

## Research Package #2

# (Junior and Senior High)

“This House would put a moratorium on the development of oil sands in Alberta” (Jr.)

“This House would put a moratorium on the development of oil sands” (Sr.)



## Mid-Year Topic (Nov./Dec./Jan.) 2010-2011

We no longer differentiate topics as “policy” or “values”. Use a model if it is helpful, but both practical and values arguments are accepted at all levels of debate.



“The process of removing the tar from the sand involves incredible amounts of energy from clean-burning natural gas (with nuclear proposed alongside), tremendous capital costs during build up, incredibly high petroleum prices to protect investments, and the largest single industrial contribution to climate change in North America.”

"It would be folly to halt oil sands production and the construction of pipelines that would carry Canadian oil to U.S. markets. Oil sands development accounts for less than 1 percent of global greenhouse-gas emissions. Environmental groups claim that oil sands produce five to seven times the carbon emissions of conventional oil, but a study by Cambridge Energy Research Associates, a highly regarded consulting group, determined that oil sands emissions are only 5 percent to 15 percent higher than the average barrel of crude oil processed in the United States."

“THW put a moratorium on the development of the oil sands in Alberta”

**The Proposition Team supports the resolution and will say “YES”**

**The Opposition Team opposes the resolution and will say “NO”**

Both Proposition and Opposition Teams will try to pick about 3 or 4 good reasons to support their position and try to develop each by going through 4 steps:

1. State your point.
2. Explain your point.
3. Provide evidence in support of your point (give an example).
4. Explain how that evidence proves your point (tie it back to your theme).

Each argument will look like this:

**Point #1:** \_\_\_\_\_

Explanation: \_\_\_\_\_

Example: \_\_\_\_\_

Tie point to theme: \_\_\_\_\_

**Point #2:** \_\_\_\_\_

Explanation: \_\_\_\_\_

Example: \_\_\_\_\_

Tie point to theme: \_\_\_\_\_

**Point #3:** \_\_\_\_\_

Explanation: \_\_\_\_\_

Example: \_\_\_\_\_

Tie point to theme: \_\_\_\_\_

# PROPOSITION TEAM

The job of the Proposition in any debate is to persuade the judges that the resolution should be supported. In order to accomplish this, there are a number of steps that the Proposition team must go through.

- 1) Define the resolution (Make sure everyone is clear upon what the Proposition is debating).
- 2) Present a Model (if needed)
- 3) Present arguments in favor of the resolution.
- 4) Refute Opposition attacks on the Proposition case. (Show why the Opposition is wrong and the Opposition is correct).

Owing to time restrictions, the Proposition duties are normally divided up between the first and second Proposition speakers. It is customary for the first proposition speaker to present two arguments followed by the second speaker who presents the final argument.

## AN EXAMPLE OF A PROPOSITION STATEMENT

Tar sands are pushing Alberta/Canada in the wrong direction when it comes to carbon emissions. In a time when one of the world's top priorities, our focus on tar sands energy does not only produce the usual high level of carbon emissions that come from oil production, but this is amplified by the energy used to extract the oil in this detrimental process.



Here are some arguments that the Proposition can use in developing their case that the government should put a moratorium on developing the oils sands.

- Oils sands production is detrimental to human health
- Extracting oil sands uses too much water. Water is a precious resource which is finite on the planet.
- Oil sands produces far too many CO2 emissions
- Alberta needs to put more emphasis on reduction of the use of energy and cleaner and renewable energy resources. Continuing to develop the oil sands is slowing down our movements towards cleaner, renewable energy.
- Tailings ponds used in the development of oil sands are detrimental to the wildlife in the area, and are not well regulated.
- Oil sands development devastates some of Canada's most beautiful natural landscape.
- It is not fiscally responsible to invest so much of our economy into a non-renewable resource. If we do not start building Alberta's economy in other areas, future generations will be in big trouble when the oil sands run dry.

# OPPOSITION TEAM

The job of the Opposition is to be disagreeable! Whatever the Proposition believes, generally, the Opposition counters. The more you disagree, the better! The Opposition has to convince the judges not to accept the Proposition resolution.

The Proposition wants to convince the judges that their proposal should be adopted.

The Opposition wants to convince you that the Proposition proposal should not be accepted for one or more reasons.

The steps that the Opposition should use are:

- 1) Either agree with the Proposition definition or propose a definition of your own. (Only disagree if absolutely necessary. These make for messy debates.)
- 2) Rebut the Proposition arguments in favor of the resolution.
- 3) Attack the Proposition Model and sometimes propose a counter model
- 4) Present reasons (arguments) to oppose the resolution.
- 5) Refute Proposition attacks on the Opposition case (show why the Proposition is wrong and Opposition is right).

Owing to time restrictions, the Opposition duties are divided between the first and second opposition speakers.

It is the custom for the First Opposition Speaker to present two arguments and the second opposition speaker to present the final argument. (This is flexible!)

## AN EXAMPLE OF AN OPPOSITION STATEMENT

Alberta's energy demands will not decrease by turning off the switch on oil production. That means that we will not only lose the valuable jobs and economy stimulus that the oil sands bring to Alberta, but we will immediately need to get our energy from elsewhere. Not only is this economically and politically unstable, but all we will be doing is sending the same problem elsewhere. The move to cleaner, sustainable energy needs to be a slow & gradual process. The best thing that we can do for the time being is to work towards the cleanest, most efficient extraction possible.

Some of the arguments that the Opposition can use in developing their case that Alberta should NOT put a moratorium on developing the oil sands:

- The environmental effects of the oil sands industry are greatly exaggerated. It represents a minuscule percentage of global carbon emissions.
- The oil sands developments are very well regulated. Each operation needs an approval, and strict limits are enforced as to the amount of water used and the safety of the tailings ponds.
- Oils sands projects recycle 80 – 95 percent of the water they use.
- Every dollar invested in the oil sands creates about \$9 worth of economic activity; with one-third of that economic value generated outside Alberta - in Canada, the U.S. and around the world. This is the primary reason for Alberta's strong economy.
- Royalties from the oil sands (\$1.9 billion in 2009-10) help fund many public programs and services, including infrastructure, health and education. It is estimated that Alberta can expect \$184 billion in royalties over the next 25 years.
- Alberta's oil sands contain recoverable reserves of 170 billion barrels, the second-largest reserves in the world. This energy is in great demand.
- One in 15 jobs in Alberta is directly related to energy. Almost 136,000 Albertans are employed in Alberta's mining and oil and gas extraction sectors.
- Oil sands development, upgrading and value-added production are expected to create employment opportunities for Albertans and the rest of Canada for years to come.

THE ARTICLES HERE HAVE BEEN EDITED, REPHRASED & ANNOTATED

# RESEARCH

**This Research booklet is not complete. It is only an overview of information and good debaters will use this booklet as a basis for their thinking and move on to other ideas and research. As well, the best foundation for any research into a topic begins with some basic reading on the ideas. Follow this with an interview with someone who is knowledgeable, can suggest ideas and can direct you to other ideas and research. Although you cannot quote this person unless he/she is published in print or on video, a human being can always explain issues better than an article.**

## **Alberta Government – About the Oil Sands**

(<http://www.oilsands.alberta.ca/1.cfm>)

Alberta contains the second largest proven concentration of oil in the world, the vast majority of which is found in oil sands deposits.

Alberta's oil sands have approximately 170 billion barrels of proven recoverable reserves.

Oil sands are naturally occurring mixtures of sand or clay, water and a thick, heavy substance called bitumen. Bitumen will not flow unless it's heated or diluted. At room temperature, it acts much like cold molasses.

Oil sands are contained in three major areas of northern Alberta beneath approximately 142,000 square kilometres, with approximately 602 square kilometres of land currently disturbed by oil sands surface mining activity.

### **Two ways to recover bitumen – mining vs. in situ**

There are 91 active oil sands projects in Alberta. Of these, five are mining projects; the remaining projects use various in situ (in place) recovery methods. For oil sands near the surface, it can be mined and moved by trucks to a cleaning facility where the sand is mixed with hot water to separate the bitumen.

For oil sands further beneath the surface, extraction is done through various in-situ processes. These processes use steam, solvents or thermal energy to make the bitumen flow to a point that it can be pumped by a well to the surface.

Approximately 80 per cent of Alberta's oil sands are recoverable through in-situ production, with only 20 per cent recoverable by mining. Upgrading and refining can be done remotely for both types of recovery. In-situ operations are able to reclaim areas much sooner than open pit mines, and also eliminate the need to create tailings ponds.

Under Alberta law, any disturbed land must be reclaimed.

## Alberta Government – Oil Sands Facts and stats

<http://www.oilsands.alberta.ca/519.cfm#Fact%20sheets>

- Alberta has proven oil reserves of 171.3 billion barrels, including approximately 170 billion barrels of oil sands bitumen.
- Oil sands are contained in three major areas of northeastern Alberta beneath about 140,200 square kilometres, with approximately 602 square kilometres of land disturbed by oil sands surface mining activity.
  - That's roughly the size of Florida, with the amount of land disturbed for oil sands mining roughly equivalent to the size of the Kennedy Space Centre.
- Approximately 80 per cent of recoverable oil sands is through in situ production, with less than 20 per cent recoverable by mining.
- In March 2008, the Alberta government issued its first reclamation certificate to Syncrude Canada Ltd. for the 104-hectare parcel of land known as Gateway Hill approximately 35 kilometres north of Fort McMurray
- There are 91 active oil sands projects in Alberta. Of these, five are mining projects; the remaining projects use various in situ (in place) recovery methods.
- In 2008, Alberta exported about 1.4 million barrels per day of crude oil to the U.S.
- Every dollar invested in the oil sands creates about \$9 worth of economic activity; with one-third of that economic value generated outside Alberta - in Canada, the U.S. and around the world.
- One in 15 jobs in Alberta is directly related to energy.
- Oil sands make up about five per cent of Canada's overall greenhouse gas emissions and less than one-tenth of one per cent of the world's emissions.
- A \$2-billion investment to advance steel-in-the-ground carbon capture and storage (CCS) projects is expected to reduce emissions by five million tonnes in annual reductions by 2015. That's the equivalent of taking one million vehicles, or one-third of all registered vehicles, off of Alberta roads.
- The Government of Alberta and private industry have each invested more than \$1 billion in oil sands research. Combined efforts will continue to bring science solutions that reduce the environmental footprint of oil sands development and increase economic recoveries.

## The Case For Oil Sands

<http://blog.energytomorrow.org/2009/07/the-case-for-oil-sands.html>

In a recent op-ed in the Argus Leader, John Duff Erickson, professor emeritus at the South Dakota School of Mines and Technology, makes a strong case for continuing the development of Canadian oil sands. He notes that Canada is the largest supplier of oil to the United States, and Canadian oil is helping to bolster U.S. energy security.

Mr. Erickson also expresses his concern about a coalition's efforts to stop the use of oil sands-derived crude oil in the United States. He says the coalition is arguing that oil sands production is a leading cause of greenhouse gas emissions:

"It would be folly to halt oil sands production and the construction of pipelines that would carry Canadian oil to U.S. markets. Oil sands development accounts for less than 1 percent of global greenhouse-gas emissions. Environmental groups claim that oil sands produce five to seven times the carbon emissions of conventional oil, but a study by Cambridge Energy Research Associates, a highly regarded consulting group, determined that oil sands emissions are only 5 percent to 15 percent higher than the average barrel of crude oil processed in the United States."

Mr. Erickson adds that several refineries in the Upper Midwest are boosting their oil sands capacity and making large investments to increase operating efficiency and reduce emissions. Under the API Climate Action Challenge, API-member refiners have committed to improve their efficiency by 10 percent by 2012.

## Canadian Oil Sands

[http://www.energytomorrow.org/Canadian\\_Oil\\_Sands.aspx](http://www.energytomorrow.org/Canadian_Oil_Sands.aspx)

Our nation needs more supplies of all energy sources, including oil and natural gas, to meet growing energy demand and provide consumers with reliable supplies of fuel. What many Americans don't know is that the U.S. gets more oil from Canada than from any other country.

Canadian oil is a reliable and plentiful strategic resource for meeting our nation's growing energy demand and making the United States more energy secure.

Here are some of the most asked questions and answers about Canadian oil sands:

How abundant are Canada's oil reserves, and what portion do oil sands constitute? Canadian oil reserves are vast and are second only to Saudi Arabia, using current technological assessments. According to the Canadian Association of Petroleum Producers, oil sands now account for more than half of western Canada's total oil production. By 2025, production from Canadian oil sands is expected to rise from about 1.3 million barrels per day to about 3.3 million barrels per day.

Why is Canadian oil important to the United States? Canada and the United States have an excellent trading and political relationship, and Canada's reliable and plentiful oil is crucial to improving our nation's energy security and meeting its growing energy demand.

The economic impact of Canadian oil sands development is a boon for the U.S. economy and is expected to lead to the creation of more than 340,000 new U.S. jobs between 2011 and 2025.

How much of its oil does Canada export to the United States? Currently, Canada sends more than 99 percent of its oil exports to the United States—the bulk of which goes to Midwestern refineries. By getting more of their oil from Canada, Midwest refineries would move from the back of the crude oil supply line to the front—making them less vulnerable to supply disruptions caused by geopolitical upheaval or storms in the Gulf of Mexico.

What are oil sands and how are they used? Oil sands are naturally occurring mixtures of sand, clay, water and a form of petroleum called bitumen—which can be upgraded for synthetic crude oil and refined to make asphalt, gasoline, jet fuel and some chemicals.

How do oil sands factor into the U.S. energy mix? According to EIA, Canada is the number-one supplier of imported oil and natural gas to the United States. Of the Canadian crude oil brought into this country, approximately half is derived from oil sands. According to a study released in May 2009 by the Cambridge Energy Research Associates, if oil sands development is maximized, the amount of oil the United States imports from Canada could potentially double by 2035.

Are there economic benefits associated with producing crude derived from Canadian oil sands? A study commissioned by API and conducted by the Canadian Energy Research Institute, "Canada's Oil Sands and Economic Impact on the United States' Economy," says greater production of Canada's oil sands is expected to stimulate economic activity in both countries, creating more than 340,000 new jobs in the U.S. alone.

As oil sands production and investment rises, the demand for U.S. goods and services also increases, adding an estimated \$34 billion to the U.S. Gross Domestic Product (GDP) in 2015 and \$42.2 billion in 2025.

The benefits of oil sands development do not fall to only one industry or any one region in the U.S. but are broadly shared across many industrial sectors and regions. Huge sums are being invested to build new pipelines and expand refineries to transport and process Canadian oil.

Are there environmental concerns regarding the use of crude derived from oil sands? The extraction and processing of oil sands do, on average, result in higher greenhouse gas (GHG) emissions than light, sweet (low-sulfur) crude oil. But so do many of the heavy, high-sulfur crudes that are being produced in the United States and around the world. On a life cycle (or well-to-wheels) GHG emission basis, oil derived from Canadian oil sands is comparable with other crudes refined in the United States. We believe that the United States is equipped to manage the emissions from crude derived from oil sands with greater care than if it were processed in regions of the world with less stringent environmental standards— not to mention the environmental costs of transporting the crude elsewhere.

What steps are being taken to limit the environmental impact of the practice? The oil and natural gas industry remains committed providing the energy our nation needs to power its economy in a reliable and environmentally-responsible manner. To this end, the oil and gas industry has invested \$58 billion, which is 44% of all low and zero carbon technology investments, in the US between 2000 and 2008. This is more than what the federal government or all other industries combined are investing.

Does the use of oil sands affect the quality of the refined product? Using oil sands as a feedstock does not affect the quality of the refined products. In fact, gasoline and other fuels made from oil sands already are being used in the United States. Every project is required to adhere to applicable federal, state and local regulations and permitting conditions. And the vast investments refiners and pipeline operators are making to increase capacity and flexibility to process oil sands includes the equipment necessary to make products that meet all required specifications.

### **The Economist: Vapour trails**

[http://www.economist.com/node/16488892?story\\_id=16488892](http://www.economist.com/node/16488892?story_id=16488892)

“THE bad news is we didn’t hit oil,” ran the old wildcatter’s joke. “The good news is we didn’t find gas.” Potentially dangerous and always more difficult to manage than pouring liquid into a barrel, natural gas used to give oil companies a headache. Now gas is dominating the thoughts of Western oil bosses and, increasingly, their firms’ portfolios. Seven of the eight projects Exxon Mobil completed last year were for natural-gas developments. Two of the three it has scheduled for this year are also gas-related. Royal Dutch Shell says that by 2012 half of its output will come from gas. The current high oil price still makes crude the prize for any self-respecting major. But the West’s big oil companies are growing gassier.

In part this is because oil is getting harder to find, for geological and political reasons. Global oil production will peak within a few decades, if not before. And the remaining “easy oil”—which can be extracted without fuss or expense—is increasingly out of bounds for Western firms. Almost 90% of it is in the hands of national oil companies which have, with few exceptions, blocked Western giants from their riches. This is forcing Big Oil into trickier and pricier areas, notably deepwater fields, such as those in the Gulf of Mexico and off Africa’s west coast, and unconventional reserves, such as Canada’s tar sands. Hence the appeal of gas, and a string of deals in Australia and America.

In March Shell joined PetroChina to buy the Australian assets of a gas specialist, Arrow Energy, for A\$3.5 billion (\$3.2 billion). ConocoPhillips paid \$5 billion in 2008 for another Australian gas firm, Origin Energy. Chevron is spending almost \$40 billion to build a liquefied natural gas (LNG) plant off the coast of Australia—one of more than a dozen such projects in the country. Almost all of them include a Western major as a leading shareholder.

In America, meanwhile, the majors are being lured by the opening of vast new “unconventional” gas reserves, which have scarcely begun to be tapped. In May Shell said it would pay \$4.7 billion to buy East Resources, a shale-gas firm with access to the Marcellus shale, a large deposit of gas close to the markets of the country’s east coast. Total and BP have joined projects started by Chesapeake Energy, a shale-gas producer long on

expertise and short on cash. And in December Exxon Mobil offered \$41 billion for XTO Energy, another shale-gas specialist. That deal, approved on June 25th, will give rise to another wave of asset-buying in the sector, says Ernst & Young, an accountancy firm.

Gas is also getting cheaper to develop. The cost of gas developments has come down—that of an offshore “floating” LNG terminal has fallen by half in the past two years, for example—while the growing inaccessibility of easy oil has made oil projects more expensive. Some of the majors’ biggest oil developments look frighteningly complex. The Kashagan oilfield in the Caspian Sea, one of the biggest discoveries in decades, was due to enter production in 2005. Now the target is 2012, and the costs could exceed \$100 billion. The disaster at BP’s well in the Gulf of Mexico may increase costs as regulations are tightened.

And although the national oil companies have mostly excluded the majors from their oil projects, foreign expertise and capital is needed for complex natural-gas projects. Qatar is now the world’s dominant LNG exporter, but it got there through partnerships with the majors. Iran, by contrast, has failed to make a viable export business out of its reserves, the second-largest in the world, thanks to withdrawal of Western money and know-how. Russia’s Gazprom needed Shell to get its LNG business started on Sakhalin Island. It selected Total, another LNG expert, to help develop the huge Shtokman field in the Barents Sea.

### **We’re not in Texas any more**

The costs of natural-gas developments vary wildly. An LNG export plant can cost tens of billions of dollars, rivalling oil projects in expense and complexity. Eni, an Italian oil giant, has joined Russia’s Gazprom in a project to pipe gas from Russia to central Europe. Their investment could exceed \$20 billion. At the other end of the scale, new shale-gas fields expand incrementally, with the addition of small wells costing as little as \$5m each. But both kinds of investment are far less exposed to the vagaries of the commodity markets than big oil projects. LNG plants go ahead only after the developer secures enough long-term contracts, some lasting 20 years or more, to underpin the project. The gas market is still dominated by such arrangements: the most liquid form of trading is in LNG, but it accounts for only about 8% of the global market. An oil firm, by contrast, cannot tell if crude will sell for \$150 a barrel five years hence, or for a fraction of that.

But the move to gas, and to shale-gas in particular, demands a shift in the majors’ business models. To keep the gas flowing from shale requires the rapid and repeated drilling of many small wells—quite a change for firms accustomed to making “binary” decisions, as one executive puts it, about whether to spend \$1 billion over a decade developing a field. Depending on market conditions, shale drillers can speed up production or wind it down, just as an electricity supplier does to meet changes in demand. Indeed, the gas business is really an infrastructure business: drill wells, build gas plants, install pipelines and accrue profits. The gassier the majors get, the more they will look like utilities.

That might be no bad thing. In the panic after the crash in oil prices in 2008, companies quickly scrapped oil projects around the world. In Canada’s tar sands alone, some \$90 billion of projects were shelved. Oil projects look increasingly pricey and risky—and they will always depend on a volatile oil market. Natural gas offers long-term reserves growth, relatively stable returns and lower risk (though there are, to be fair, environmental concerns about possible contamination of water sources as a result of shale-gas extraction).

Most of all, however, the majors’ dash for gas is a bet on demand and climate-change policy. The International Energy Agency says oil consumption has peaked in the West and could rise globally by just 0.5% a year to 2030. But Exxon Mobil expects gas consumption to be 55% higher in 2030 than it was in 2005. Even this could be conservative. Philippe Boisseau, head of Total’s gas and power division, says the potential for gas consumption in China, for example, is much bigger than assumed. Only a lack of import infrastructure is constraining demand growth there, he argues.

Industrialization and electrification in the developing world will require a lot of new power stations. If governments begin to punish the fuels that emit most carbon dioxide, a good portion of that electricity will come from gas. A \$30-a-tonne carbon tax would make gas—which is about half as polluting as coal when burnt—the preferred fuel for new power stations. Double the tax, and gas would remain competitive with nuclear and wind

power, too, says Exxon Mobil. Efforts by the world's governments to cut carbon emissions have stalled, but the oil majors are voting with their drill bits. The future, they believe, will be less oily and a lot gassier.

### **350 More Ducks Killed In Canada's Toxic Tar Sands Tailing Ponds**

<http://oilsandstruth.org/350-more-ducks-killed-canada039s-toxic-tar-sands-tailing-ponds>

by Matthew McDermott, New York, NY on 10.28.10

Just days after Syncrude was fined over C\$3 million for , there are more duck deaths to report. At last count, the Vancouver Sun reports 350 ducks have been killed.

The birds landed on the Mildred Lake tailing pond in northern Alberta and had to be euthanized after coming into contact with tarry bitumen floating on the surface. Ducks were found to have landed at similar tailing ponds at Suncor Energy and Shell tar sands facilities.

Normally bird deterrent devices are deployed at the tailing ponds so that birds are frightened away. In this latest incident Syncrude said that the ducks were forced to the ground by freezing rain and "appeared to be exhausted and unable to fly."

Only Way to Ensure No Bird Deaths Is To Shut Down Tar Sands Production

We've detailed the myriad problems with tar sands in more posts than I can remember, so let's just go with the Greenpeace statement on the incident. It's right on the mark:

Syncrude's claim that the latest round of duck deaths is due to freezing rain is completely unacceptable.

Alberta's weather changes all the time--if tar sands companies can't ensure the safety of birds, animals and humans regardless of the weather, then they should be shut down until they can.

Eliminating these toxic lakes is the only way to ensure the safety of birds animals and humans that are currently being poisoned by these sprawling toxic lakes.

### **Alberta Tar Sands The High Cost of Oil Profits**

<http://www.suite101.com/content/alberta-tar-sands-a51335>

Apr 19, 2008 Kelley Wadson

According to Petroleum Economist magazine, the world's tar sands reserves are huge. Although they occur in over 70 countries, Canada has the majority, around 85%, in four regions: Athabasca, Wabasva, Cold Lake and Peace River, in areas covering nearly 77 000 km. Alberta's tar sands are frequently praised as a geological miracle, and a much safer source of oil than the turbulent countries of the Middle East. But how do these benefits weigh against the environmental and health costs of extraction?

#### **Water**

Oil sands projects require two to six barrels of water to produce one barrel of oil. In a day, the oil extraction process uses enough water to supply the needs of three Alberta cities: Calgary (population 1 million), Lethbridge (79 000) and Red Deer (82 900). This is only expected to grow, so that by 2010 industry could be withdrawing more water from the Athabasa River, Alberta's main waterway, than the entire urban population of the province.

More alarming is where this water ultimately ends up; most is disposed as waste material, or "tailings." As William Marsden explains in his book, "Stupid to the Last Drop," this waste material "contains highly toxic hydrocarbons such as naphthenic acids, which are deadly to marine life, plus a host of other chemicals, including arsenic." Although their safe containment and disposal has yet to be resolved, they are pumped into huge lakes contained by a system of dams that are now the largest bodies of water in the region.

## **Cancer**

The pollution has had serious ramifications on the health of Native communities in northern Alberta. In 2003, a local doctor began to notice an alarming number of rare cancer cases and autoimmune diseases, such as rheumatoid arthritis and lupus.

Autoimmune diseases can be caused by arsenic and benzene, and certain polycyclic aromatic hydrocarbons (PAHs) that include anthracene and chrysene, which are found in the oil sands. Benzene, PAHs and arsenic are all proven carcinogenic chemicals and can combine to disable the immune system. Arsenic, amongst other heavy metals, is a byproduct of the oil extraction process; digging and drilling activities brings it to the surface, where it is released into surface water. PAH levels have also increased, to the point where fish are showing signs of extreme toxic stress, even changing their sex and harming their reproductive capabilities.

## **Economic Folly**

Polluted water and environmentally-caused diseases are just a few of the problems that the extraction of oil from the tar sands have brought to the region. Massive stretches of boreal forest have been razed, and entire ecosystems of peat bogs, fens, rivers and wetlands have been lost, aside their unique flora and fauna.

The underlying problem is that the benefits, the profits which oil companies reap, are deemed more valuable than the environmental costs. We can only hope for a paradigm shift, a new economics, in which the real costs of such development can be included alongside the conventional "bottom line."

## **Other Electronic Resources:**

<http://www.oilsands.alberta.ca>

<http://www.capp.ca/CANADAINDUSTRY/OILSANDS/Pages/default.aspx#7Znm5s2sVTqb>

<http://www.canadasoilsands.ca/en>

<http://oilsandstruth.org>

<http://www.oilsandswatch.org/>

[http://www.environment.alberta.ca/documents/Oil\\_Sands\\_Opportunity\\_Balance.pdf](http://www.environment.alberta.ca/documents/Oil_Sands_Opportunity_Balance.pdf)

<http://prairie.sierraclub.ca/files/OilSandsVision&Principles.pdf>

[http://www.democracynow.org/2010/6/25/tar\\_sands](http://www.democracynow.org/2010/6/25/tar_sands)

<http://www.suncor.com/en/responsible/3229.aspx>

<http://www.osli.ca>