



EMEND

Ecosystem Management Emulating Natural Disturbance



“Good disturbances” may help achieve reclamation goals

Minimal disturbance is an approach to oil and gas development that aims to preserve the attributes of the original site as much as possible during development.

Minimal disturbance practices include carefully selecting equipment and site location, as well as using snow and woody materials during exploration to help reduce or eliminate soil disturbance.

While a minimal disturbance approach is important to reduce soil compaction, erosion, and soil rutting, creating good disturbances can also benefit reclamation goals, particularly on sites with a heavy moss layer.

Key Messages

EMEND research shows the following:

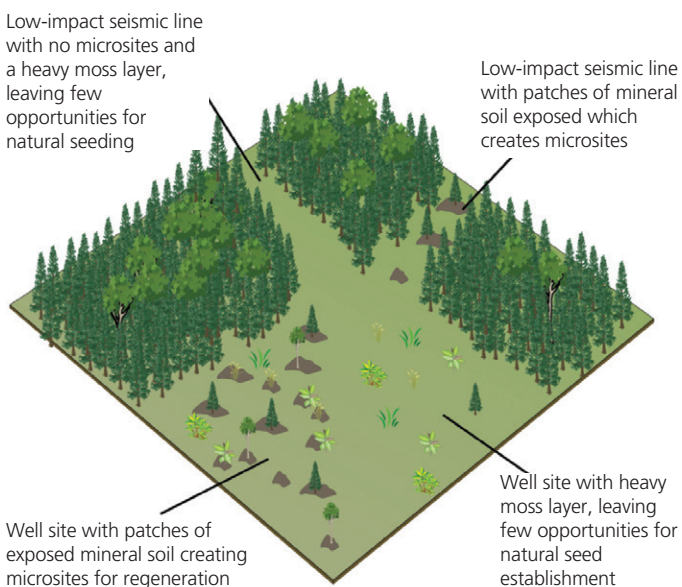
- Lightly disturbing the forest floor often exposes patches of mineral soil. These microsites are critical for successful regeneration of white spruce (*Picea glauca*) and aspen and poplars (*Populus* sp.) from seed and can encourage understory diversity.

- Treatments that resemble 5-m-wide linear corridors show improved recovery of white spruce and aspen when patches of soil are exposed.
- Site preparation further increases reclamation success by improving tree regeneration on sites with a high water table or high likelihood for competition.

Exposed mineral soil patches encourage regeneration

One of the key benefits of lightly disturbing the forest floor layer is that it creates patches of exposed mineral soil. These good disturbances provide not only a landing pad for white spruce and aspen seeds but also heat and moisture, which are necessary for germination. The exposure of mineral soil can also lead to colonization by early successional species such as *Calamagrostis canadensis*. However, the benefits of exposed microsites for white spruce outweigh the negative effects of increased competition from undesirable species.

These findings present clear opportunities for reclaiming linear features such as low-impact seismic lines, or other areas where minimal disturbance techniques are used. In these cases, the sites typically have little or no disturbance to the forest floor layer or resulting exposure of mineral soil. This is especially the



About EMEND

Ecosystem Management Emulating Natural Disturbance (EMEND) is a collaborative research project that aims to understand what recovery in the boreal forest looks like following a range of forest harvesting, fire, and silvicultural treatments. As EMEND is grounded in forest ecology science, there are many lessons to be shared with the oil and gas industry to aid in reclamation. This series aims to apply EMEND knowledge to the oil and gas industry.

case in areas with high cover of mosses such as old-growth forests or other conifer-dominated stands. In these cases, some level of good disturbance to the forest floor layer may prove helpful. For example, many low-impact seismic lines may not recover through natural means unless some level of minor disturbance is used to expose mineral soil.

Good disturbances can create microsites critical to the recovery and success of exploration sites, including low-impact seismic lines.



Site preparation is beneficial on some sites

Site preparation as a silviculture method is an example of a good disturbance that should be considered for specific site conditions faced during reclamation. Mounding creates warmer microsites for seedlings and reduces the competition from species such as *C. canadensis*. At EMEND, the survival of planted white spruce on mounded sites was on average 83%, compared to a maximum of 55% from natural regeneration.

Despite its additional costs, site preparation could be a critical tool for providing trees and other woody species with a competitive advantage in cases where a high level of competition from early successional grasses is likely. The added benefit of improved nutrient availability and warmer growing conditions could also lead to improved growth rates of overstory species on these sites.

While carefully managing disturbance levels on a site is important, reclamation advisors should explore good disturbances to encourage a diverse forest community on reclaimed sites.



Disturbance levels need to be carefully managed

The level of disturbance required to aid regeneration is small. Some studies have shown that dragging heavy chains over a site can help expose microsites. EMEND research shows that even when carefully minimizing soil disturbance by restricting operations to winter months, the skidding of trees along the frozen forest floor can create enough disturbance to promote the natural regeneration of white spruce.

Bibliography

- Gradowski, T.; Sidders, D.; Keddy, T.; Lieffers, V.J.; Landäusser, S.M. 2008. Effects of overstory retention and site preparation on growth of planted white spruce seedlings in deciduous and coniferous dominated boreal plains mixedwoods. *For. Ecol. Manag.* 255:3744–3749.
- Solarik, K.A.; Lieffers, V.J.; Volney, W.J.A.; Pelletier, R.; Spence, J.R. 2010. Seed tree density, variable retention, and stand composition influence recruitment of white spruce in boreal mixedwood forests. *Can. J. For. Res.* 40:1821–1832.

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