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Prioritization can improve cost effectiveness of seismic line restoration

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The Challenge

Restoration of legacy seismic lines has become a topic of frequent conversation among land managers. The release of the federal recovery strategy for woodland caribou in 2012 has contributed to this momentum with companies now investing considerable resources in restoring legacy seismic lines. The costs for these restoration activities can be extremely high and tools are needed to help improve the efficiency and effectiveness of treatments.

The Approach

Our project tested whether LiDAR could be used to inventory current and future levels of regeneration along legacy seismic lines. We sought to determine the probability of legacy lines regenerating to three metres in height after 10, 30 and 50 years. To do this, we used a suite of variables including ecosite, distance to roads, and depth to water (i.e., wet areas mapping). A three metre height threshold for vegetation was used to represent recovery. This represents a height at which trees, as opposed to understory shrubs, are most likely to form the canopy suggesting positive trajectories to forest recovery.

The Results

Our results show that approximately one third of the existing seismic lines within our study landscape will fail to regenerate to a height of three metres within 50 years. Upland mesic sites showed a relatively strong ability to regenerate on their own (passive restoration), while lowland (bogs and fens) and upland dry sites were slow to recover. This suggests that active forms of restoration are required to speed vegetation recovery.

We also found a strong effect of proximity to roads, suggesting that lines closer to roads have higher levels of off-road traffic, which negatively affects regeneration along these lines. Finally, seismic lines with narrow widths and east-west orientations showed improved natural vegetation regeneration in comparison to wider widths and north-south orientations.

Fig. 1 Ground photo illustrating typical vegetation conditions along legacy seismic lines in the boreal forest of Alberta. Many lines fail to recruit trees many decades post-disturbance resulting in arrested succession.

Management Implications

- Prioritization of restoration within upland dry and lowland sites will help improve program efficiency.
- Eliminating off-road traffic along lines within upland mesic sites could aid natural regeneration as these sites show a strong potential to regenerate if left undisturbed.
- Restoration programs could maximize restoration benefit for dollars invested by prioritizing efforts according to costs, treatment effectiveness and distance to roads.

Further Reading

Van Rensen, C.K., S.E. Nielsen, B. White, T. Vinge, and V. Lieffers. 2015. Natural regeneration of forest vegetation on legacy seismic lines in boreal habitats in Alberta's oil sands region. Biological Conservation 184: 127-135.

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