NORTHERN RIVER BASINS STUDY

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KEY FINDINGS AND RECOMMENDATIONS

Canada Alberta Northwest Territories
Northern River Basins Study

INTRODUCTION

The Northern River Basins Study was a four and one-half year initiative to investigate the cumulative effects of development on the Peace, Athabasca and Slave river basins. From its beginning in 1991 to its completion in 1996, work completed by the Northern River Basins Study (NRBS) within the Peace, Athabasca and Slave river basins remained timely and relevant. The NRBS was launched in response to concerns expressed by northern residents following the 1991 approval of the Alberta Pacific Pulp Mill in Athabasca, Alberta. As the Study closes, new developments are being discussed in northern Alberta.

During the Study's four-and-one-half years of scientific work, about 150 projects or "mini studies" were initiated. Results of these studies were combined with extensive traditional knowledge research, public input and intensive analysis by some of Canada's most esteemed scientists.

This information and recommendations by the Study Board bring together findings, conclusions and recommendations which are hereby presented to the Ministers representing the governments of Canada, Alberta and the Northwest Territories.

The Report provides a valuable benchmark that defines the state of the Peace, Athabasca and Slave rivers as they currently exist. In some cases, scientists and Study Board members are concerned about current conditions within the river systems and recommend immediate action. However, overall the Study believes that there is sufficient time through good management and planning to preserve and protect the northern rivers while supporting wise sustainable development.

The specific river reaches where remedial action is needed illustrate the sensitivity of the river ecosystems and underline the importance of action. Even during the course of the Study, technological improvements and more stringent regulations have resulted in measurable improvements in conditions in certain areas. At the same time, NRBS scientists discovered new challenges to the health of the aquatic ecosystem, particularly from a cumulative effects perspective.

The Study demonstrated conclusively that residents of the river basins care deeply about the ecological state of the region in which they work and live. Their support of the Study has signalled the importance of public involvement in setting goals and devising management plans for the basins.

These four factors combined — the timeliness of the Study, its value as a benchmark, the importance of technological and scientific advances, and public concerns, indicate the need for action on the Board recommendations as soon as possible. This is the responsibility of Canada, Alberta and the Northwest Territories in their stewardship of the natural resources of the basins. Given that stewardship, one may have confidence that continued use and prudent development can occur in balance with protection of the natural ecosystem and preservation of the culture and evolving lifestyles of the traditional residents.

The following text discusses the Study's key findings and recommendations that, in the Board's view, warrant special attention by governments. Additional Board recommendations are found in the Northern River Basins Study Report to the Ministers.

QUALITY OF FISH AND WATER

The most common questions posed by basin residents during consultations with the Study Board are "Can we eat the fish?" and "Can we drink the water?" The Study has been able to provide some information with regard to these questions. Dioxin and furan levels in fish have declined significantly over the period of the Study, and levels of polychlorinated biphenyls (PCBs) in fish appear to be within generally accepted consumption guidelines. Research confirms, however, that levels of toxic dioxins, furans and mercury still exist in a number of important fish species located in certain river reaches.

Provincial fish consumption advisories are in place at certain sites to protect residents from consuming harmful quantities of contaminants in fish. In the northern river basins, fish are a major source of food for some basin residents, in particular, aboriginal peoples living in remote northern communities.

In the interests of human health, the Study Board recommends that federal and provincial authorities re-evaluate fish consumption guidelines for the northern river basins in light of NRBS findings and dietary patterns of residents.

With regard to drinking water quality, the NRBS concludes that the large majority of basin residents receive good quality water from municipal treatment facilities. However, NRBS researchers found several instances where the quality of treated drinking water did not meet guidelines.

In the Alberta portion of the basins, a number of small treatment facilities (generally serving less than 500 residents) have difficulty at times meeting water quality guidelines with respect to turbidity and microbial contamination. There are 85 small facilities operating in Alberta, serving a total population of approximately 21 900. Individuals receiving water from these facilities may be more susceptible to waterborne diseases, such as giardiasis ("beaver fever"), salmonellosis and shigellosis.

Visits to several small treatment plants reveal that difficulties are often related to maintenance and operation, rather than inadequate treatment systems.

The NRBS Board recommends that governments should increase their efforts in petitioning smaller communities to educate and train facility operators regarding the need to properly operate water treatment facilities. This includes the use of existing programs for operator training, certification and assistance. The Board also calls for authorities to ensure the adequacy of treatment facilities in these areas.

At least 25 per cent of basin residents obtain their water directly from rivers, lakes, springs, wells and dugouts without treatment by conventional facilities. NRBS studies found that surface water sources in the Study area often contain bacteria and should be treated prior to consumption.

Ecosystem Health

A main objective of the NRBS was to define the combined effect of multiple developments on the Peace, Athabasca and Slave river ecosystems. Researchers used a variety of methods to measure how environmental stressors are affecting aquatic life.

Many reaches of the Peace, Athabasca and Slave rivers appear minimally affected by environmental stress. In other reaches, however, fish and other aquatic organisms are experiencing stress. Reaches immediately downstream of pulp mills, for instance, contain a higher proportion of fish that are sexually immature. Among sexually mature fish, sex hormones tend to be lower and some of the fish collected in these reaches display physical abnormalities such as tumours or growths.

While NRBS studies couldn't clearly measure the nature and extent of these problems, the results raise significant concern that environmental stress may be affecting the health of aquatic life within certain river reaches.

The NRBS Board feels that this issue demands further attention to ensure that present and future developments do not impair the ecological well being of the rivers.

Nutrients / Dissolved Oxygen

Aquatic organisms require dissolved oxygen to survive and reproduce. Several natural and human-caused factors can deplete the amount of dissolved oxygen in river water. Winter ice cover prevents air from entering the water system. The decay of organic material, such as plants or organic substances in sewage and pulp mill effluent, consumes oxygen. The addition of nutrients (i.e., nitrogen and phosphorus) in wastewaters can also lead to reduced dissolved oxygen levels by stimulating algal and plant growth that consume oxygen as they decay.

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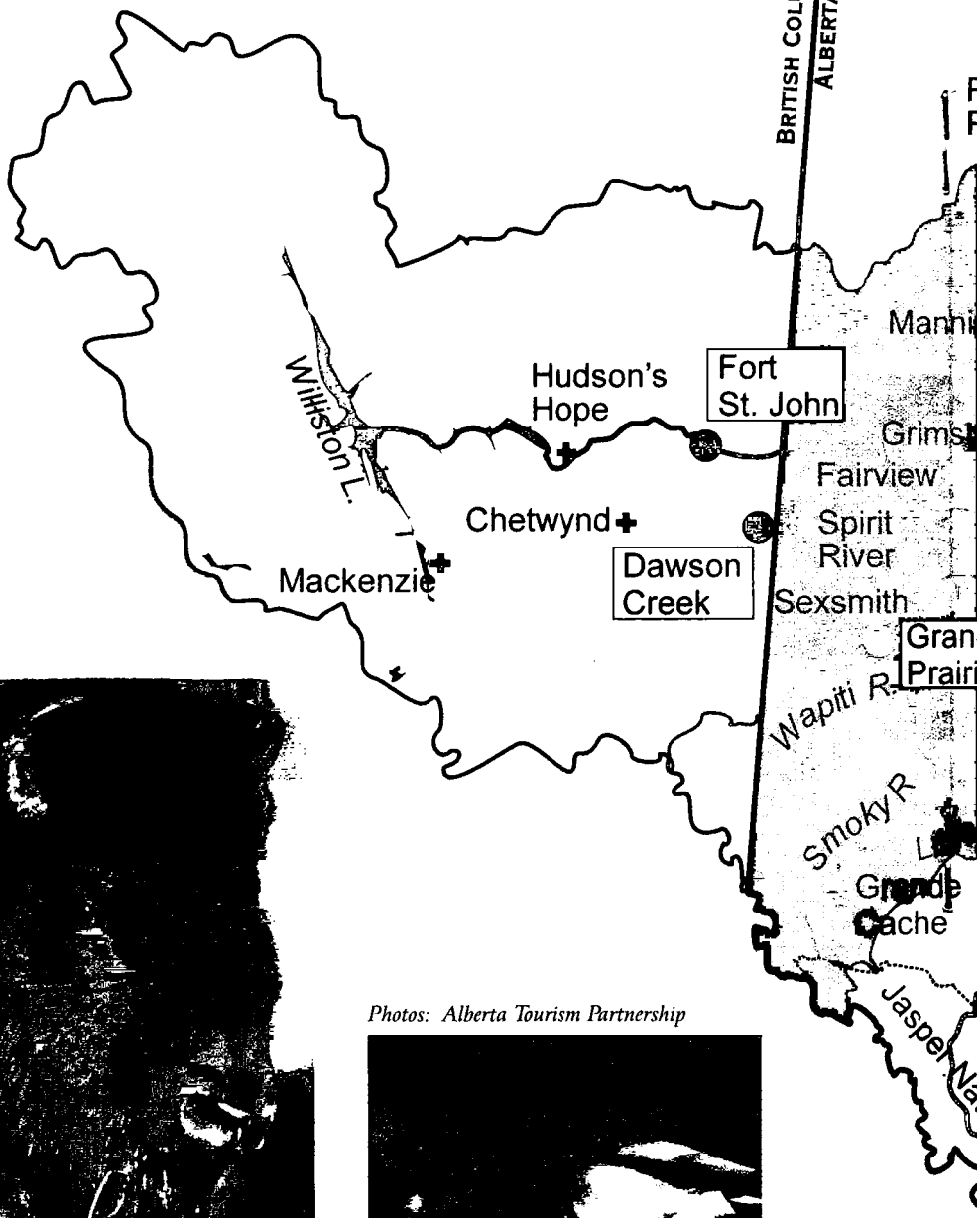
In Alberta, the level required to protect the health of aquatic life is set at 5 mg/L under the *Alberta Surface Water Quality Objectives*. While average dissolved oxygen levels in the mid-water column of the Athabasca River rarely fall below 6.5 mg/L, levels in or at the riverbed can be lower. Lower dissolved oxygen levels (i.e., 3 - 5 mg/L) can disrupt the growth, development and ultimately the survival of sensitive aquatic species that spend at least a portion of their lifecycle in or adjacent to the riverbed. This includes several important fish species, such as mountain whitefish and bull trout, as well as the bottom-dwelling organisms upon which they feed.

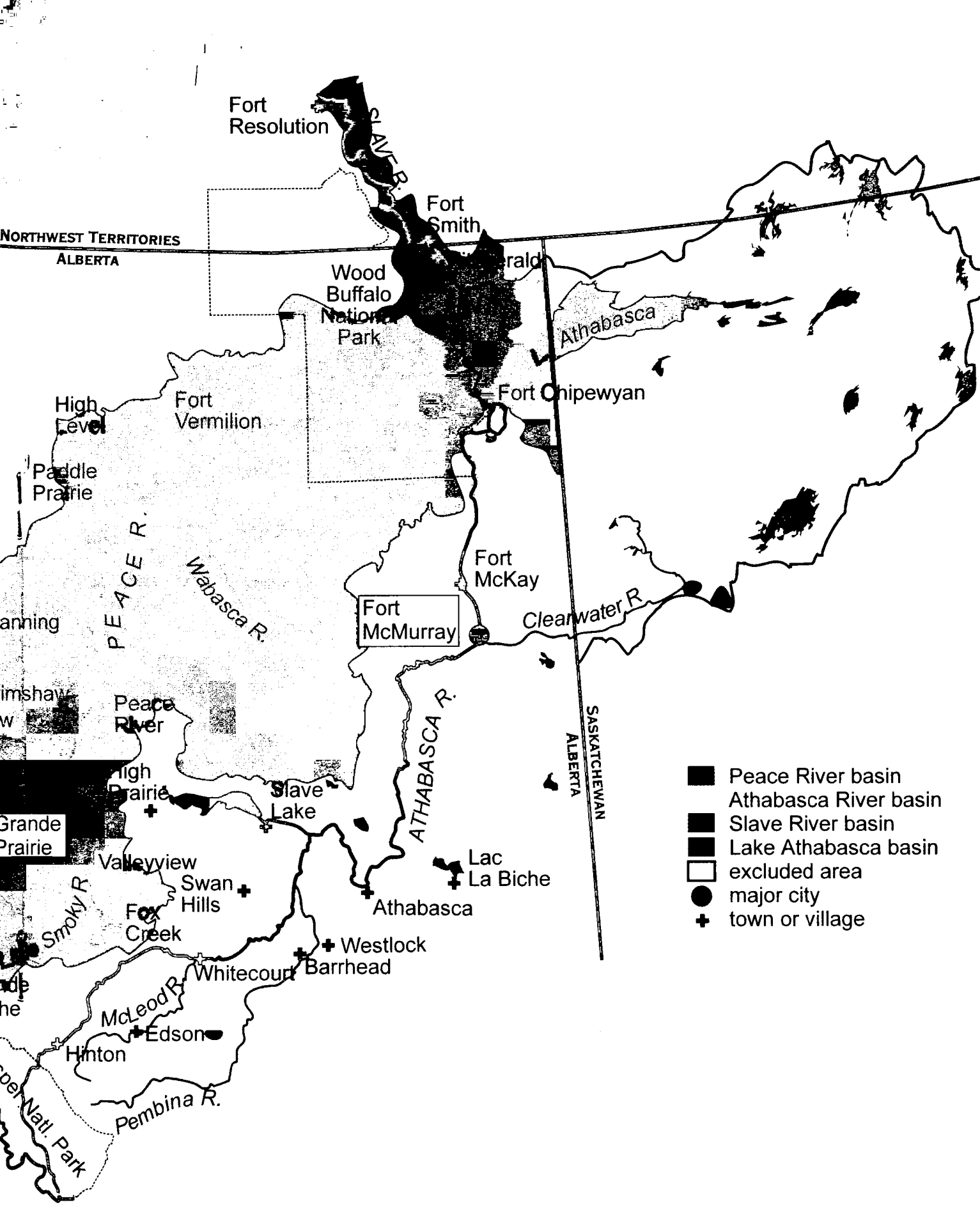
These findings suggest that present Alberta guidelines may not adequately protect aquatic life at localized sites within the basins.

The Board recommends that the governments of Alberta and Canada initiate studies to determine the winter dissolved oxygen requirements for fish and other aquatic species in the various reaches of the northern

Northern River Basins Study Area



Photos: Alberta Tourism Partnership


Fort Resolution
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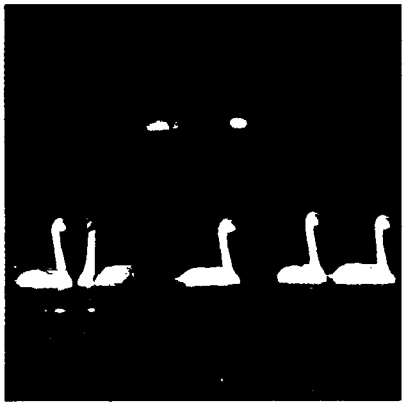
NORTHWEST TERRITORIES
ALBERTA
Wood Buffalo National Park
Athabasca
Fort Chipewyan
High Level
Fort Vermilion
Paddle Prairie
PEACE R.
Wabasca R.
Fort McKay
Fort McMurray
Clearwater R.
Peace River
ATHABASCA R.
SASKATCHEWAN
ALBERTA
Slave Lake
Grande Prairie
Valleyview
Swan Hills
Fox Creek
Smoky R.
Lac La Biche
Athabasca
Westlock
Barrhead
Whitecourt
McLeod R.
Edson
Hinton
Pembina R.
Peace River basin
Athabasca River basin
Slave River basin
Lake Athabasca basin
excluded area
major city
town or village

rivers. It further recommends that Alberta adopt the more conservative guideline set forth by the Canadian Council of Ministers of the Environment (6.5 mg/L) as an overall provincial approach for making decisions on future development proposals.

The Board also feels that current nutrient regulations and monitoring practices may not adequately protect long-term environmental health in the basins. NRBS studies have revealed that nutrient inputs from pulp mills and municipalities have enriched aquatic communities immediately downstream of their outfalls, especially in the Athabasca and Wapiti/Smoky river systems. Currently, the problem is primarily aesthetic and relates to the amount of algae immediately downstream of the outfalls.



Alberta Tourism Partnership

While this initial effect is localized, nutrients may eventually accumulate in downstream sections of the rivers and cause nutrient/dissolved oxygen difficulties in the long-term. Nutrient enrichment may also alter characteristics of the aquatic food chain and effect contaminant bioaccumulation. For example, this process may explain higher PCB levels in fish below pulp mills in a nutrient-rich environment.

Further population increases and development of the basins are imminent and will no doubt place added nutrient-related pressures on the northern rivers. The NRBS Board is not satisfied that current nutrient regulations and monitoring requirements can adequately protect the long-term environmental health of certain river reaches.

The Board recommends that the Ministers improve the quality of analysis and reporting of monitoring of nutrient and biological oxygen demand throughout the basins, especially for municipal sewage treatment facilities and pulp mills. The Board also recommends further reductions in phosphorus concentrations in both pulp mill and sewage effluent.

Flow Regulation

British Columbia's W.A.C. Bennett Dam was constructed in the late 1960s to meet growing demands for hydroelectricity. NRBS studies confirm that the dam has a significant impact on the flow patterns, sediment transport, river morphology, ice formation and habitat along the mainstem Peace River.

Changes to flow and ice patterns are at least partly responsible for the lack of ice-jam induced floods in the Peace-Athabasca Delta. In the absence of these floods, the delta is slowly drying out — profoundly affecting the natural environment and the traditional lifestyles of local residents. NRBS research also suggests that flow regulation by the dam is affecting the rate of growth of the Slave River Delta into Great Slave Lake.

Several attempts have been made to replenish water levels in the Peace-Athabasca Delta. These efforts have successfully restored water levels in the lower lakes and channels but could not flood the elevated lakes (or "perched basins"). Several new and potentially more effective options were identified within the NRBS and one of its companion initiatives — the Peace-Athabasca Delta Technical Studies.

In light of improved understanding of the mechanisms controlling flooding of the Peace-Athabasca Delta, the Board feels that these new remediation options warrant serious consideration.

Accordingly, the Board recommends that the governments of Canada, Alberta and British Columbia implement an action plan for remediating the Peace-Athabasca Delta in consultation with affected basin residents.

Previous remediation attempts were frustrated by the absence of natural flow patterns on the Peace River. The Board stresses that economic factors in hydroelectric production must not be allowed to take precedence over environmental stability.

The Board recommends as a principle for any future negotiations regarding mitigation measures, that the operational regime of the Bennett Dam be modified to aid the restoration of the Peace River and the Peace-Athabasca Delta.

Key Issues by River Reach

The NRBS research program has greatly enhanced understanding of how the Peace, Athabasca and Slave rivers respond to developments within the basins. Given this new information, researchers were able to identify critical environmental issues and management challenges within individual river reaches. A few areas deserve special attention: the Wapiti/Smoky river system, and the Athabasca River between Hinton and below Whitecourt.

Of these, the Wapiti/Smoky river system is most stressed by

development. Among other developments, the system receives discharges of nutrients and contaminants from sewage and pulp mill effluent emanating from the Grande Prairie area. Since it produces lower annual flows than the mainstem Peace River, the Wapiti/Smoky system is less able to assimilate wastes and more vulnerable to the effects of development. While dioxin and furan levels in sediments and aquatic life are declining, levels are still among the highest in the basins. Levels of PCBs in fish from the Wapiti River doubled between 1992 and 1994.

Several lines of research suggest that the Athabasca River from Hinton to below Whitecourt is exposed to environmental stress. Levels of certain industrial contaminants (PCBs, dioxins, furans and others) and metals downstream of Hinton are higher than in other river reaches. Fish and large aquatic invertebrates exhibit signs of stress that may be related to contaminants. Higher incidences of fish abnormalities are also reported downstream of Whitecourt. Nutrients from industrial effluent and municipal sewage have stimulated algal growth to levels of aesthetic concern.

The Slave River Delta lies at the northern tip of the Study area. Fish sampled in the delta were large and in good physical condition. However, these same populations showed signs of environmental stress. Although there is evidence of contaminants deposited in the delta and Great Slave Lake, the actual exposure of fish to these contaminants remains unknown.

In light of these findings, the Board recommends that the Ministers initiate action to protect the Wapiti/Smoky river system from further development-related stress and apply reach-specific guidelines and associated regulatory requirements recognizing the small size of this river system. It further recommends enhanced monitoring and research in the Athabasca River from Hinton to below Whitecourt.

Pollution Prevention

NRBS research findings confirmed that rivers are being affected by human developments. Ultimately, it is always more costly, both economically and ecologically, to restore a contaminated river system than to prevent pollution at its source. However, it would be difficult for *all* sources of pollution to be eliminated from the basins environment. Some pollutants arise from distant sources and are carried to the basins in the atmosphere. Still others (e.g., agricultural runoff) are difficult to trace back to their point-of-origin.

The NRBS Board feels that these difficulties should not deter efforts to reduce and eliminate identifiable pollution sources to the rivers. In addition, NRBS studies and consultations reveal that some basin residents advocate the notion of "zero discharge."

The Board recommends that regulatory agencies within the basins declare and implement pollution prevention as a primary environmental objective and as an important component of sustainable development. The Board recommendations contain specific provisions for persistent toxic substances and nutrients. It also urges governments to pursue international arrangements to eliminate the use, generation and discharge of airborne pollutants.

Basin Management

Ultimately, rivers and other water bodies are the final repository for many wastes arising from land-based activities. In this way, the condition of rivers reflect activities throughout the basins. The Board has formulated a series of policy-related recommendations urging enhanced inspection, enforcement and planning to protect water quality and quantity.

One of these recommendations deals with a successor organization to the NRBS Board. In an NRBS survey of households and stakeholder organizations, a large number of respondents supported the establishment of an ongoing inter-governmental and stakeholder committee that would be responsible for the protection and wise use of the northern river basins.

The Board considered several options and proposes that governments with jurisdiction over the northern river basins create such new bodies as necessary to advise governments on matters related to the aquatic and riparian ecosystems of the northern river basins.

The Board offers a specific recommendation on the nature and possible structure of a new body. However, it is also clear that a range of contrasting opinions exist on how specifically the need may be met. The Board's detailed recommenda-

tion and discussion are designed to provide guidance in this area.

An effective monitoring program is an integral part of any management plan. Currently, monitoring within the basins is performed by a number of agencies, such as industries, municipalities, universities and governments.

The NRBS Study Board recognizes the need to harmonize individual monitoring efforts and recommends the creation of an Integrated Ecosystem Monitoring Committee (IEMC). Functioning within the framework of a successor organization, the IEMC would 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.

Timeliness is crucial in the establishment of both the IEMC and the successor organization.

To maintain the momentum initiated by the Northern River Basins Study, the Board recommends the establishment of a steering committee to facilitate the transition to other bodies or successor organizations by April 1, 1997. The Board also strongly endorsed the early signing of the ***Mackenzie River Basin Transboundary Waters Master Agreement***.

Study Process

One of the key findings of the NRBS has been the success of the study process itself. Although initiated by governments, the NRBS was set up to be "arm's length" from those governments. The Ministers appointed a Study Board that represented many interests associated with the Peace, Athabasca and Slave river basins, including industry, environmental groups, aboriginal peoples, health, agriculture, education, municipalities and the federal, provincial and territorial governments. While their interests are diverse, the Board members provided broad, comprehensive direction to the Study, and they became united in their shared vision of wise management and sustained use of the rivers.

This representative system was further strengthened by sustained and deliberate involvement of basin residents in the Study process, through a proactive communications strategy with regular news releases, attentive media relations and frequent community meetings. This provided basin stakeholders with up-to-date information and ensured that their questions and concerns were received and considered in a timely fashion. In accord with Board policy, all information from the Study was promptly released to the public, and a final series of community workshops assisted the Board in developing its recommendations.

An important finding of the Study is that public involvement is a contemporary and politically sensible way to operate

that it is of immeasurable value in sustaining public good will for any study. Very useful information was gathered through the public process that influenced the science program and subsequent results.

The broadly representative Board and the inclusion of open public participation gained greater acceptance and credibility for the Study than could ever be achieved through a closed process.

Recognizing the numerous benefits of public involvement, the Study Board recommends that meaningful public participation become an integral part of future studies within the basins.

Further Recommendations

The Study Board also forwards a number of other recommendations to the Ministers. The Board identifies several research and monitoring needs, such as studies to define the extent of PCB contamination in the basins and to describe the effects of oil sands on aquatic life. Several management recommendations are also outlined, dealing with water management, land and water use planning, water quantity/quality planning, water diversions, and inspection and enforcement activities. Additional Board recommendations, further discussion on the recommendations noted above and summaries of recommendations made by NRBS researchers are detailed in the body of the Report to the Ministers. Copies of Northern River Basins Study publications are available by calling the Study office at (403) 427-1742 prior to June 30, 1996 or by contacting:

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