Northern River Basin Study Management Recommendations

FINAL REPORT

Prepared for:
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1.0 Introductions

The Northern River Basin Study (NRBS) was a 5-year initiative launched in 1991 to improve our understanding of the existing conditions, and impacts of industrial development occurring in the Peace-Athabasca-Slave River basins. At the end of the project in 1997, a set of 24 research and management recommendations was developed to increase our knowledge of key issues in the ecosystem, and our ability to better manage northern river systems. One of the recommendations was the creation of a follow-up research program called the Northern Ecosystem River Initiative (NREI), which ran from 1998 – 2003.

The purpose of this document is to assess the current state of each recommendation through a summary of the research and management actions taken since 1998 to address each recommendation. This summary includes the work done during NREI project, and more recent projects/initiatives carried out in the last 8 years. While steps have been taken to address all recommendations, substantial work remains for many. In addition, many of the management recommendations are on-going commitments which require constant vigilance and funding to maintain the ecological integrity of the Northern River Basins.

2.0 Northern River Basin Study Management Recommendations

Recommendation 1.1 - Pollution Prevention:

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.

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

1. Industrial Effluent Limits Policy implemented by Alberta Environment set Total Suspended Solids (TSS) and Biochemical Oxygen Demand (BOD) limits for pulp mills on the Peace River.
2. A NO_x /SO_2 subcommittee, under the Cumulative Environmental Effects Management Initiative, encourages industry, government and public stakeholders to design and implement an air emissions management system, and an action plan to manage and control regional NO_x/SO_2 emissions associated with oil sands development.
3. The Canadian Council of Ministers of the Environment (CCME) endorsed Canada-Wide Standards in April 2001 for: mercury in fluorescent lamps; petroleum hydrocarbons in soil; and atmospheric releases of dioxins and furans from waste incinerators and coastal pulp and paper boilers.
4. Industrial Release Limits Policy released by Alberta Environment in November 2000 determined the release limits required to maintain ambient air and soil quality (AENV 2000).
5. In July 1999, regulators and stakeholders released the Regional Sustainable Development Strategy framework design to manage the cumulative environmental effects of multiple developments in the Athabasca Oil Sands Area
6. Alberta Environment released new surface water quality guidelines in 1999 (AENV 1999).
7. A Pollution Prevention and Conservation Section was created in Alberta Environment in 2002 to lead in the development of pollution prevention and stewardship programs.
8. Alberta Environment released new Technology Based Standards for Pulp and Paper Mill Wastewater Releases in 2005 based on a detailed review of international standards for the pulp mill sector. Standards in Alberta were based on the Industrial Release Limits Policy, which requires that limits be set to ensure: 1) that environment and human health are

protected; 2) the most appropriate pollution control technologies are adopted; and 3) continuous improvement is sought.

9. Federal, Provincial and Territorial governments are working with the Agricultural Industry to implement a comprehensive Agricultural Policy Framework (APF). The Framework includes an environmental element that recognizes that agriculture must function sustainably with the natural environment to ensure its long-term viability and profitability.
10. In June 2002, the Clean Air Strategic Alliance (CASA) published its Pollution Prevention/Continuous Improvement Framework.
11. CCME has committed to the development of Canada-Wide Standards for the reduction of mercury emissions from coal-fired electric power generating plants by 2005.

B) Recommendation Conclusions and Management Actions Conducted

Significant steps have been taken to reduce the release of effluents and toxins into aquatic habitat from the industrial, agricultural, and municipal sectors since the 1990s. However, pollution remains an issue in the northern basins given the increasing industrial development, coupled with the absence of monitoring stations, is creating growing uncertainty and concern. Continued cooperative efforts between the Federal, Provincial and Territorial governments are critical to the successful protection of aquatic habitat and air quality enhancement.

Recommendation 1.2 - Persistent Toxic Substances:

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).

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

1. 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 to Environment Canada
2. The Pulp and Paper Mill Effluent Chlorinated Dioxins and Furans Regulations were implemented under the Canadian Environment Protection Act in 1999
3. In 2001 the Canadian Council of Ministers of the Environment endorsed Canada-wide standards for emissions of dioxin and furans from waste incineration
4. Sampling and analyses conducted in 2003 indicate that total (Σ)PCBs in water and suspended sediment are present at low concentrations in the Athabasca and Wapiti rivers, but tend to be higher downstream of developed areas.
5. Concentrations of dioxins and furans in suspended sediment samples collected from the Athabasca River in 2001 are significantly lower than the levels measured in 1992.
6. Bottom sediment samples collected from the upper Athabasca River in 2000 revealed ΣPCB concentrations well below the CCME Interim Quality Sediment Guidelines.

7. As reported previously, dioxins and furans have shown marked declines in concentrations in muscle tissue in burbot, mountain whitefish and longnose suckers in the upper Athabasca river system. These declines further reflected the success of new treatment technologies instituted by the pulp and paper industry since the early 1990.
8. Preliminary results of food web investigations by NREI researchers suggest a strong correspondence in the spatial patterns of PCB concentrations in burbot livers, zoo-benthos, and forage fish. The primary causal factor is thought to be the accumulation and retention of PCBs in the periphyton-rich upper reaches of these rivers.
9. Other toxins including arsenic, mercury, PAHs have been shown to increase downstream of the some industrial facility (particularly oil sands operations) to toxic limits well beyond Alberta Environment and CCME guidelines (Timoney and Lee 2009).
10. Weldwood, Weyerhaeuser, and Alberta Pacific Forest Industries are utilizing process technologies (i.e., oxygen delignification and/or elemental chlorine-free bleaching) which reduce or eliminate the formation of dioxins and furans
11. On the upper Athabasca River, studies of mountain whitefish indicate a significant decline in dioxin and furans downstream of Hinton between 1992 and 1998.

B) Recommendation Conclusions and Management Actions Conducted

Control of persistent toxic substances remains an on-going issue. There has been substantial improvement on the regulations of some toxic substances, while the release/seepage of other toxic substances is increasing due to the rapid increasing industrial development in the oil sands regions. This includes:

A) Steps have been taken to reduce the release of some groups of persistent toxic substances (PCBs, toxaphene and dioxins and furans) through improved processing technologies of industrial waste water. NREI research demonstrated that the trend in point source loading have been substantially reduced by pollution prevention actions and/or by natural ecological processes. However, the continued presence of some of these toxic substances in fish tissue make clear that non-point sources of these contaminants such as long-range atmospheric deposition, local agricultural activities and other industrial processes still impact biodiversity within the basin. The presence of these contaminants confirms the vulnerability of the northern river basins to impacts from sources within and external to the basin.

B) Toxins associated with fish abnormality, and endocrine disruptions have shown increases linked to industrial activity. Greater regulation, control, and monitoring of these substances is critical.

Recommendation 1.3 - Nutrients:

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

1. In 2001 the Government of Canada published a comprehensive review on the nature and extent to which nutrients derived from human activities impair Canadian ecosystems and affect the quality of life and health of Canadians. A report entitled “Nutrients in the Canadian Environment” is available at: http://www.ec.gc.ca/ soer-ree/English/SOER/nutrients.cfm.
2. Alberta Environment long-term monitoring of nutrients at 2 long-term monitoring stations along the Athabasca indicate no statistical change in total phosphorus and nitrogen concentration between 1973 and 2002.
3. The Growing Forward Agricultural Policy Framework was released in 2008 by the federal, provincial and territorial Ministers of Agriculture with the goal of improving agricultural competitiveness and improving social and environmental policies.

4. Between the period of 1995 and 2000 average total phosphorus loadings from the five pulp mills on the Athabasca River demonstrated an increasing trend. Based on current 2009 water quality data for mill effluent, this trend continues with phosphorous concentration averaging greater than 40 times the target thresholds used for the CCME Guidelines for the Protection of Aquatic Life (CCME 2006). Alberta Environment is working with the pulp mills to evaluate all options for nutrient control.

B) Recommendation Conclusions and Management Actions Conducted

The discharge of nutrients to northern rivers continues to be an issue. Average total phosphorus loadings from pulp mills have shown an increasing trend, while total nitrogen loadings have been variable and show no obvious temporal trend. Pulp mill approvals in Alberta have now required the mills to conduct studies into ways to reduce their industrial wastewater pollutants, including nutrients. One strategy which has received funding from Alberta Environment, Alberta Agriculture, and the Alberta Research Council is the use of pulp and paper residual (i.e. sludge) as a fertilizer product to increase agricultural yield and reclaim disturbed sites rather than deposable into landfills. Overall, research conducted under the NREI umbrella resulted in an improved ability to establish reach specific nutrient guidelines, and can aid in the development nutrient management strategies.

Recommendation 1.4 - Other Wastes:

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

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

1. Nutrient loadings from municipalities including Grande Prairie and Jasper have declined as a result of improved treatment facilities.
2. The City of *Fort McMurray* completed the construction of a new *sewage treatment plant* in 2010, with new capacities to significantly reduce waste water discharge.
3. Alberta Environment receives annual waste water reports from all municipalities and industrial facilities which directly discharge waste water back to rivers and lakes. These reports include water quality analysis, water use, and effluent flow information. This is a reporting requirement under the Alberta Environmental Protection and Enhancement Act.

B) Recommendation Conclusions and Management Actions Conducted

Technological advances by industry and municipal waste water facilities have contributed to an overall reduction of wastes discharged directly into the northern rivers basin. In Alberta, the Environmental Protection and Enhancement Act will continue to be a major vehicle for regulating waste management by municipalities, regional authorities and waste management companies.

Recommendation 1.5 - International Airborne Pollutants

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.

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

1. Canada has signed a number of international treaties on airborne pollutants including: 1) Canada-US Air Quality Agreement and the North American Agreement on Environmental Cooperation (1991), and 2) Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (1999).
2. Canada hosted the International Pollution Prevention Summit in 2000.
3. Canada formally adopted a global treaty – the United Nations Convention on Persistent Organic Pollutants in 2001. The treaty bans 12 highly toxic chemicals, including include PCBs, dioxins and furans, DDT and other pesticides.
4. In January 2008, the Alberta government released Alberta's new Climate Change Strategy with the goals of: 1) Implementing carbon capture and storage; 2) Greening energy production; and 3) Conserving and using energy efficiently.

B) Recommendation Conclusions and Management Actions Conducted

Airborne pollutants continue to be a critical issue in the Athabasca basin. Deposition of air pollution and wind-borne particles is a key source of water contamination in areas near major industrial point source such as the Oil Sands. Elevated levels of polycyclic aromatic hydrocarbons (PAHs) have been observed within 50km of major oil sands facilities (Kelly et al. 2009). Moreover, evidence suggests the bioaccumulation of toxins in fish muscle may be due to these indirect source resulting from air pollution and wind-borne contaminants. Canada has signed variety of international agreements for the reduction and elimination of airborne pollutants, but currently lacks a rigorous air pollution monitoring program critical to tracking and understanding the movement and disposition air contaminants at regional scales.

Recommendation 1.6 - Final Reporting:

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.

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

Northern River Ecosystem Initiative ran from 1998 – 2003, with final program reports completed in 2004.

B) Recommendation Conclusions and Management Actions Conducted

Management Action Complete

Recommendation 2.1 - Winter Dissolved Oxygen:

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.

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

1. Results of the NREI study conducted by Chamber et al. (2006) led by Environment Canada confirm that pore water DO concentrations measured during the winter on the Wapiti River are highly variable, whether in areas untouched by major development or in those reaches receiving effluents. Pore-water DO did not display a consistent relationship with water column DO concentrations in either circumstance.
2. The findings introduce uncertainty into the usefulness of water column DO alone as an indicator for assessing risk in northern rivers where pore water habitats are important. Future DO objective development may need to consider site-specific conditions (e.g., substrate type, location of spawning areas, flow, effluent inputs) and specific biotic requirements to ensure adequate protection

B) Recommendation Conclusions and Management Actions Conducted

This remains an on-going issue. NREI research provides preliminary information on the physical relationships and assumptions concerning DO dynamics in northern river ecosystems. However, further research is critical to understand the dynamics of DO, and how to appropriately monitor for it.

Recommendation 2.2 - CCME DO Guidelines:

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

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

Alberta published new dissolved oxygen guidelines in August 1997, which included the chronic value of 6.5 mg/L. This information is available in the document entitled Surface Water Quality Guidelines for Use in Alberta (1999)

B) Recommendation Conclusions and Management Actions Conducted

Management Action Complete

Recommendation 2.3 - Monitoring Improvements:

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 licenses and permits. These data be logged in a central database and linked to provincial water quality data.

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

1. In February 2002 Alberta Environment published the Laboratory Data Quality Assurance Policy. This policy document sets out the mechanism by which Alberta ensures that analytical data vital to environmental management and regulatory assurance are accurate and reliable.
2. The Environmental Management System (EMS) is being enhanced to enable electronic reporting of both municipal and industrial effluent discharges. This enhancement is taking place under the terms of a partnership between Saskatchewan Environment Resource Management and Alberta Environment that was initiated in April 2003.

3. Under the Pulp and Paper Effluent Regulations, all mills are required to submit their Environmental Effect Monitoring data on water quality electronically to Environmental Effects Monitoring data housed by Environment.
4. Water quality monitoring data of municipal and other industrial waste water is reported annually to Alberta Environment. However information is submitted as individual reports (pdfs), and needs to be organized into a central database.

B) Recommendation Conclusions and Management Actions Conducted

Progress has been made in implementing a central database for water quality monitoring data (Environmental Effects Monitoring database), and in standardizing Quality Assurance/Quality Control requirement for all water quality testing. However, public access to the EEM data remains difficult due to lack of digital catalogues and access to hard copy records.

Recommendation 2.4 - Phosphorus in Pulp Mill Effluents:

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.

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

Phosphorus loadings from pulp mills continue to increase, however, winter dissolved oxygen conditions in the Athabasca River over the past 15 years have remained above guideline values each year, with the exception of winter 2003 at the station upstream of Grand Rapids.

B) Recommendation Conclusions and Management Actions Conducted

Management recommendation has not been met regarding reducing in phosphorous concentrations. Reduction in phosphorus loadings from pulp mills continue to remain as an ongoing task. For the most part, monitoring of winter dissolved oxygen have remained above guideline. As well, some of the work done as part of the NREI raised concerns over the validity of current DO Guidelines as they relate to the survival of zoobenthos within the substrate.

Recommendation 2.5 - Municipal Waste Water Treatment:

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.

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

A new municipal wastewater treatment system for Jasper has been fully operational since 2003. This system uses biological nutrient removal technology with UV disinfection. The City of Grande Prairie has also implemented the biological nutrient removal technology, and UV disinfection of effluents and as part of a recent upgrade

B) Recommendation Conclusions and Management Actions Conducted

Management recommendation addressed

Recommendation 3.1 - Operator Training & Recommendation 3.2 - Municipal Treatment Facilities:

3.1 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.

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

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

1. The provincial and federal governments have improved education and training for waste water plant operators in small communities and in First Nations to ensure the safe operation of water treatment facilities.
2. Improvements to water treatment facilities, both in terms of upgrading with new technology and improved protocols for testing has been supported by all levels of government. Resources announced through the Infrastructure Canada-Alberta Partnership Agreement will provide one means of achieving improvements to an aging water treatment and distribution system. The 'source-to-tap' facility assessments being conducted by Alberta Environment will also provide a means of addressing priority issues associated with supplying a safe and secure water supply to consumers., continued vigilance at all levels of government is required to ensure a continued safe and reliable drinking water supply for the people of the northern rivers basin.

B) Recommendation Conclusions and Management Actions Conducted

Management recommendation is an on-going commitment to ensuring the training of waste water treatment operators, and maintenance of water treatment facilities. Vigilance at all levels of government is required to ensure a continued safe and reliable drinking water supply for the people of the northern rivers basin.

Recommendation 4.0 - Alberta Water Act and Planning:

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

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

The Alberta Water Act came into force on January 1, 1999. The Framework for Water Management Planning and the Strategy for the Protection of the Aquatic Environment, requirements under the Act, have been completed and are available to guide planning activities.

B) Recommendation Conclusions and Management Actions Conducted

Management recommendation addressed

Recommendation 5.0 - Instream Flow Needs:

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.

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

1. Under the Alberta Water Act, and Water for Life Strategy, planning recommendations for instream flow needs are being developed through the Alberta Water Council, and the development of the State of the Watershed reports for each of 13 major basins in Alberta.
2. The Phase 1 Water Management Framework (P1FC) for the lower Athabasca River was implemented in March 2007 and established as a short-term plan for protecting the aquatic ecosystem, considering current water demand, water management options, and environmental flows. This was viewed as a first step because it was not enforceable, did not consider the future impacts of climate change, and failed to establish ecological base flow limits.
3. The Phase 2 Water Management Framework (P2FC) was released in January 2010, and provided recommendations to the Government of Alberta on in-stream flow needs for the lower Athabasca River. It is the responsibility of Alberta Environment and Water to finalize and implement the framework. The goal of the framework was to recommend a plan prescribing how much water, and when it could be withdrawn from the lower Athabasca River, in addition to making recommendations on implementation and enforcement requirements. The P2FC Committee submitted non-consensus recommendations for a Lower Athabasca River Water Management Framework (WMF). The Committee reached agreement in most areas related to understanding of social, economic, and environmental management issues surrounding flow requirements, but was unable to reach a consensus regarding ecological base flow (at 87 m^3/second) and withdrawal exemptions (at 4.4 m^3/second).
4. The P2FC report was released during the development of the Lower Athabasca Regional Plan. The completed draft Lower Athabasca Regional Plan includes a commitment to complete an updated water quantity management framework for the Lower Athabasca River. The Lower Athabasca Regional Plan is available at: https://www.landuse.alberta.ca/RegionalPlans/LowerAthabascaRegion/PlanningProcess/Pages/Draft LARP.aspx). Oil sands mining activity is subject to the P1FC until an updated framework is completed by regulators.

B) Recommendation Conclusions and Management Actions Conducted

Management recommendation is in the process of being addressed through a variety of avenues, including the development of State of the Watershed reports. However at present, government rules for water withdrawals on the Athabasca River are delayed in the P2FC process due to lack of consensus among committee members.

***Recommendation 6.0 - Inspection and Enforcement Activities*:**

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

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

1. Alberta Environment publically releases the number of compliance assessments (inspections, reviews and audits) and enforcement activities that are completed under the Environmental Protection and Enhancement Act and the Water Act. The province's Compliance Assessment and Enforcement Initiatives Annual Reports summarize activities undertaken by Alberta Environment to ensure approval holders and all Albertans clearly understand their environmental obligations.
2. Alberta Environment has developed Compliance Assurance Principles that describe how the department will continue to use education, prevention, and enforcement to ensure that regulated parties comply with the legislation administered by Alberta Environment.

B) Recommendation Conclusions and Management Actions Conducted

Management recommendation is an on-going commitment to ensure the public transparency and enforcement of water quality/quantity standards in the basin. Governments continue to publicize inspection and enforcement actions. The federal and provincial governments continue to publish annual reports. However, access to reports on the transgressions is difficult to access. Many exist only in non-digital hard copy form, and are only stored in one location in many cases.

Recommendation 7.1 - Reclamation of Peace-Athabasca Delta:

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.

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

1. The Wood Buffalo National Park Management Plan was released in 2010. It focuses on building relationships with local Aboriginal groups and communities, and includes the Peace-Athabasca Delta Area Management Approach. Area management approaches are effective for specific geographic locations within the park that require more detailed planning. The Peace-Athabasca Delta Area Management Approach addresses the challenges of maintaining, or in some cases improving, the delta's ecological integrity and cultural value in cooperation with Aboriginal partners, stakeholders, government and industry.
2. Three hydrological studies, and 2 wildlife studies were conducted under the NREI umbrella in the Peace-Athabasca Delta (PAD). These studies have provided additional information and building blocks that can be used for managing the PAD.
3. Research in PAD area included the hydrology and climate of the Delta, and waterfowl ecology. Monitoring techniques have been developed to support the management of the Delta hydrologic-climate models have been designed that can assist in testing potential outcomes from various management scenarios. In addition, ecological indicators which were established during the NRBS have been re-evaluated and can be used over the long term to as a performance measure of the success of management decisions.
4. The Peace-Athabasca Delta – Environmental Monitoring Program (PAD-EMP) Steering Committee, facilitated by Parks Canada, has participation from ten First Nations communities, two ENGOs (World Wildlife Fund and Ducks Unlimited), Environment Canada, Indian and Northern Affairs Canada, the Department of Fisheries and Oceans, the Province of Alberta and the Government of the Northwest Territories. Given the influence of upstream and regional industrial development (e.g., oil sands, hydro power) and climate change, the PAD-EMP is in the process of designing a comprehensive ecological monitoring program to support effective environmental stewardship by providing long-term data and information

to evaluate and report on the Delta's ecological integrity. A "State of Vulnerability" report for the PAD will be written as a precursor to finalizing an ecological monitoring program.

B) Recommendation Conclusions and Management Actions Conducted

Action plans for the maintenance, monitoring and reclamation of the Peace-Athabasca Delta has not been developed to date. However, many of the initial steps have been addressed. Considerable effort has gone into understanding of the ecological dynamics of the Peace-Athabasca Delta under the NREI umbrella.

1. A draft Ecosystem Management Plan for the PAD was tabled in 2000. However, no agreement was signed and implemented by the five principal jurisdictions: Alberta (Alberta Environment), Athabasca Chipewyan First Nation, Fort Chipewyan Métis Association #125, Mikisew Cree Nation and Canada (Parks Canada).
2. The governments continue to support the long-term protection of the ecologically important deltas of the northern river basins. The need for a Management Plan for the Peace-Athabasca Delta will be referred to the Mackenzie River Basin Board for consideration.

Recommendation 7.2 - Bennett Dam Operations:

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.

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

1. 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. Recently, there has been co-operation in operating the dam to enhance spring flows in the Peace- Athabasca Delta with the hope of maintaining flooding of unique perched basins wetlands.
2. The Mackenzie River Basin Transboundary Waters Master Agreement (MRBTWAA) was signed by Canada, Yukon, Northwest Territories, Saskatchewan, British Columbia and Alberta. This agreement commits the jurisdictions to negotiating bilateral agreements, and issues related to the Bennett Dam are being discussed.

B) Recommendation Conclusions and Management Actions Conducted

Management and operation of the Bennett Dam to enhance ecological protection of the PAD remain an on-going issue due to inter-jurisdictional negotiations.

Recommendation 8.0 - Basin Planning:

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.

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

1. In recognition of the need to sustainably manage Alberta's water resources, the Alberta Water for Life Strategy was implemented in 2003, with the stated goals of: maintaining safe, secure drinking water; healthy aquatic ecosystems; and reliable, quality water supplies for a sustainable economy. The Water for Life Strategy also mandated the formation of non-profit Watershed Planning Advisory Councils (WPACs) for each of the main basins in Alberta, including the Athabasca River Basin. The primary goal of each WPAC is to develop a State of the Watershed (SoW) report, which is currently under development for the Athabasca Watershed. Each WPAC will develop watershed planning recommendations for the basin.
2. Under the Alberta Land-use Planning Framework, the draft Lower Athabasca Regional Plan is current available for review. The report includes a commitment to develop management frameworks (including limits and thresholds) for groundwater, surface water quantity, biodiversity and land disturbance, and improved integration of industrial activities on the landscape.
3. The Regional Aquatic Monitoring Program (RAMP) was initiated in 1997 by the oil industry to collectively carry out its aquatic survey and monitoring needs in the area. RAMP is a multi–stakeholder initiative with representation from industry, aboriginal groups, and federal and provincial governments.
4. Cumulative Effects Management Association (CEMA) operates in the Regional Municipality of Wood Buffalo. The association partners with local First Nations and Métis people, and is a non-profit association which employs a professional secretariat to coordination research on Land, Air, Water and Reclamation. CEMA's role in this Oilsands region is to produces recommendations for government regulators pertaining to the cumulative impact of Oilsands development in north-eastern Alberta. CEMA has six working groups to coordinate research: Sustainable Ecosystem, Reclamation, Air Quality, Surface Water, Ground Water, and Traditional Knowledge.
5. Starting in 1997, Wood Buffalo Environmental Association (WBEA) monitors air quality at 16 stations throughout the Regional Municipality of Wood Buffalo. Under the Clean Air Strategic Alliance, the WBEA Monitoring Program is responsible for ownership and operation of a regional consolidated air quality monitoring network in the region. WBEA has begun the development of an Air Quality Index (AQI) to track the status and trends of air quality in the region.
6. Alberta Environment and Alberta Sustainable Resource Development, through the Regional Sustainable Development Strategy for the Athabasca Oil Sands (RSDS), continue to work to improve the current environmental management system. This is being achieved in partnership with CEMA and through consultation with local stakeholders in the Regional Municipality of Wood Buffalo.
7. Alberta-Pacific Forest Industries, Inc (AL-Pac) and Ducks Unlimited formed a watershed-based conservation partnership for the AL-Pac Forest Management Area. The goal is to achieve ecosystem health and sustainability through the conservation of water quality and quantity, and biodiversity within the Al-Pac FMA. This program is focused on wetlands and riparian areas, with an overall approach on the investment in science and research to better

understand: 1) ecological functions and the impacts of human activities 2) establish ecological benchmark areas and 3) promote watershed management. Completed work includes investment in a completed province wetland inventory, and improved sustainable forest management activities.

B) Recommendation Conclusions and Management Actions Conducted

Under the Alberta Water Act, the Alberta Water for Life Strategy, and Land-use Planning Framework, initial steps have been taken to develop land and water use planning at Basin scales. The WPACs are still in the early stages, with State of the Watershed reports in the Athabasca basin schedules to be completed by 2012- 2013. For the Athabasca watershed, several steps remain to be done, including the traditional ecological knowledge report, cumulative effects assessment, and the modeling of future condition under different targets and management scenarios.

***Recommendation 9.0 - Water Diversions*:**

The government of Canada, the NWT, Alberta, BC and SK exercise their legislative powers to the fullest in preventing major diversions of basin water outside of the northern river basins.

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

1. The Government of Canada continues to uphold its position on the prohibition of bulk water removal from major drainage basins in Canada.
2. All western provinces have implemented regulations restricting the bulk removal of water.

B) Recommendation Conclusions and Management Actions Conducted

Management recommendation is an on-going action. The governments of Canada, Alberta, and the Northwest Territories continue to prevent major inter-basin diversions of water through various legislation and policies.

Recommendation 10.1 - Smoky and Wapiti River & Recommendation 10.2 - Slave River Delta Fisheries:

Recommendations not applicable to the Athabasca Basin

Recommendation 10.3 - Athabasca River: Hinton to Whitecourt :

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

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

1. NREI research along this reach included topics such as endocrine disruption in fish, contaminants in water, sediments and biota, and nutrient/algal relationships.
2. All the pulp mills along the Athabasca River report annually on water quality in accordance with the federal Pulp and Paper Mill Environmental Effects Monitoring (EEM) Guideline.

B) Recommendation Conclusions and Management Actions Conducted

Surveillance of the Athabasca River water quality continues by Alberta Environment, and by monitoring and annual reporting on water quality by all Pulp and Paper Mills under the federal Environmental Effects Monitoring program. However, public access to the EEM database remains difficult.

Recommendation 11.0 - Integrated Ecosystem Monitoring Committee:

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). he 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 (Synthesis Report 10).

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

1. The Mackenzie River Basin Board has created a number of working committees to assist with the delivery of its responsibilities. A “Technical Committee” has been established to: coordinate information management within the basin; assess existing data; review issues of concern within the basin; identify data gaps; and ultimately to develop monitoring guidelines and programs.
2. The Alberta Biodiversity Monitoring Institute (ABMI) has begun its first rotation of a provincial monitoring program. The Institute monitors terrestrial and wetland biodiversity including terrestrial habitat structures, song-birds, vascular and aquatic plants, and aquatic benthic invertebrates. Monitoring is based on a province-wide 20 km x 20 km sampling grid.
3. The federal government lead by Environment Canada has begun the development of an Integrated Plan for Oil Sands Monitoring.

B) Recommendation Conclusions and Management Actions Conducted

No IEMC committee has been established. However, monitoring in northern rivers has increased through a variety institutes and partnerships. Steps have been taken to develop regional, large-scale monitoring program at the basin-wide, and sub-basin level. The ABMI is expecting to be able to report on the status of aquatic biodiversity in the Athabasca Basin over the next 3-5 years. The establishment of an IEMC committee should still be promoted because there is a need to integrate the activities and data availability of the several independent monitoring initiatives (ABMI, RAMP, WBEA, CEMA, Environment Canada and other government researchers).

Recommendation 12.0 - Fish Consumption Policies:

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.

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

1. In 2000, Alberta Health and Wellness (AHW) in collaboration with Alberta Sustainable Resource Development (ASRD), Weldwood Canada and the Westview Regional Health Authority completed a review of the fish consumption advisory on the Athabasca River System. Revised guidelines for mountain whitefish, burbot and bull trout were issued.
2. Collaborating with Health Canada, Alberta Treaty 8 Health Authority completed the "Northern River Basins Food Consumption Survey". This was a food use and cost surveys with eight communities in Northern Alberta. The survey profiled traditional food consumption patterns and traditional food beliefs. The final reporting is not yet released. Several tasks are remaining include completion of a database for contaminants and healthy food choices, and an analysis of risk and social structures based on traditional food belief and consumption.
3. The Government of Alberta issues and reviews fish consumption advisories for fish caught from local water bodies. The Chief Medical Officer of Health in Alberta Health and Wellness is responsible for issuing food consumption advisories. Of particular concern is methylmercury. It is formed through natural biological processes in the water and sediment from other forms of mercury. Fish absorb mercury directly through their gills and through consuming prey fish. Predatory species, including pike, walleye and burbot tend to show the highest concentrations.

B) Recommendation Conclusions and Management Actions Conducted

NRBS/NREI research highlighted issues of fish contaminants in the northern river basins, and led to review and revision of fish consumption guidelines. However, the new guidelines need to be assessed against the Northern River Basins Food Consumption Survey, and recent information on fish contaminant levels. In addition, regular monitoring of lakes is required to ensure the timely issuing of any fish consumption advisories in northern river basins.

Recommendation 13.0 - PCB Contamination:

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.

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

1. NREI research on organochlorine contaminants in fish from Alberta's northern rivers found: 1) PCBs in burbot liver remain relatively high in the Wapiti River downstream of Grande Prairie and, to a lesser extent, in the upper Athabasca River; 2) PCB concentrations in muscle of mountain whitefish, bull trout and long nose sucker from the Athabasca river system are relatively low and similar to results from the same or related species elsewhere in northern Canada; and 3) the lack of a significant decline in PCBs in burbot liver at most locations may suggest a persistent source.
2. Site-specific scientific evidence obtained through NREI has revealed that there are no active known point sources of PCBs to the Peace, Athabasca, Smoky or Wapiti river systems. However, past use, disposal and/or accidental release of PCBs may be partially responsible for the concentrations currently observed in sediments and fish from these systems.

3. River systems flowing through Grande Prairie and Hinton reveal that while there may be incidental, low-level contamination in and around urban/industrial centres, the concentrations in sediments are well below recommended CCME interim sediment quality guidelines.

B) Recommendation Conclusions and Management Actions Conducted

The NRBS and NREI have provided important insights into the sources, abundance and distribution of PCBs. This knowledge will serve as a baseline for future comparisons to document trends over time. The findings of NREI also establish the need to better understand the role of long range transport and deposition of PCBs, and the influence of glacially derived water.

Recommendation 14.0 - Annual Reporting:

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.

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

1. Northern River Ecosystem Initiative ran from 1998 – 2003, with 3 progress report (1999, 2001, 2003), and a final program reports completed in 2004.

B) Recommendation Conclusions and Management Actions Conducted

Management Action Complete

Recommendation 15.0 - Endocrine Disruption & Recommendation 15.0 - Fish Abnormalities:

15.1 - 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;

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

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

1. Two linked studies investigated Endocrine Disruption under the NREI umbrella. The first was a detailed endocrine assessment in wild fish within the Northern Rivers Basins, with a complementary study the characteristics of EDCs in effluent water at pulp mill sites in the Northern Rivers Basin.
2. NREI researchers observed minimal or no clear signs of endocrine disruption in fish downstream of pulp mills and municipal treatment plants. Researchers now hypothesize that eutrophication may mask the metabolic or endocrine response in fish and this could be a factor confounding the interpretation of effects measured at the NREI study sites.
3. An examination of protocols used by various jurisdictions and institutions within Canada for collecting, handling and reporting information on fish tissue contaminants and abnormalities has been completed. Consistent protocols are in place for the collection and reporting of contaminant information as part of the regulatory effects monitoring.

4. A review of information collected during the Environmental Effects Monitoring (EEM) data in 2000 found some indication of increased fish abnormalities in some reaches of the Athabasca River.
5. RAMP has reported data showing the percentage of fish with some type of external abnormality ranged from a minimum of 0.3 per cent in 1987 to a maximum of 6.5 per cent in 1996, with an average abnormality rate of 2.3 per cent of fish. However it should be noted that RMAP has underreported the number fish with abnormalities in annual reports submitted to the province.

B) Recommendation Conclusions and Management Actions Conducted

NREI research was an initial step in understanding the endocrine disruption and reproductive biology of fish throughout the basins. Results of NREI research suggests the potential for endocrine disruption exist within the Athabasca basins. The NREI was unable to resolve the fish abnormality issue reported during the NRBS. Based on new information collected under the EEM program, it is evident that endocrine disruption and abnormalities persist. Implications to fish health and populations remain an unknown, as are the causes of these abnormalities and endocrine disruption. Further studies and improved monitoring need to be conducted to understand the causes and incidence of fish abnormalities both in relation to pulp mills and Oil Sand activity, and their implications to ecosystem and human health.

Recommendation 16.0 - Oil Sands Effects:

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.

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

1. The oil sands industry established the Regional Aquatic Monitoring Program (RAMP) in 1997 to collectively carry out its aquatic survey and monitoring requirements. RAMP was includes representation from federal and provincial governments, along with stakeholders from the region. The RAMP program running since 1997. However, the RAMP program for monitoring, reporting, and managing the monitoring program has been assessed as sub-standard in the lower Athabasca. It has been criticized due to the lack of standardized methodologies, insufficient/inconsistent sampling efforts, and incomplete reporting. New programs are now being initiated to address these issues.
2. Environment Canada's research program on the impacts of oils sands development on the aquatic ecosystems of north-eastern Alberta, a companion study to the NREI, has concluded. Results of this research have indicated that: 1) Tributaries passing through the Fort McMurray oil sands region contain significant levels of naturally derived hydrocarbons in the suspended sediment, likely derived from natural oil sand exposures along the banks of these rivers.
3. The federal government lead by Environment Canada has begun the development of an Integrated Plan for Oil Sands Monitoring.

B) Recommendation Conclusions and Management Actions Conducted

Oil sands monitoring began in 1997, and has become a priority for the federal government in 2010. Future steps to meet this goal are: 1) establishing on integrated program for biodiversity and water monitoring across the region, and 2) secured funding for long-term monitoring.

Recommendation 17.0 - Slave River Delta Morphology & Recommendation 17.0 - Great Slave Lake Limnology:

Recommendation not applicable to the Athabasca Basin

Recommendation 18.0 - Government Scientific Capacity:

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.

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

1. Numerous initiatives have been undertaken since the completion of the NRBS/NREI programs, including: 1) Regional Aquatic Monitoring Program (RAMP), 2) Collaborative Mercury Research Network, Mackenzie Global Energy and Water Experiment, 3) Senior Industrial Research Chair in Integrated Landscape Management, and 4) Western Boreal Conservation Initiative. 5) Cumulative Effects Management Association (CEMA). However, the majority of these programs are short-term (1-5 years), and continued investment and focus on research in the northern rivers basins is required, in addition to ongoing assessment of project integrity and efficacy.

B) Recommendation Conclusions and Management Actions Conducted

Management recommendation is an on-going commitment to ensuring the long-term protection of northern rivers.

Recommendation 19.0* - Great Slave Lake Fisheries*:

Recommendation not applicable to the Athabasca Basin

Recommendation 20.0 - Public Participation & Recommendation 21.0 - Public Surveys & Recommendation 22.0 - Basin Wide Water Management:

20.0- 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.

21.0- 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.

22.0-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.

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

1. Under Alberta Water for Life Strategy was implemented in 2003, each Watershed Planning Advisory Councils (WPACs) is to develop a State of the Watershed (SoW) report, which include public participation and surveys. Each WPAC will develop land-use and water-use planning recommendations for implementation at the basin-wide scale, to meet the present and future concerns about the aquatic and riparian ecosystems of Northern River Basins. Each WPAC will develop land-use and water-use planning recommendations for the basin
2. Under the Mackenzie River Basin Trans-boundary Waters Master Agreement there is a requirement for a State of the Environment Report every five years. The process leading to its preparation includes input from various constituencies from which perceptions of issues and the state of the environment are obtained.

B) Recommendation Conclusions and Management Actions Conducted

The State of the Watershed reports produced by WPACs under the Water for Life Strategy for each Basin in Alberta are an important vehicle for ensuring public participation and surveys in basin-wide planning and management of northern river basins, including the Athabasca. In addition, the Watershed Planning Advisory Councils (WPACs) are key in the promotion of basin wide water management practices at the appropriate regional scale.

Recommendation 23.0 - Mackenzie River Basin Board:

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.

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

Mackenzie River Basin Board was established by the governments of Canada, Alberta, the Northwest Territories, Saskatchewan, British Columbia, and the Yukon, which have all signed the Mackenzie River Basin Transboundary Waters Master Agreement. The Board will be a

cooperative forum in which governments in the basin could develop consistent and cooperative management approaches and resolve inter-jurisdictional issues. The governments propose that the Mackenzie River Basin Board serve the purpose of the recommended Northern River Basins Board.

B) Recommendation Conclusions and Management Actions Conducted

The Mackenzie River Basin Board was established in 1997. Currently, the Board influences regulatory decisions made in the various jurisdictions through: 1) State of the Aquatic Ecosystem Reports, to inform decision makers, 2) participating in and influencing pre or post regulatory processes, such as planning, regional or cumulative environmental impact assessment processes, or ministerial reviews of sensitive decisions, and 3) by appearing as a "friend of the tribunal" in federal, provincial and territorial public hearings to advocate for the principles endorsed in the Master Agreement. The Agreement commits the parties managing water resource to maintain the ecological integrity and sustainability of the aquatic ecosystem, but also allows each partner to manage their resources provided such does no unreasonable harm to the ecological integrity for the aquatic ecosystem in another jurisdiction.

Recommendation 24.0 - Northern Rivers Ecosystem Initiative:

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.

A) Provincial/National Guidelines Implemented and Actions in Athabasca Basin

Northern River Ecosystem Initiative ran from 1998 – 2003, with final program reports completed in 2004.

B) Recommendation Conclusions and Management Actions Conducted

Management Action Complete