ACRRE ALBERTA CENTRE FOR RECLAMATION AND RESTORATION ECOLOGY
RESEARCH NOTES
Research Note Dec. 2015 #10

Soil salvage depth is key to aspen root fragment survival and sucker regeneration in forest reclamation

Research led by: Simon Landhäusser & Vic Lieffers

The Challenge

When clearing mine sites for development, forest floor material is salvaged and often directly placed onto nearby reclamation sites. Soils salvaged from aspen forests have significant quantities of root fragments contained in these materials. Aspen roots are known to produce aspen suckers following disturbance and this potential may be used to quickly establish aspen on reclamation sites.

We conducted an operational scale trial to determine what factors impact the ability of root fragments to regenerate and produce viable aspen suckers. We considered the influence of soil salvage depth and root fragment characteristics, such as size and carbon (food) reserves.

The Approach

Trees of an aspen dominated forest site were sheared off in the winter using a large bulldozer. Next, the forest floor material and corresponding aspen root systems were salvaged to a depth of either 15 or 40 cm. The material was then directly transferred to a nearby reclamation site using large equipment. Target depths for the material placed at the reclamation site were the same as the salvage depths (i.e., 15 and 40 cm). Sucker production and aspen height were measured over the course of two growing seasons.

The Results

Aspen sucker production from root fragments was three times higher at a salvage/placement depth of 40 cm compared to 15 cm.

Successful suckering occurred only on root fragments with little damage and that were located in the upper 20 cm of the soil. In addition, fragments from the deeper 40 cm salvage treatment grew taller and had lower mortality.

Improved contact between roots and the soil, and a lower risk of drying out, were key factors contributing to the greater success of fragments in the 40 cm salvage depth. More specifically, the 15 cm salvage depth resulted in more aspen root fragments in the top 5 cm of soil, exposing them to significant variation in moisture conditions. This variation in moisture negatively affected the survival of root fragments and their ability to produce suckers.

Fig. 1 Sucker regeneration (left) and an excavated root fragment (right) on the reclamation trial site.

Management Implications

- Deeper soil salvage increases root fragment survival and promotes aspen regeneration. Deeper soil salvage is therefore preferred as long as it can be performed without including undesirable materials such as clay.
- Soil handling should be minimized to reduce damage to aspen root fragments.
- Aspen stands with large lateral roots with diameters ranging from 1-4 cm are likely prime candidates as root donor stands.
- Soil stockpiling time should be minimized to preserve roots and their carbon (food) reserves and provide the best chance for successful sucker production.

Further Reading

Landhäusser, S.M., J. Wachowski, V.J. Lieffers. 2015. Transfer of live aspen root fragments, an effective tool for large-scale boreal forest reclamation. Canadian Journal of Forest Research 465: 1056-1064.

Wachowski J; S.M. Landhäusser, V.J. Lieffers. 2014. Depth of root placement, root size and carbon reserves determine reproduction success of aspen root fragments. Forest Ecology and Management 313: 83-90.

Acknowledgements

Funding was generously provided by the Natural Sciences and Engineering Research Council (NSERC) and the Canadian Oil Sands Network for Research and Development (CONRAD), with sponsorship from Capital Power, Shell Canada, Suncor Energy Inc., and Syncrude Canada.

This summary was prepared by Matthew Pyper – Fuse Consulting Ltd.