

Biodiversity and Ecosystem Management in Alberta's Oil Sands

*Ronald Morrison and Tim Shopik, presented at the 32nd Annual Conference of the International Association for Impact Assessment, 30 May 2012, Porto, Portugal**

1. The Realities of Oil Sands Development

The Canadian oil sands are located in the Boreal Forest, mostly within the province of Alberta. Approximately half of Canada is covered by the Boreal Forest, an area more than 5.7 million km². Extending over almost half of Alberta, the Boreal Forest encompasses about 317,000 km². The oil sands reserves comprise about one sixth the area of Alberta.

The oil sands present an excellent context to address the risks and opportunities related to biodiversity and ecosystem management. Similar to the progressive releases of Apple iPhones, development of the oil sands has advanced in stages, with more recent attention to sustainability, biodiversity and ecosystem management. These factors are becoming more a part of the business case of oil sands development.

Canadians are fortunate to have the third-largest proven oil reserves in the world. Most of these reserves are in the oil sands, extending over a region in north-eastern Alberta of about 140,000 sq. km, or roughly the size of England, and containing about 1.75 trillion barrels of bitumen. About 10 % of that is recoverable with current economics and technologies. Both open pit mining and in-situ recovery techniques are applied in the development of oil sands. In-situ development such as steam assisted gravity drainage is used for deeper deposits. It involves drilling and injecting steam into the ground to heat the bitumen (recoverable hydrocarbon) *'in place'*, enabling it to be pumped to the surface. About 80 per cent of oil sands reserves can be extracted through in-situ production, with less than 20 per cent of the reserves that can be mined.

Myths, mixed messages and confusion about oil sands abound, and often distort the realities of development and opportunities toward environmental sustainability. The myths and realities surrounding oil sands development in Alberta relate mainly to environmental concerns over air emissions, tailings ponds and reclamation, water use, forest clearing, and wildlife impacts. Perhaps the most common myth is the misconception of oil sands as tar sands. Oil sands are comprised of sand, water, bitumen and clay. The hydrocarbon or oil bearing element is bitumen, a thick black, naturally occurring substance. Reference to tar is a misnomer in that tar is a man-made substance derived from petroleum or coal.

Another myth is that oil sands development will clear all of Alberta's boreal forest. Oil sands development is located in only a fraction of the boreal forest of the province. Of that smaller area, in-situ production has well confined land footprints and presents good opportunities for reclamation. All areas developed must be reclaimed, addressing biodiversity concerns such as caribou and other wildlife species inhabiting the oil sands region. Progressive reclamation of both previous mined areas and more recent in-situ oil sands development is ongoing.

2. Ecosystem and Biodiversity Building Blocks

Sustainable development, including more attention to ecosystem and biodiversity values is becoming a key factor in managing the social, economic and environmental risks in large scale energy projects. With a strong demand to develop the oil sands, they contribute to global energy supply, and provide thousands of jobs and \$2.1 trillion CDN in economic development.

Ecosystems and the services they provide have direct business values and support future development opportunities. Biodiversity loss and the degradation of ecosystems are no longer thought of as externalities of business. Not only does business rely on ecosystem services such as water and energy that are integral to their operations, but it has come to better appreciate the full value of ecosystems in terms of its social licence to operate and the sustainability of ecosystem values.

With less than ten years of major development in the oil sands, the challenge is to demonstrate that the resource can be developed with minimum effects on biodiversity. Site disturbance associated with any resource development affects ecosystems in different ways and in turn, biodiversity. Habitat loss and ecosystem degradation are the major concerns of sustaining biodiversity.

Development in the oil sands is moving toward a better understanding of ecosystems and the services they provide. It is however necessary to think outside the box of individual project lease areas. Ecosystem and biodiversity attributes are not confined to the linear spatial geometry of lease areas. Complexity in the structure, function and dynamics of ecosystems cannot be interpreted within the boundaries of project areas alone. Addressing biodiversity concerns beyond individual exploration and development sites presents a challenge in the oil sands. How individual developments sit within the larger ecological landscape is an issue that requires further attention and collaboration.

Extending from the site specific to regional scales, this complexity requires a hierarchical approach in managing development on an ecosystem basis. At the same time, changing public perception is also necessary for a longer term view of oil sands development, as well as a better understanding of the potential for rebuilding ecosystems disturbed.

Another reality of oil sands development is the relative biodiversity of the Boreal Forest being considerably less than other more temperate regimes with higher biological productivity. This means that recovery rates of Boreal ecosystems are slower. There are no quick fixes to the disturbance of ecosystems in the Boreal Forest, but that does not mean that development cannot be sustainable in the long term.

Site disturbance in oil sands exploration and development is much like trying to pick out all of the black (bitumen) jelly beans from a jar full of multi-coloured jelly beans. It is not possible to grasp only the black jelly beans without disturbing any of the others. In the same sense, it is not possible to extract bitumen out of the oil sands without some level of site disturbance. The reclamation of sites altered in oil sands activities is a key variable in the sustainability equation.

3. Conservation and Reclamation - What They Mean for the Oil Sands?

Opportunity, opportunity and opportunity! Conservation planning in the further development of the oil sands presents significant opportunities in terms of mitigation possible in exploration and production. Moving biodiversity theory to management actions in the oil sands presents a challenge and opportunity to conserve and enhance biodiversity.

Still further opportunities are presented in the reclamation of sites disturbed by oil sands activities. The counter to less than optimistic perspectives on reclamation and the potential for biodiversity and ecosystem restoration in the oil sands are the numerous successes of resource development in other sectors, particularly mining and tourism.

The greening of the once moonscape of Sudbury in northern Ontario is one of the most successful reclamation achievements in the world. Years of mining, logging, fires, smelter emissions and soil erosion had depleted vegetation and impacted local aquatic environments. Much of the damage resulted from metallic dust contaminating the soil, as well as acidic runoff from waste mining rock. Over 80,000 hectares and thousands of lakes in the region were affected. Reclamation pioneering techniques were developed, including aerial seeding of large tracts of barren land and the application of mixtures of lime and fertilizer to promote growth of ground cover and ultimately trees, some 15 million which were planted over the past 30 years.

Frégate Island in the Seychelles is another example of outstanding ecological restoration. The eco-tourism and hotel resort started the program only about 15 years ago. The initial focus was on rehabilitation of the terrain and flora after 200 years of extensive coconut and cinnamon monoculture industry. Almost all of the endemic species of flora were lost, with invasive species taking over and essential habitat of native fauna impacted. Thousands of native trees were propagated and conservation activities undertaken to recover previous species. Populations of the Seychelles Magpie Robin, classified as one of the rarest birds in the world, and several other species, have made remarkable recoveries. The success of the program included most of the island being restored to its natural land cover, with the re-colonization of indigenous vegetation.

More Thinking Outside the Box - Are There Still Other Opportunities?

The superlatives of the above reclamation examples can be replicated in the oil sands. Much progress is already underway. Research, development and monitoring of biodiversity and ecosystem values in the oil sands are making similar advances. These follow the principles of the international Convention of Biodiversity, as well as policy and regulatory direction at the federal and provincial levels. Biodiversity is being addressed on the government and academic fronts through the Alberta Biodiversity Monitoring Initiative. The *Lower Athabasca Regional Plan* and its proposed biodiversity strategy, the *Ecological Monitoring Committee for the Lower Athabasca*, and the *Alberta Biodiversity Monitoring Institute* have all contributed as government led programs. Much progress is also being made by industry initiatives including the *Oil Sands Leadership Initiative (OSLI)*, *Oil Sands Developers Group*, *Sustainable Ecosystems Working Group*, and the *Canadian Oil Sands Innovation Alliance*.

Following the direction of IPIECA, the global oil and gas industry association for environmental and social issues, managing biodiversity impacts is undertaken when ecosystem disturbance from operations in the oils sands is unavoidable. Initiatives such as the OSLI *Faster Forests* program are changing more traditional approaches to site reclamation, with the goal to more aggressively accelerate the recovery of disturbed sites. Winter planting of frozen conifer tree seedlings is another oil sands research project that is pioneering new approaches to reclamation.

Statoil Canada, an operator in the oil sands, has collaborated with these initiatives and other developers, government and local communities to manage its environmental and social impacts, while contributing to economic benefits of developing the oil sands. In response to the challenges and opportunities for biodiversity, Statoil has led activities at a regional level and within its project areas to manage biodiversity.

Land stewardship and best practices for biodiversity conservation, reclamation, and biodiversity offsets present further opportunities for oil sands developments. Statoil has undertaken a variety of related research and monitoring initiatives to address habitat disturbance and fragmentation of ecosystems. Most of these relate to regional wildlife populations and other opportunities to enhance biodiversity, such as reforestation and wetland reclamation, bio-indicator research, and the *Local Ecological Footprinting Tool*.

Another example is the award winning research undertaken by Statoil to address caribou recovery concerns. The research developed novel monitoring methods to guide resource management and mitigate wildlife impacts. Detection dogs were used to collect caribou, moose and wolf scat during three winters. Collected scat samples were then used to assess resource selection, diet, DNA-based measures of population abundance and hormone-based measures of psychological, reproductive and nutritional conditions. Ongoing wildlife monitoring, and pilot projects involving treating linear disturbances with coarse woody debris or slash material to stimulate plant growth and deter wolf predator movement are further initiatives.

The resource development industry has also applied the concept of biodiversity offsets. An increasing number of companies, particularly in the mining sector, are implementing 'no-net loss' programs based on offset initiatives for biodiversity challenges. These initiatives are being further developed and supported through the *Business and Biodiversity Offsets Program*, *UNEP Economics of Ecosystems and Biodiversity*, *IFC Performance Standard 6 on Biodiversity Conservation*, *Biodiversity and Ecosystem Services Risk and Opportunity Management within the Extractive Industry*, and the *Biodiversity Working Group* of IPIECA and the International Association of Oil and Gas Producers.

Conservation and Reclamation Turn-Around

With continuing research, monitoring and advances in reclamation technologies, a 'turn-around' phase in conservation and reclamation of site disturbance by oil sands activities is indeed possible. The current concerns of disturbance can be diminished through ongoing reclamation efforts and as target ecosystems and species begin to recover to sustainable levels, over the longer term.

As with Sudbury and Frégate Island, ongoing management and monitoring will be required to bring about the 'turn-around' phase of ecosystem and biodiversity improvements for oil sands development. Change in direction as well as early successes need to be sustained through continued intervention and long term strategic planning. As ecosystems rebuild, corresponding indicators will become more dominant in the landscape, and less vulnerable to natural and human disturbances. This kind of turn-around however, can only be realized through the further collaboration of government, industry and local communities in a team effort.

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