

## ***Leaf-Off Imagery with 5cm Pixels are Required for Establishment Surveys of Evergreen Seedlings***

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#### **Project Summary**

The *Provincial Restoration and Establishment Framework for Legacy Seismic Lines in Alberta* provides guidelines for evaluating the early success of restoration treatments on seismic lines. The goal of this project was to reveal the conditions under which conifer seedlings could be reliably detected with automated remote-sensing algorithms and therefore contribute to operational *Framework* assessments. We found that imagery acquired during leaf-on conditions (summer) provides a poor foundation for automated detection with optical data. Data collected under leaf-off conditions (spring and fall) is preferred, since evergreen seedlings are spectrally distinct from their surroundings during this time. We require pixel sizes 5cm or smaller to detect establishment-survey aged evergreen seedlings (8-10 years after treatment; >60cm tall) reliably (detectability accuracy >70%). Larger evergreen seedlings (>125 cm tall) are detected even more reliably (detectability accuracy >80%). Tamarack seedlings were not detected reliably under any of the conditions we assessed, though the leaf-off window in the fall was not evaluated (tamarack seedlings are yellow during this season, and are therefore more likely to be detected). Very small survivability-assessment aged seedlings (10-60cm tall; 2-5 years after treatment) require pixel sizes better than 1cm for reliable detection using these techniques.

#### **Management Implications and Lessons Learned**

Optical data with pixel sizes 5cm or smaller acquired during leaf-off conditions can detect evergreen conifer seedlings 60cm and taller with good accuracies (>70%) and low levels of false-positives. These accuracies likely provide the foundation for reliable establishment surveys of evergreen-conifer seedlings, though this should be verified experimentally. Operational survival assessments (very small seedlings 2-5 years after treatment) and assessments involving deciduous-conifer species (e.g. tamarack) are likely not possible with these techniques.

#### **Publication(s)**

A peer-reviewed journal article is anticipated by Fall 2020.