

# Oil sands leave toxic traces

Pollutants in Canadian lakes are linked to exploitation of energy source.

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Oil sands in Alberta, Canada, hold some of the world's largest reserves of crude oil, and production there has been booming. But a study shows that contaminants from the development of the sands are stacking up in the environment.

Scientists studied five lakes near mining and upgrading operations around Fort McMurray, Alberta, and one further lake 90 kilometres northwest. They found that levels of polycyclic aromatic hydrocarbons (PAHs) — carbon-based compounds, some of which are toxic or carcinogenic — in lake sediments have been on the rise since the 1960s. By 2011, PAH levels in the lakes ranged from 2.5 to 23 times higher than they were before 1960. The results are published today in the *Proceedings of the National Academies of Science*<sup>1</sup>.

The group checked the PAHs found in the lakes against those associated with bitumen from the nearby Athabasca oil sands, to examine the likelihood that the chemicals were coming from natural sources such as forest fires. They found that levels of industry-related chemicals in the lake sediments rose sharply from 1990 onwards.

"The signature of the PAHs and the timing strongly suggest that development and the refining of the oil sands plays a role in PAHs increasing in these lakes," says Joshua Kurek, an environmental scientist at Queen's University in Kingston, Canada, and lead author of the study.

## Not natural

The results build on a pair of studies published in 2009 and 2010 by David Schindler, a freshwater ecologist at the University of Alberta in Edmonton, and his colleagues. They found [elevated levels of PAHs and heavy metals](#) in river water and snow downstream from mining operations<sup>2,3</sup>.

Some critics claimed that the contaminants had entered the waterways as a result of natural erosion of bitumen-rich soils. However, there are no data on levels of PAHs in river water before development of the oil sands on which to base comparisons. The lake sediments used in the latest study provide a historical record that circumvents the gap.

"Lake sediments accumulate 24 hours a day and 365 days a year. They are slowly and indirectly monitoring the environment around us, collecting contaminants," says John Smol, a limnologist at Queen's University and a co-author of the study.

"The surprise is that they can detect the contaminants at over twice the radius that we can," says Schindler. "It suggests there is a wide area affected by these airborne contaminants."

A study published last year failed to find any increase in PAHs in lake sediment cores 200 kilometres downstream from the mining area<sup>4</sup>.

## Growth spurt

The rising levels of contaminants did not negatively affect algae and the microscopic invertebrates that graze on them — in fact, these thrived. Smol attributes the boost in microorganism populations to warmer air temperatures; the average temperature in Fort McMurray has increased by 1.65 °C since 1960.

Crude-oil production is expected to double between 2011 and 2020 in Alberta. The province's government announced in October 2012 that it would create an independent agency to monitor pollutants, including those coming from oil-sands operations. Neither the



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The oil-sands refinery at Fort McMurray in Canada has been associated with increased levels of pollutants in local waters.

head of the new agency nor a representative of the Regional Aquatic Monitoring Program, which represents the oil-sands industry, responded to *Nature's* requests for comments before deadline.

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## References

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