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RESEARCH NOTES
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Temporary drilling pads from oil sands exploration require microtopography for restoration

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The Challenge

In situ oil sands exploration (OSE) requires the creation of temporary drilling pads, which are often located in peatlands. These pads are created by removing trees and blading the fen surface, leaving windrows of peat along the pad edges; the pad is then frozen-in to create a level surface. However, once abandoned, these pads often fail to regenerate and can become flooded during the growing season. This research examined differences in vegetation and microtopography between OSE pads and undisturbed peatland, and provides possible solutions to help improve regeneration on these challenging sites.

The Approach

In 2011, ten OSE pads that had been established in 2000–2002 were compared to adjacent undisturbed peatland habitat (Fig. 1). The pads were divided into two groups based on their post-disturbance development: bryophyte-poor (wetter; minimal trees and *Sphagnum*) and bryophyte-dominated (drier; more woody plants and *Sphagnum*). The adjacent undisturbed sites were all classified as wooded moderate-rich fens in the Alberta Vegetation Inventory.

At each of the paired OSE pad/undisturbed sites, researchers sampled vegetation (plant species richness and composition), tree layer structure and peat depth, and conducted microtopographic surveys of the peat surface in relation to the water table. They also collected surface water samples for chemical analysis.

The Results

The OSE pads had a more uniform surface and lower surface elevation than the undisturbed sites, especially at pads classified as bryophyte-poor. These differences in microtopography were associated with differences in plant species richness and composition between the pads and the undisturbed sites. Specifically, the OSE sites had greater sedge cover than the undisturbed sites and fewer plant indicator species.

The reduced microtopography and lower surface elevation of the bryophyte-poor OSE sites meant that they were often flooded during the growing season, negatively affecting vegetation recovery. Meanwhile, the more pronounced microtopography of the bryophyte-dominated OSE sites seemed to help them recover from disturbance more quickly than the bryophyte-poor sites – although their vegetation composition was still different from the undisturbed sites.

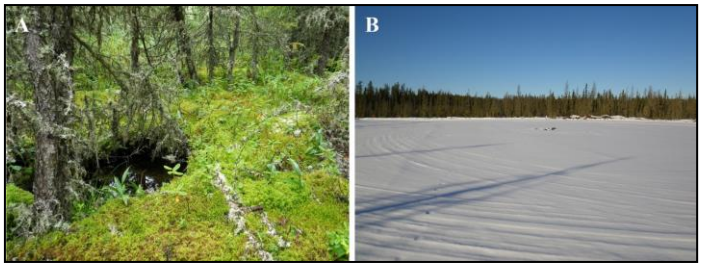

Fig. 1 (A) undisturbed wooded moderate-rich fen; and, (B) OSE pad prepared for drilling (Photos: R. Caners).

Management Implications

- Minimizing compaction and disturbance severity while maintaining vertical microtopography on OSE pads could reduce surface flooding and prevent associated large-scale changes in vegetation composition.
- During OSE pad development, microtopography could be preserved by minimizing blading, which will also retain plant material for regeneration and vegetation recovery.
- Immediately after drilling at an OSE pad, surface microtopography could be enhanced by removing large blocks of frozen peat and dispersing them across the pad. However, this requires further testing.

Further Reading

Caners, R.T.; V.J. Lieffers. 2014. Divergent pathways of successional recovery for in situ oil sands exploration drilling pads on wooded moderate-rich fens in Alberta, Canada. Restoration Ecology **22**: 657–667. doi10.1111/rec.12123.

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