercial fishery. The Department of Fisheries and Oceans has used this joint study to initiate a review of monitoring data from the fishery and to update information about catch composition and sizes.

The Government of the Northwest Territories has developed a discussion paper on the Great Slave Lake fishery for public review. A key element of this discussion paper also recommends a review of the status of fish stocks in the commercial and recreational fisheries of Great Slave Lake. Consultations with GSLAC and other user groups will lead to the development of such a review.

NRBS Recommendation 20 (1996)

In light of the benefits to be gained through public involvement it is important that meaningful public participation be an integral part of the planning and development of future studies and their scientific programs.

Governments' response to the recommendation (1997)

The three governments recognize that the meaningful public participation initiated by the Study will continue to help all parties make better decisions for effective basin management. Canada, Alberta, and the Northwest Territories share responsibilities with all residents and sectors in the basins in managing the northern rivers and promoting sustainable development. Public involvement and open communication are explicit in federal and provincial operating guidelines. The Integrated Ecosystem Monitoring Committee under the Mackenzie Basin Board (see Recommendation 23) is expected to provide a forum for public input into the design of studies and monitoring programs.

NREI Progress Report (1998/99)

Comprehensive public consultations were an integral component of the Northern River Basins Study. The numerous follow-up studies being conducted through the Northern Rivers Ecosystem Initiative are specifically addressing recommendations that the public made to governments during the Northern River Basins Study. Information related to this follow-up work is being communicated to basin stakeholders through periodic newsletters. The newsletters identify government contacts so that the public can provide comments or obtain additional information. A NREI Internet web site will soon be available to the public as an additional source of information.

Other initiatives underway in the basins are obtaining public input through more formal consultation processes. For example, as part of the development of the *Regional Sustainable Development Strategy for the Athabasca Oil Sands Area*, consultation sessions were held with numerous regional stakeholder groups. Similarly, the Regional Aquatic Monitoring Program has conducted public meetings and has broad stakeholder representation. The Mackenzie River Basin Board held its first public meeting in Fort Smith in June 1999.

NRBS Recommendation 21 (1996)

A valid and representative sample survey be conducted five years hence to assess changes in the use of the river basins and in the perceptions and attitudes of residents, providing a means of comparing public perceptions with realities at that time and providing guidance for policy development.

Governments' response to the recommendation (1997)

The governments agree that a survey would be valuable. This recommendation will be referred to the Board established under the *Mackenzie River Basin Transboundary Waters Master Agreement* for advice on survey design and implementation (see Recommendation 23).

NREI Progress Report (1998/99)

This recommendation has been provided to the Mackenzie River Basin Board for their consideration.

NRBS Recommendation 22 (1996)

The Ministers co-operate to establish, on a suitable financial basis, such new bodies as are needed to meet the present and future concerns about the aquatic and riparian ecosystems of Northern River Basins.

Governments' response to the recommendation (1997)

The governments agree that a mechanism is required to facilitate basin-wide water management. The governments therefore agree to cooperate to establish a Board under the *Mackenzie River Basin Transboundary Waters Master Agreement* as the body to address many of the issues concerning the aquatic and riparian ecosystems of the northern river basins (see Recommendation 23).

NREI Progress Report (1998/99)

The Mackenzie River Basin Board was established in 1998, and is jointly funded by Canada, Saskatchewan, Alberta, British Columbia, Yukon, and the Northwest Territories.

NRBS Recommendation 23 (1996)

23.1 All reasonable efforts by the Ministers be directed to the earliest possible signing of the Mackenzie River Basin Transboundary Waters Master Agreement, and the establishment of that Board.

23.2 Membership of any new board or panel related to the affairs of the northern river basins be kept small but appointed to represent federal, provincial and territorial governments, First Nations, municipalities, industry, environmental interests, residents and other stakeholders without dominance by any one constituency or interest group.

23.3 The method of appointment for each member be acceptable to the constituency to be represented by the member.

23.4 An advisory board, to be called the Northern River Basins Board (NRBB), be created jointly by the governments of the jurisdictions covered by the northern river basins, to advise governments on matters related to the aquatic and riparian ecosystems of the northern river basins.

23.5 If the NRBB is established as recommended, the Integrated Ecosystem Monitoring Committee (IEMC) as described in Monitoring Recommendation 11-1 should be closely linked to NRBB, possibly reporting to the NRBB.

Governments' response to the recommendation (1997)

The governments agree with the need for a prompt establishment of a *Mackenzie River Basin Board*. Canada, Alberta, the Northwest Territories, Saskatchewan, British Columbia, and the Yukon have all signed the *Mackenzie River Basin Transboundary Waters Master Agreement* under which such a Board will function. The Board will be a cooperative forum in which governments in the basin could develop consistent and cooperative management approaches and resolve interjurisdictional issues. The governments propose that the Mackenzie River Basin Board serve the purpose of the recommended Northern River Basins Board, thus avoiding the duplication and cost of having two boards.

NREI Progress Report (1998/99)

All elements of the commitments made by the governments in the above response have been fulfilled by the establishment of the Mackenzie River Basin Board.

NRBS Recommendation 24 (1996)

A steering committee be established by the governments of Canada, Alberta and Northwest Territories to facilitate a transition, by April 1, 1997, from the NRBS to other bodies with successor functions.

Governments' response to the recommendation (1997)

Since the release of the NRBS *Report to the Ministers*, a federal-provincial-territorial task force has been struck to develop an integrated, considered response to the NRBS findings and recommendations. As well, the governments have completed the signing of the *Mackenzie River Basin Transboundary Waters Master Agreement* and are working to establish the Board under that Agreement. The federal-provincial-territorial task force will facilitate the transition to that Board.

NREI Progress Report (1998/99)

The federal-provincial-territorial task force was replaced with a steering committee established by the governments of Canada, Alberta and the Northwest Territories in June 1998. The steering committee will oversee the implementation of the commitments made by Ministers in their *Response to the Northern River Basins Study*. This Northern Rivers Ecosystem Initiative Steering Committee includes membership from the government departments who have primary responsibilities for undertaking the follow-up actions: Environment Canada; Indian and Northern Affairs Canada; Health Canada; Alberta Environment; Alberta Health and Wellness; and the Northwest Territories Department of Resources, Wildlife and Economic Development. The Committee reports annually to a group of three senior officials consisting of the following: the Regional Director-General of the Prairie and Northern Region of Environment Canada; the Deputy Minister of Alberta Environment; and the Deputy Minister of the Department of Resources, Wildlife and Economic Development of the GNWT. The Committee will prepare a final report upon completion of their responsibilities in 2003.

The Mackenzie River Basin Board, also established in 1998, is committed to cooperatively managing the water resources of the Mackenzie River Basin. The NREI Steering Committee will meet with the Board to ensure all NRBS recommendations are satisfactorily addressed.

NRBS First Nations/Métis Recommendation FN1 (1996)

Governments establish a committee, that will involve communities and other stakeholders, to consult, advise and implement resulting programs and projects which are the outcome of the recommendations from the Northern River Basins Study, so that the interests and rights of the First Nations/Métis are safeguarded and protected.

Governments' response to the recommendation (1997)

The governments agree that people most directly affected by water policies and programs should have the opportunity to provide input to the development and implementation of them. The *Mackenzie River Basin Transboundary Waters Master Agreement* and associated bilateral agreements will provide important mechanisms for this and other purposes. First Nations/Métis will be represented on the Board under this *Agreement*.

NREI Progress Report (1998/99)

The *Mackenzie River Basin Transboundary Waters Master Agreement* has been signed and the Mackenzie River Basin Board established. The membership on the Board includes a First Nations/Métis representative from each of British Columbia, Alberta, Saskatchewan, Yukon and the Northwest Territories. As well, First Nations/Métis people are consulted on initiatives such as the development of the *Regional Sustainable Development Strategy for the Athabasca Oil Sands Area*.

Representatives of the NREI Steering Committee will meet with First Nations/Métis groups in the northern river basins to keep them advised of progress and to share results.

Peace River near its juncture with the Slave River.

NRBS First Nations/Métis Recommendation FN2 (1996)

The governments develop a government to government relationship with First Nations/Métis governments concerning implementation of northern river basins strategies and recommendations.

Governments' response to the recommendation (1997)

The governments are committed to First Nations and Métis involvement in the implementation of the NRBS recommendations. The *Mackenzie River Basin Agreement* will be an important mechanism for involving First Nations/Métis peoples; however, other mechanisms will also be used as appropriate to address specific recommendations. For example, the document *An Understanding on First Nations/ Alberta Relations* of November 10, 1995 sets a framework in which Alberta deals with First Nations signatory to the document. Similarly, the *Alberta/ Métis Framework Agreement* signed August 16, 1993 sets a framework in which the province interacts with the Métis Nation of Alberta Association.

NREI Progress Report (1998/99)

The *Mackenzie River Basin Transboundary Waters Master Agreement*, which recognizes the needs, concerns and rights of Aboriginal Peoples, has been signed and the Mackenzie River Basin Board has been established. The membership on the Board includes a First Nations/Métis representative from each jurisdiction.

Aboriginal Peoples are involved in the implementation of NRBS recommendations through initiatives such as training of water treatment plant operators. As well, Aboriginal Peoples are represented on the Peace-Athabasca Delta Environment Committee, and have been consulted during the development of the *Regional Sustainable Development Strategy for the Athabasca Oil Sands Area*.

In the Northwest Territories, co-management land and water boards under the *Mackenzie Valley Resource Management Act* have been established. These co-management boards regulate the use of settlement and Crown lands and water by issuing land-use permits and water licences.

NRBS First Nations/Métis Recommendation FN3 (1996)

An ecosystem management approach be used which includes all aspects of the watershed management and encompasses the commitment of First Nations/Métis people to the ecosystem approach.

Governments' response to the recommendation (1997)

The governments support and will use an ecosystem management approach. This is one of the fundamental principles behind the *Mackenzie River Basin Transboundary Waters Master Agreement* and of the operational policies of Canada, Alberta, and the Government of the Northwest Territories.

NREI Progress Report (1998/99)

The ecosystem management approach has been adopted as a fundamental principle under the *Mackenzie River Basin Transboundary Waters Master Agreement*, and will be implemented by the Mackenzie River Basin Board.

Alberta's new *Water Act* recognizes that the protection of the aquatic environment is an important element of sustainable water management. The Act requires the development of a strategy for the protection of the aquatic environment as part of the provincial water management framework. In addition, in 1999 the Government of Alberta affirmed and renewed its commitment to sustainable development in a new policy statement, *Alberta's Commitment to Sustainable Resource and Environmental Management*.

NRBS First Nations/Métis Recommendation FN4 (1996)

Any future research programs developed or endorsed by the governments or research organizations be encouraged to focus on the integration of scientific and traditional knowledge within a First Nations/Métis research protocol.

Governments' response to the recommendation (1997)

The NRBS has demonstrated the importance of traditional knowledge. The governments encourage the integration of traditional and scientific knowledge in research programs. The *Mackenzie River Basin Transboundary Waters Master Agreement* calls for the incorporation of traditional knowledge and values in the conduct and actions of the Board.

NREI Progress Report (1998/99)

The Mackenzie River Basin Board was established in 1998, and has made a commitment to consider the needs and concerns of Aboriginal Peoples through *"the incorporation of their traditional knowledge and values*[1]*."*

A current example of the integration of traditional and scientific knowledge in research programs is the cooperative development, by First Nations, industry, and federal and territorial governments, of a cumulative effects monitoring program for diamond mine developments in the Northwest Territories.

[1] Mackenzie River Basin Transboundary Waters Master Agreement (1998)

NRBS First Nations/Métis Recommendation FN5 (1996)

The northern river research strategies endeavour to enable First Nations/Métis communities and governments to initiate and carry out scientific research which answers First Nations/Métis environmental questions about the northern river basins.

Governments' response to the recommendation (1997)

The governments endorse the participation of First Nations/Métis communities in strategies for environmental research. As in the NRBS, it is important that research programs are designed to include the concerns of First Nations/Métis people. Governments are committed to working with First Nations/Métis people to initiate and carry out scientific activities. *The Mackenzie River Basin Transboundary Water Master Agreement* and associated bilateral agreements provide mechanisms through which such an objective can be achieved.

NREI Progress Report (1998/99)

The Northern Rivers Ecosystem Initiative incorporates First Nations/Métis involvement in scientific research projects. One current example is the Fish Consumption Advisory project being undertaken by the Alberta Treaty 8 Health Authority, in conjunction with the Treaty 8 Environmental Secretariat, and Health Canada. This project will help to address the NRBS recommendation regarding the development of new human health-based fish-consumption advisories.

NRBS First Nations/Métis Recommendation FN6 (1996)

Governments commit to a cooperative and participatory thrust of future research in the northern river basins focusing on human health and its link to environmental contaminants or ecological change, and the cause and effect relationship of environmental contaminants or ecological change to the health of the communities and peoples involved; particular effort should be placed on the quality of water within the region encompassed by the Northern River Basins Study boundaries.

Governments' response to the recommendation (1997)

The governments agree with co-operative and participatory research, and the need to examine potential linkages between human health and environmental conditions. Their commitment to this is demonstrated by the Northern River Basins Human Health Monitoring Program, being completed by Alberta Health. This study is examining the situation carefully, and will identify knowledge gaps or deficiencies and make recommendations accordingly. Governments are committed to reviewing the findings and addressing the recommendations.

NREI Progress Report (1998/99)

Alberta received the final report and recommendations of the *Northern River Basins Human Health Monitoring Program* in April 1999. The findings are under review, and the recommendations will be addressed in 1999. Current human health/environment-related initiatives being undertaken through the Northern Rivers Ecosystem Initiative, with the participation of Aboriginal Peoples, include projects dealing with fish-consumption guidelines and drinking water (see Recommendations 3.1 and 12).

Canada

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Northwest Territories