

## River Report Card

**Athabasca River System** – Any changes in the aquatic resources of the Athabasca River appear to be very minor and largely undetectable. Hydrologic conditions measured in 2004 were generally consistent with results recorded in previous years. There were no detectable changes in water and sediment quality that could be attributed to oil sands development. In addition, there was no evidence to suggest that fish populations in the Athabasca River have changed as oil sands development has increased in the basin.

**Athabasca River Delta** – There were no influences of oil sands development activities detected in the Athabasca River Delta in 2004.

**Muskeg River System** – RAMP monitoring in this basin is extensive in response to increasing oil sands development. In 2004, decreases were observed in flow characteristics relative to pre-development conditions. Hydrologic conditions vary from year to year, so additional monitoring is required to assess the importance of this result. There was little observable change in water and sediment quality measurements. As well, no effect from oil sands development on benthic invertebrate communities or fish populations was detected.

**Steepbank River System** – There is little evidence to suggest that mining operations (which commenced in 1997) have influenced hydrologic and water quality conditions. Subtle shifts in benthic community composition were observed, but the communities were similar to those found in other river systems unaffected by oil sands activities.

### Activities That May Influence Water Quality

*Within the Regional Municipality of Wood Buffalo:*

- Oil sands operations
- Pipeline construction
- Forestry operations
- Drilling activities
- Gravel and limestone quarries
- Municipal growth/infrastructure development

*Upstream of the Regional Municipality of Wood Buffalo:*

- Pulp and paper operations (five mills)
- Coal mining
- Agriculture and livestock operations
- Municipal wastewater facilities

## Reference Watersheds

In addition to monitoring “exposed” lakes and rivers that may be affected by oil sands developments, RAMP monitors “reference” lakes and rivers within the Regional Municipality of Wood Buffalo that are not expected to be influenced by mining activities. Data collected from reference lakes and rivers is compared to that recorded in “exposed” aquatic systems. When changes to exposed lakes and rivers are detected, this information helps scientists determine whether these changes have occurred naturally or may be related to oil sands activity.

In 2004, RAMP monitored these reference watersheds outside areas of current oil sands development:

- Clearwater-Christina River system
- Hangingstone River system
- Calumet River system
- Firebag River system
- Ells River system; and
- Kearl and McClelland lakes

*Note: Future oil sands development may have an impact on some of these watersheds.*

**Tar River System** – Mining-related clearing and draining of land commenced in the basin during the second half of 2004. Ongoing monitoring will be conducted to assess potential mine-related effects on the Tar River. No differences in sediment quality or benthic invertebrate communities were observed. Suspended sediments were higher than in past years, which may be related to land disturbance, heavy rains that occurred during the sampling period or both.

**MacKay River System** – At most, differences in all aquatic resources were minor. Changes in hydrologic conditions were similar to those expected if there was no oil sands activity in the basin. Few minor changes were evident in water and sediment quality and benthic invertebrate communities. All results were within the range of natural variability.

**Small Lakes and Streams** – Several small lakes and streams located near oil sands developments were also monitored by RAMP. These included Mills Creek, Poplar Creek, Beaver Creek, Isadore's Lake and Shipyard Lake. In general, results from this work did not suggest any effect related to oil sands operations.

# Healthy Rivers, Lakes and Fish



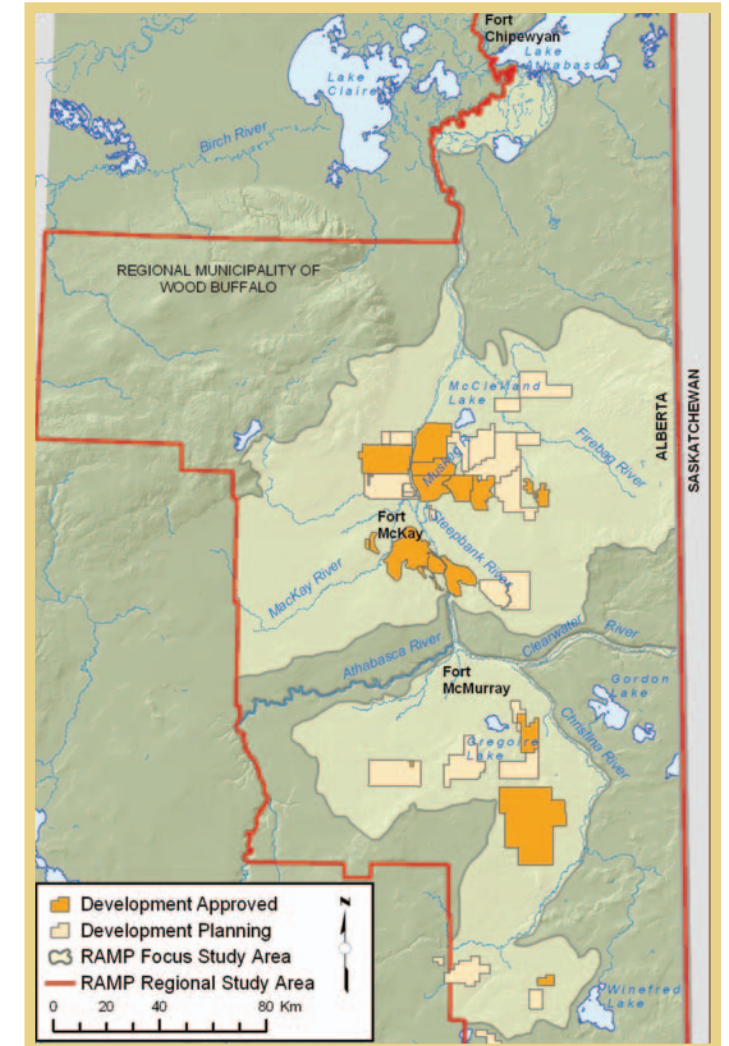
Since it was initiated in 1997, the role of the Regional Aquatics Monitoring Program (RAMP) has been **monitoring the health of the region's aquatic environments** so that long-term trends, regional issues and potential cumulative effects related to industrial development can be identified and addressed.



**RAMP** is an oil sands industry-funded, multi-stakeholder initiative created in response to oil sands development within the Regional Municipality of Wood Buffalo. Since 1997, RAMP has continued to grow and adapt to the needs of the community, regulators and industry. RAMP is responsive and able to modify its activities based on past monitoring results, new oil sands developments, technological advances and community concerns.

Sampling conducted by RAMP is focused on lakes and rivers in areas where oil sands development is occurring or is planned as well as downstream of any development. During 2004, RAMP monitoring focused on the following aquatic systems:

- Athabasca River and the Athabasca River Delta;
- major tributaries of the Athabasca River, including the Clearwater, Christina, Hangingstone, Steepbank, Muskeg, MacKay, Ells, Tar, Calumet and Firebag rivers;
- select minor tributaries of the Athabasca River such as MacLean Creek, Beaver Creek and Poplar Creek;
- specific shallow lakes in the vicinity of current or planned oil sands development; and
- a set of regional lakes important either from a fisheries perspective or potentially sensitive to oil sands emissions.

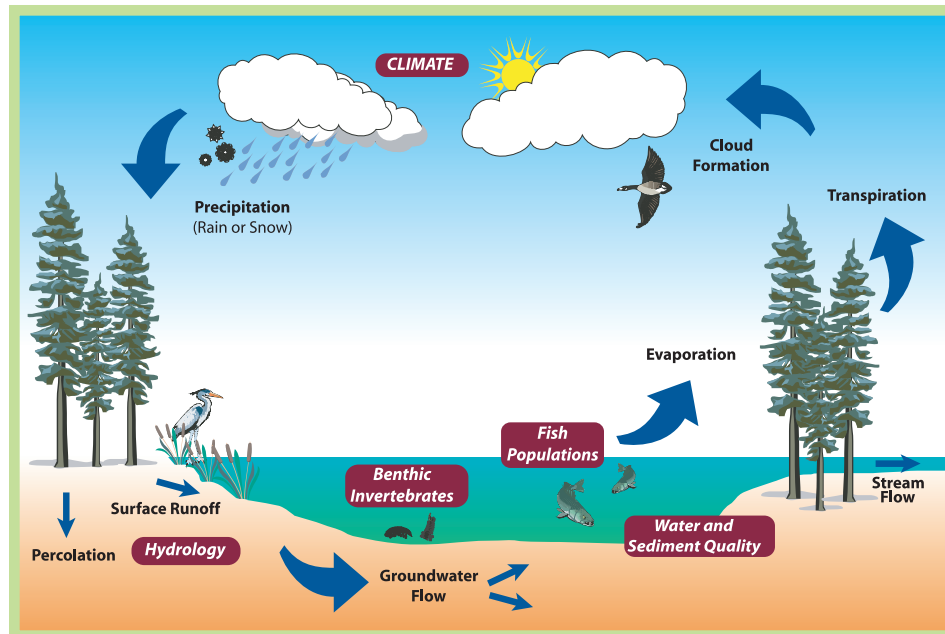


Map of Oil Sands Development Areas

### WHO'S INVOLVED IN RAMP?

- | INDUSTRY   | STAKEHOLDERS   | GOVERNMENT  |
|--|--|---|
| <ul style="list-style-type: none"> <li>• Alberta Pacific Forest Industries Inc.</li> <li>• Albion Sands Energy Inc.</li> <li>• Canadian Natural Resources Limited</li> <li>• Deer Creek Energy Ltd.</li> <li>• Devon Canada Corporation</li> <li>• Husky Energy</li> </ul> | <ul style="list-style-type: none"> <li>• Imperial Oil Resources</li> <li>• OPTI Canada Inc.</li> <li>• Nexen Inc.</li> <li>• Petro-Canada Oil and Gas</li> <li>• Shell Canada Limited</li> <li>• Suncor Energy Inc. Oil Sands</li> <li>• Syncrude Canada Ltd.</li> </ul> | <ul style="list-style-type: none"> <li>• Alberta Energy and Utilities Board</li> <li>• Alberta Environment</li> <li>• Alberta Sustainable Resource Development</li> <li>• Environment Canada</li> <li>• Fisheries &amp; Oceans Canada</li> <li>• Regional Municipality of Wood Buffalo</li> </ul> |
| <ul style="list-style-type: none"> <li>• Athabasca Chipewyan First Nation</li> <li>• Athabasca Tribal Council</li> <li>• Chipewyan Prairie First Nation</li> <li>• Fort Chipewyan Metis Local #124</li> <li>• Fort McKay First Nation</li> </ul>                           | <ul style="list-style-type: none"> <li>• Fort McKay Metis Local #122</li> <li>• Fort McMurray First Nation</li> <li>• Mikisew Cree First Nation</li> <li>• Oil Sands Environmental Coalition</li> <li>• Pembina Institute</li> </ul>                                     |   |

Several rivers and lakes near oil sands development (“exposed” watersheds) within the Regional Municipality of Wood Buffalo were monitored during 2004. Monitoring focused on five key components of these boreal aquatic ecosystems: climate and hydrology; water and sediment quality; benthic invertebrate communities; fish populations; and water quality in regional lakes sensitive to acidification.



The components of RAMP are all part of the aquatic ecosystem

**Climate and Hydrology** – monitor changes in the quantity of water flowing through rivers and creeks. The information gathered increases knowledge of how streams and lakes react to rain and snow, flooding, drought and other irregular events.

Overall, it appears that there has been very little change in hydrologic conditions up to and including 2004. Surface water hydrology in the RAMP study area has exhibited minor changes, some of which may be a result of oil sands development.

**Benthic Invertebrate Communities** – consist of aquatic organisms such as insects, snails, clams and worms that spend at least part of their lives in or on the bottom of rivers, lakes or wetlands. These organisms are an important food source for fish and are an important indicator of fish habitat quality. Generally, benthic communities in unpolluted waters consist of a large number of animals (high abundance)

and a wide range of species (richness). Monitoring benthic communities provides a measure of the health of a lake or river.

In 2004, similar abundance and richness of benthic invertebrates were observed in water bodies located in areas of oil sands development relative to those located elsewhere in the region. This was consistent with results from previous RAMP surveys.

**Water and Sediment Quality** – reflect habitat quality and potential exposure of fish and invertebrates to organic and inorganic chemicals. Monitoring the physical and chemical characteristics of water and sediment (includes mud, soil, sand and other materials that make up the bottoms of lakes and rivers) provides insights into how natural and human activities affect the health of aquatic ecosystems. Water quality measurements provide a snapshot of current conditions. Sediment quality measurements show how chemicals accumulate over time.

Based on data collected during 2004, there is little or no difference in overall water and sediment quality between samples collected near oil sands developments and elsewhere within the Regional Municipality of Wood Buffalo.

**Fish Populations** – serve as an important monitoring tool because they are good ecological indicators and a valued resource. RAMP monitors fish populations in the Athabasca River as well as smaller rivers and streams flowing into the Athabasca to see if they are being affected by oil sands development and also to determine whether or not the fish are safe to eat. The RAMP fish program monitors: the presence and abundance of fish species; where the fish go and how much time they spend in the oil sands region; fish habitat; fish health; and fish tissue chemistry.

The 2004 fish population and tissue quality survey results were similar to those from previous RAMP surveys. In 2004, muscle tissue was analyzed from fish collected in three locations: the Muskeg River (northern pike); the Clearwater River (northern pike and walleye) and Winefred Lake (walleye, northern pike and lake whitefish). In general, concentrations of metals and tainting compounds (sources of abnormal odour and flavour in fish tissue) found in fish muscle do not pose a risk to human health. At all three sites, mercury concentrations in fish muscle exceeded government guidelines for people subsisting on fish. The guideline for recreational consumers of fish was occasionally exceeded. Elevated concentrations of mercury occur naturally in the oil sands region and are not a result of oil sands development.

**Acid-Sensitive Lakes** – are water bodies considered vulnerable to increasing acidity. Acid-forming compounds (such as oxides of sulphur and nitrogen released by industry)



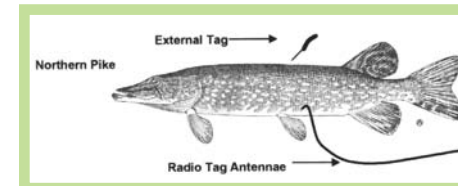
**Natural Variations in Water Quality and Fish Populations**

Some variations in water quality and fish populations are natural and expected. From one year to the next, observations may be influenced by climatic conditions, precipitation and water flow. Even the weather conditions at the time data are collected may influence results. Factors such as an increase in beaver dams during drier years may result in a decrease in fish populations. The dams make it difficult for fish to reach spawning areas, which also may be degraded due to the activity of beavers. Consequently, variations in fish populations noted in one year do not necessarily reflect any long-term changes in abundance.

can cause the water to become more acidic. Increased acidity can harm the health of fish, insects and plants. The goal of this monitoring is to identify early signs of acidification before the lakes and organisms have been harmed.

Since 1999, RAMP has monitored the water quality of 50 lakes located throughout the Regional Municipality of Wood Buffalo that are considered sensitive to potential acidification from industry-related emissions.

In the most recent years of monitoring, about half the lakes became less acidic and a few became more acidic. This is not seen as evidence of a definitive trend of potential increases or decreases in acidity, as most of these differences were small and likely related to natural conditions. RAMP will continue to monitor these lakes for potential acidification.



**How Fish are Counted**

RAMP employs several techniques to determine the number and species of fish in the region. A two-way fish counting fence was used across the lower Muskeg River in 2002 and 2003, to determine the number of fish moving into and out of the river during the spawning season. Counts were also conducted using electrofishing, hoop nets and fish larval traps. Electrofishing makes use of specially-equipped boats and backpack electrofishing units which generate an electrical pulse that is passed through the water. Any fish within a three- to five-metre radius are temporarily immobilized and float to the surface. Then they are netted, counted by species and released.

**How You Can Help**

There are several ways that members of the public can assist RAMP in monitoring the health of the region's lakes, rivers and fish populations:

**Fish Tagging Program**

If you catch a fish that has been tagged, please report the tag number, tag colour, the kind of fish and its length and weight to Alberta Environment, Alberta Sustainable Resource Development at (780) 743-7200. Please release live radio-tagged fish after recording the external tag number and fish information to allow the study to continue.

**Fish Abnormalities Program**

If you catch an abnormal fish (lesions, growths, scarring, unusual scale patterns, body colour changes or physical abnormalities, including missing fins, curved spines and blindness), please retain the specimen and contact RAMP c/o Hatfield Consultants at 1-888-743-4290 (toll-free). Please ensure that any retained fish meets the requirements laid out in the Alberta Guide to Sportfishing Regulations.

**River Response Network**

- Report any spill-related events to Alberta Environment at 1-800-222-6514 (toll-free).
- Report occurrences of foam, scum, turbidity and other events, which may or may not be of natural origin, by calling 1-800-222-6514 (toll-free).