

Using Spatial Analysis for Siting Athabasca Oil Sands Tailings Ponds

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Purpose

The Athabasca Oil Sands deposits cover 140,200 km² of Alberta. The oil sands contain the valuable resource bitumen, which provides the world with 1.5 million barrels of oil per day. To produce 1 m³ of crude oil, 2-4.5 m³ of water is used to extract the bitumen. The concern is that the contaminated water is transported to tailings ponds where it has seeped into important water sources in the past.

The purpose of my project was to see where the best locations for tailings ponds would be based on four important criteria. The criteria were founded on what the tailings ponds would impact the most environmentally and the soil they are built upon. The other three criteria are water bodies, caribou habitat, and native land.

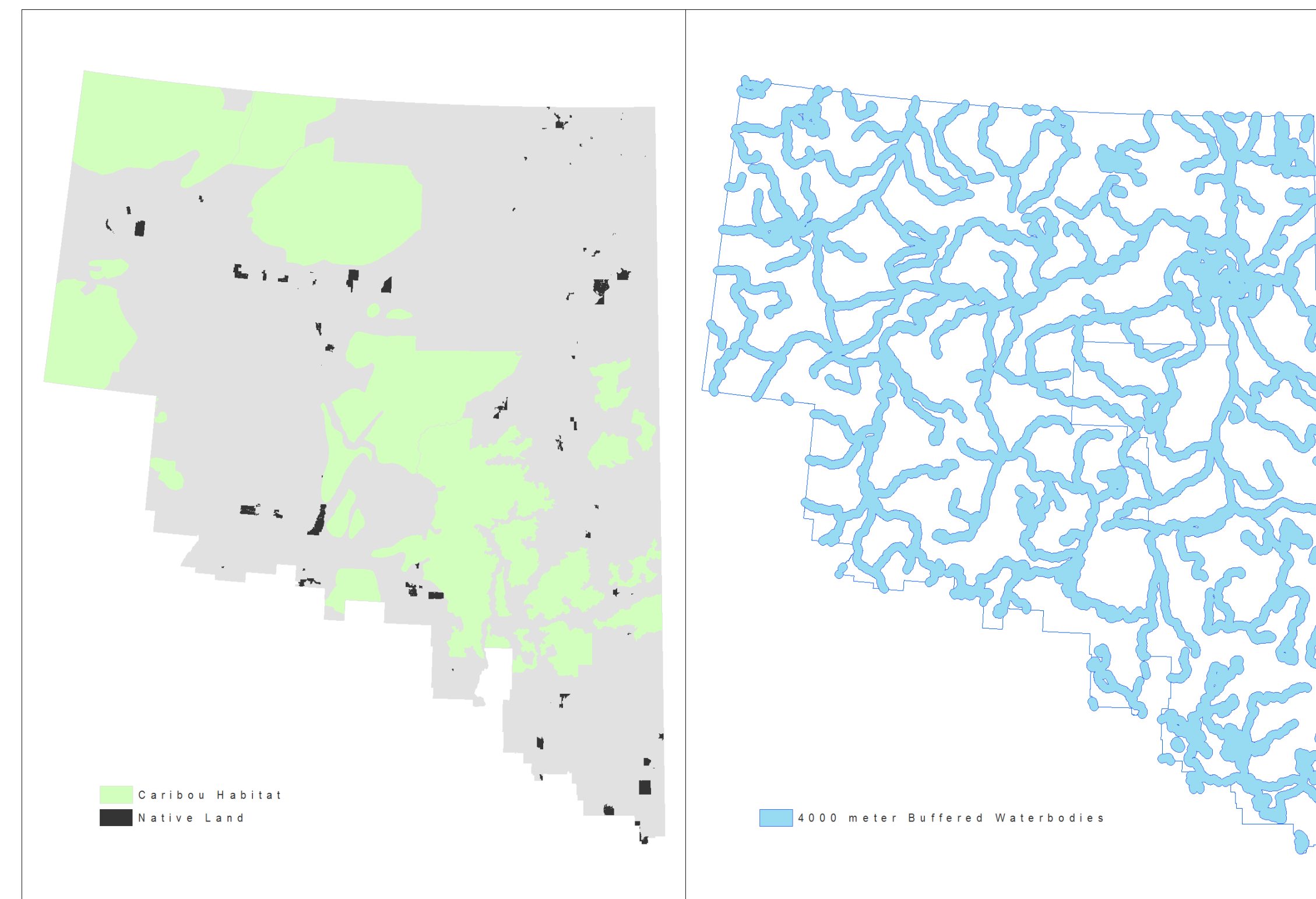
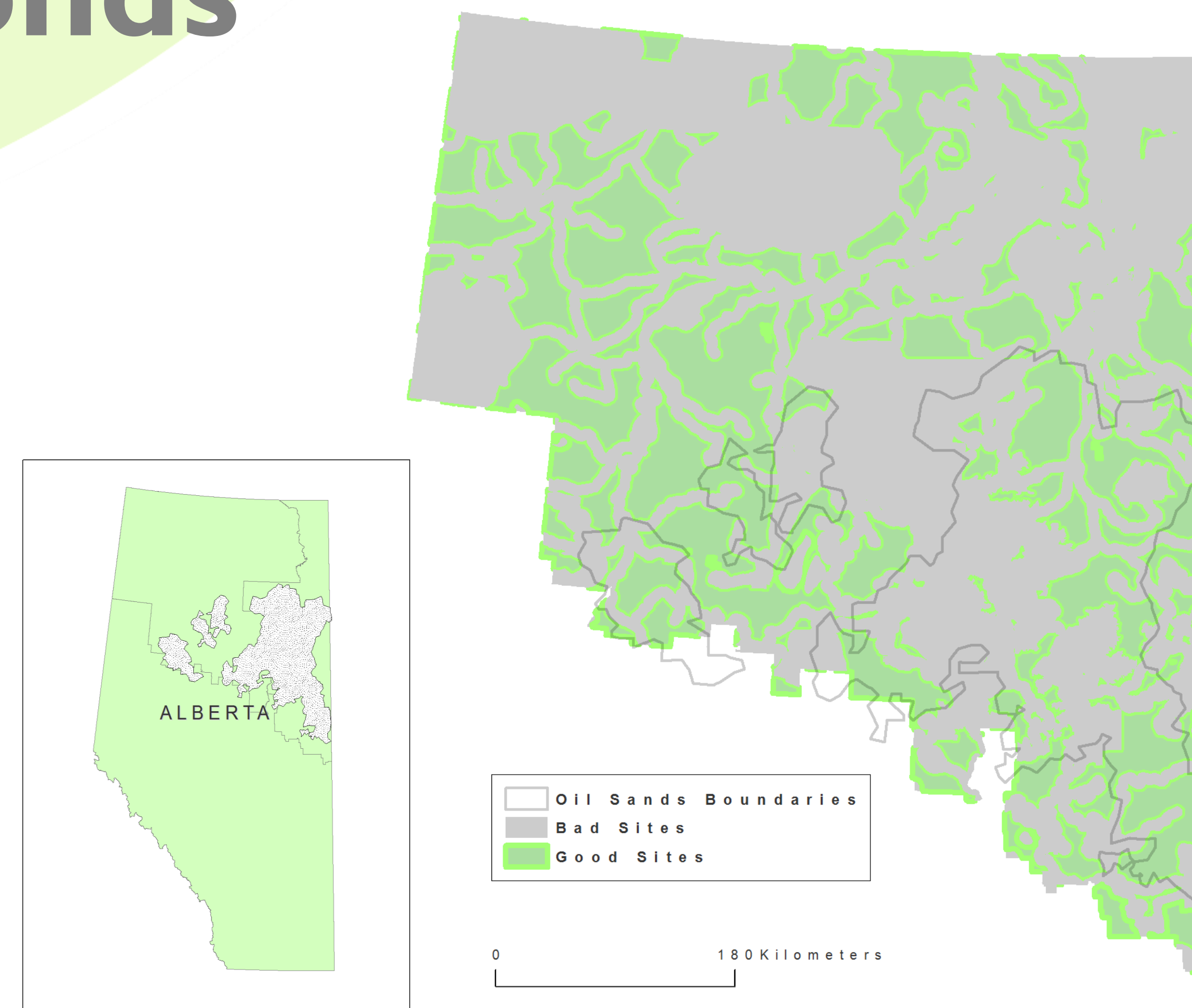


Objectives

My hypothesis is that there will be very few suitable locations that will be able to withstand tailings ponds effects. As a result of:

- Locations where tailings cannot seep into nearby water bodies.
- Keeping tailings ponds out of local habitats.
- Based on soil types, to build tailings ponds.

By creating this map my hope is to inform the Canadian oil sands industry of how important tailings pond site selection is to the surrounding environment.

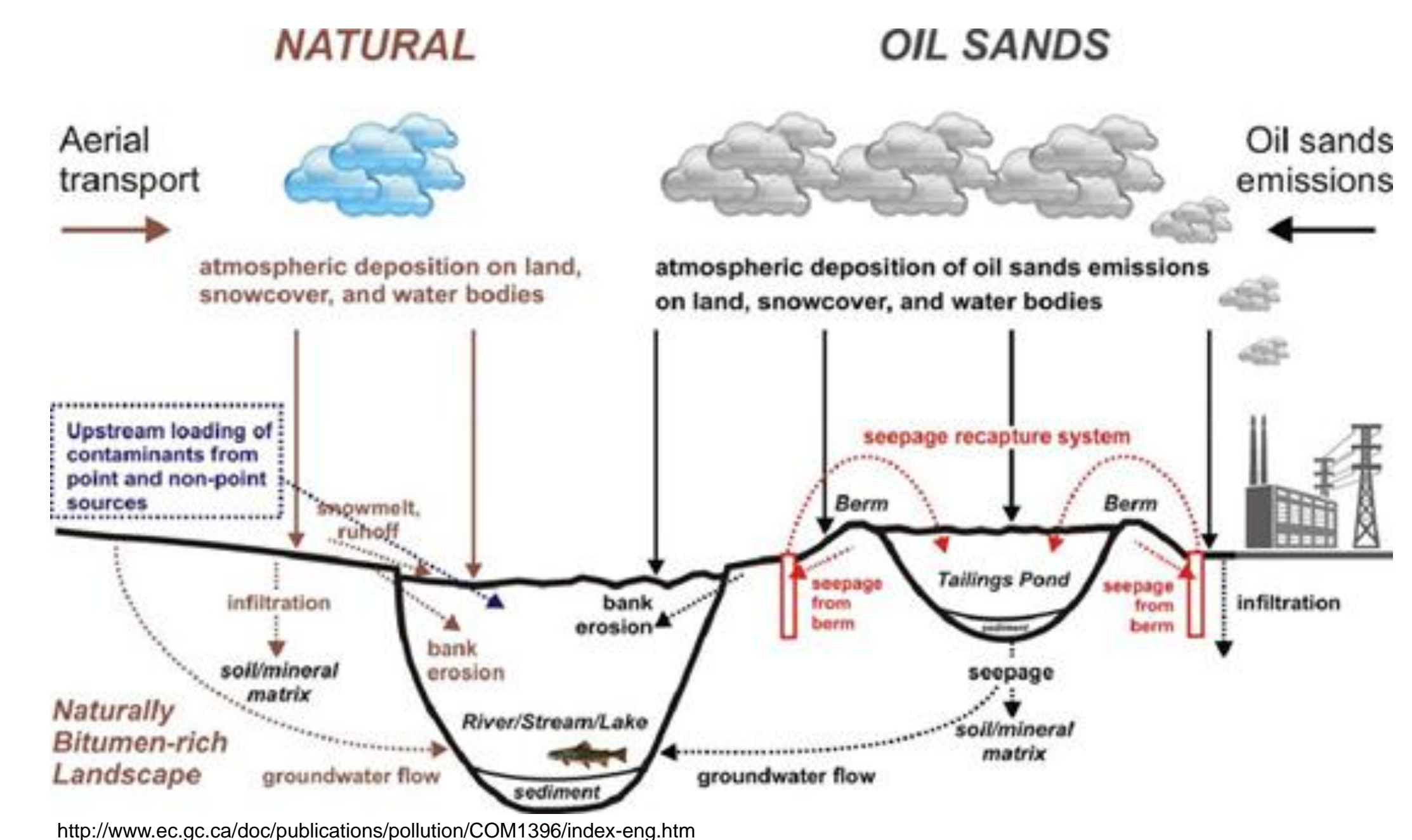


Methods

To create a map that shows suitable sites for tailings ponds, I first found data based on my four criteria of soil, caribou habitat, native land, and water bodies. After adding the data, I needed to convert each vector layer into a raster. Once my rasters were ready I reclassified each of them. For soil I wanted to show which soils were the best for holding tailings. For water bodies, native lands and caribou I wanted to reclass them to show where *not* to build. By multiplying all four rasters by each other, using the raster calculator, my spatial analysis was completed.

Results

The area of the oil sands shown to the left is approximately 73,743 km² (18,222,431 acres). Of that area 28,409 km² (7,020,016 acres) is suitable land for tailings pond placement. That is 38.5 % of the land within these boundaries. Although the percentage reflects that most of the land within the oil sands boundaries is not suitable for tailings ponds I am surprised that the percentage is not much higher. My reaction is derived from my analysis of the two layers: caribou habitat and rivers and lakes, along with the 4000m buffer I applied to them. Initially these two appeared to exclude much of the land as each was processed.



Citations

1. CAPP. Canadian Association of Petroleum Producers. 2011. Crude Oil Forecast, Markets & Pipelines. Available from: <http://www.capp.ca/getdoc.aspx?DocId=190838>
2. Woynillowicz, D., Severson-Baker, C., Raynolds, M. 2005. Oil Sands Fever: The Environmental Implications of Canada's Oil Sands Rush. Available from: www.pembina.org.

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