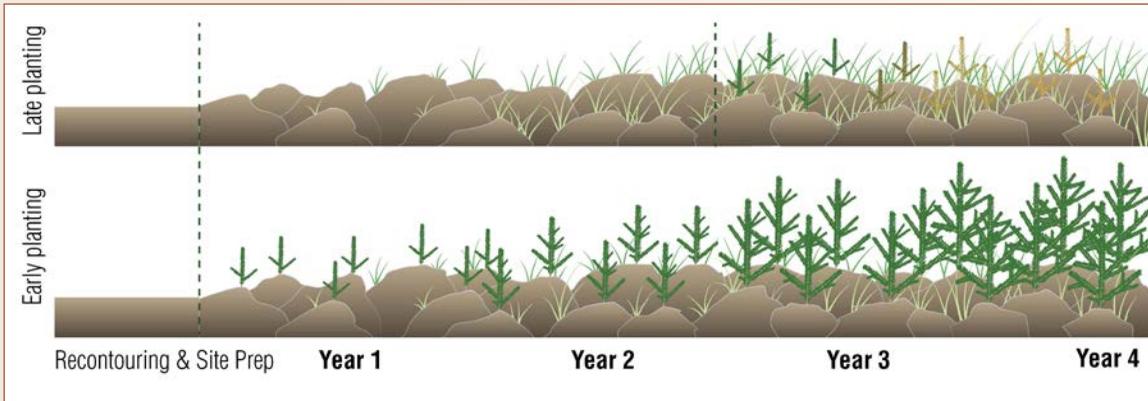


## Respect the importance of timing

Foresters have come to appreciate the importance of timing. This includes an awareness that planning for site recovery begins before the first tree is cut or cleared on a site. By ensuring that seeds or planted trees are placed on a site as soon as possible after reclamation, reclamation practitioners can help desirable species outcompete other vegetation. This affords the opportunity to achieve reclamation goals faster (Figure 3).

Through experience, forestry practitioners have learned that knowledge of site conditions can be used to anticipate whether undesirable vegetation will be a significant challenge. If undesirable species have established, the use of mechanical or chemical vegetation removal can provide the opportunity for desirable species to get a leg up on the competition.



**Figure 3.** Planting trees quickly after site re-contouring can help trees outcompete other vegetation.

## Conclusion

As the area disturbed by oil and gas disturbances increases within the forested regions of Alberta and beyond, it is important to leverage existing knowledge about forest regeneration and apply these techniques in land reclamation programs. This factsheet has provided a brief look at how the union of forestry experience with land reclamation objectives can improve efficiency and outcomes. A range of specific tools are further explored in the Silvicultural Toolkit. Capitalizing on these silvicultural tools and techniques may be a key first step in achieving reclamation goals in a quicker, more predictable fashion, saving companies both time and resources.

*We would like to acknowledge COSIA's (Canada's Oil Sands Innovation Alliance) for their contribution to this project.*

*Aussi disponible en français sous le titre : Forêt et remise en état des terres – Une alliance naturelle*

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For more information, contact: [nrcan.silviculturetoolkit-outilssylviculture.nrcan@canada.ca](mailto:nrcan.silviculturetoolkit-outilssylviculture.nrcan@canada.ca)



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# Forestry and Land Reclamation – A Natural Fit



## An Introduction to the Silvicultural Toolkit for Land Reclamation

In 2017–18, Canada's Oil Sands Innovations Alliance (COSIA) partnered with the Canadian Forest Service - Natural Resources Canada (NRCAN) to develop a suite of extension products. These products demonstrate how forestry techniques can be used to manage for purposeful reclamation outcomes within Alberta's in-situ oil sands regions. This union of forestry experience with land reclamation objectives represents two key opportunities for oil and gas operators. First, forestry principles that have been honed over generations and are backed by science can help land reclamation practitioners expedite the return to forest cover on disturbed sites. This in turn may help companies achieve their reclamation goals faster.

Second, these tried and true forestry principles can improve the predictability of reclamation outcomes. By capitalizing on knowledge of site characteristics and regeneration potential, companies can reduce their long-term reclamation costs and reduce costly re-entry into previously reclaimed sites.

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This is not to say that knowledge from forestry can provide all the answers. Rather, it can help address many of the historical challenges in reclaiming forested landscapes.

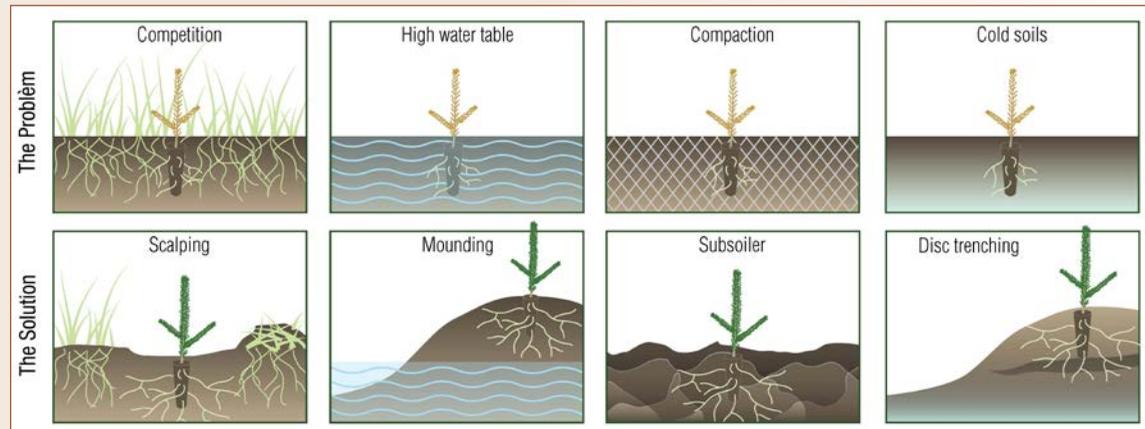
When it comes to applying knowledge from forestry in land reclamation, practices can be grouped into four core principles:

- Know your site
- Manage your seed sources and regeneration stock
- Address limiting factors and create microsites
- Respect the importance of timing

## Know your site

Forests are highly diverse, and Alberta's boreal forests are no exception. Jack pine knolls, black spruce bogs, and aspen and white spruce mixedwoods are just a few of the sites one may encounter. It makes sense, then, that reclamation prescriptions should also be diverse and linked to the natural site conditions.

Site assessments are often used in forestry to determine the site-appropriate prescription, and the Silvicultural Toolkit outlines how a site assessment can be used in a similar way to enhance a reclamation program. The toolkit also provides guidance on how to move away from a 'one size fits all' approach to reclamation and to instead make adjustments based on local site conditions (Figure 1).



**Figure 1.** Local site conditions can vary by site and require site specific prescriptions to be successful.

Key considerations in knowing your site include having clear vegetation objectives, understanding natural and man-made limiting factors, and incorporating vegetation performance into your decisions.

## Manage your seed sources and regeneration stock

For prompt and predictable return to forest cover, it is often necessary to consider planting or seeding on your reclamation site. Natural regeneration may also be an option, as forest soils can be a gold mine of native seeds and roots. However, some construction approaches can damage this potential resource.

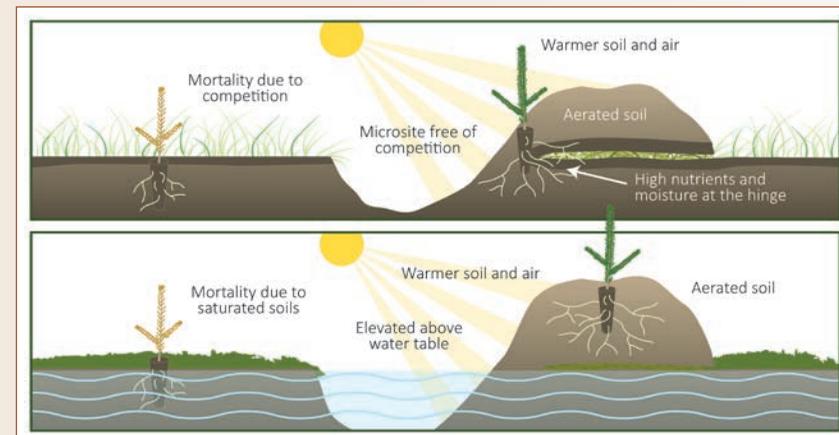
The most effective technique for preserving your seed source is to leave soils in place rather than stripping them. When soils must be removed, stripping forest soils at appropriate depths and storing them carefully can greatly improve the viability of seeds and roots within these soils. Conserving cones and tree tops from salvage operations can also provide an immediate seed source at the time of reclamation.

## Address limiting factors and create microsites

Microsites are pockets of shade and moisture that help promote the growth of tree seedlings and other plants. Depending on the limiting factors of the site, the ideal microsite might be slightly warmer, drier, wetter, or more or less sheltered than the surroundings. Sheltered microsites also protect tree seedlings during days when temperature variation is extreme, such as in the spring and fall, or when the snow-pack is variable. Forestry operations use microsites to improve productivity, and they are a go-to tool when regenerating forests on difficult sites.

Sites impacted by oil and gas operations are often highly compacted, creating challenging conditions for seedling growth. Microsites can improve these conditions by creating pockets of shade and moisture that help promote the growth of tree seedlings and other plants. Depending on the limiting factors of the site, the ideal microsite might be slightly warmer, drier, wetter, or more or less sheltered than the surroundings. Forestry operations use microsites to improve productivity, and they are a go-to tool when regenerating forests on difficult sites.

While past oil sands reclamation practices encouraged uniform soil surfaces, we now know that variation in the soil surface is key because it creates microsites that benefit both trees and other native species. Variability can be introduced during soil placement, and specific techniques like mounding or scalping can be used to create microsites that improve the growth and vigour of trees and woody plants (Figure 2). A range of site preparation techniques are profiled throughout the Silvicultural Toolkit.



**Figure 2.** Creating microsites can improve the growth and vigour of trees and woody plants.