



# FASTER FORESTS

A VISUAL GUIDE TO  
IMPROVED CONSTRUCTION AND  
RECLAMATION PRACTICES ON  
OIL SANDS EXPLORATION SITES



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**Faster Forests Program**

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### **About the Faster Forests Program**

The vision of the Faster Forests program is to be able to tell the difference between a Faster Forests site and a standard site five years after treatment. The Faster Forests site will not only have taller trees and shrubs, but will be further along the trajectory to resembling the surrounding forest. There will be more diversity and therefore more value of the site in the context of landscape level goals regarding habitat or similar ecological values.

The Faster Forests Program is a collaboration between ConocoPhillips Canada with Husky Energy, MEG Energy, Nexen, Cenovus, Devon Canada, Athabasca Oil and Suncor Energy.

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# Why this Guide Matters

Significant progress has been made in testing and documenting new approaches to the reclamation of oil sands exploration (OSE) sites within Alberta.

Many oil sands companies now recognize that a 'neat and tidy' approach to well site reclamation may not create the necessary surface variability that is important for trees and shrubs to establish on reclaimed sites.



**Neat and tidy practices, like those on the left, are no longer considered desirable within forested sites. More soil variability and placement of woody materials is the new reclamation standard.**



# Why this Guide Matters

This guide identifies OSE construction and reclamation practices that can protect the natural capacity of a site to regenerate back to a forest, reducing reclamation costs and making outcomes more predictable.

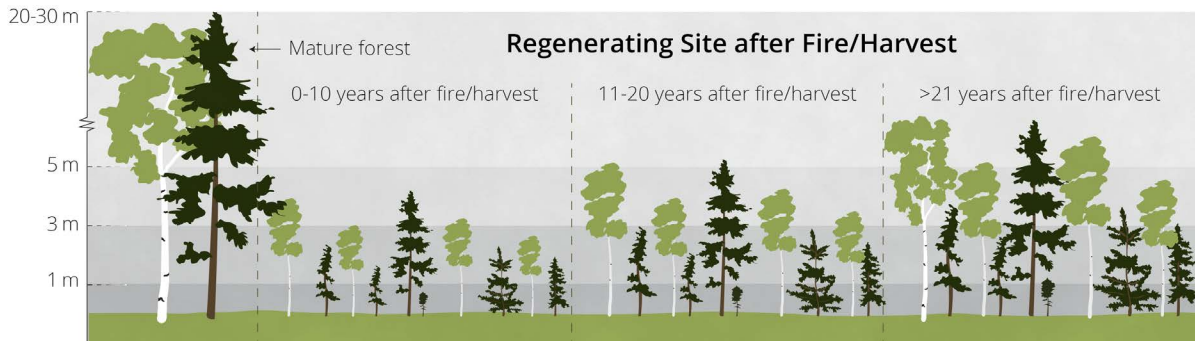
As can be seen in these images, OSE sites post reclamation can produce a range of outcomes. Notice the relative absence of trees and shrubs on the top and middle sites, with dense regeneration on the bottom site.

The goal of this guide is to empower operators to make wise decisions that can benefit forest recovery on OSE sites.



# Why Change? Past Practices Have Not Met Company Goals

When looking at past practices, studies have shown that OSE sites often have fewer trees, and the trees that are present are far shorter than similarly burned or harvested sites. Construction and reclamation operators can greatly improve the success of sites by using the practices outlined in this guide.



# New Practices Have a Strong Foundation in Ecology

After a wildfire, seedlings quickly re-establish, encouraging the return of forest cover to sites shortly after disturbance.



By learning from natural disturbances like wildfire, operators can modify their operations to improve forest growth and recovery on OSE sites. One example is the careful use of coarse woody materials during reclamation of OSE sites.





# Effective Work Begins with Knowing Your Sites

**In general, there are three types of sites that operators will encounter in the boreal forest.**

**Upland forests** can vary from dry jack pine forests, to lush mixedwood forests, to pure white spruce stands. Protecting the soil seed bank and root fragments through modified soil salvage or minimal disturbance is critical for enabling reclamation success on these sites.

**Treed peatlands** are largely composed of bogs and treed fens. Bogs typically contain trees that are less than 10 m tall and widely spaced. These sites have characteristic 'hummocks and hollows' that provide important variability and elevated microsites for trees to establish on.

**Non-treed peatlands** are typically fens that are treeless, or nearly so, because the sites are too moist for most trees to grow. The high water table and very soft ground that can be typical of these peatlands make them challenging sites for both construction and reclamation.



# Low Disturbance Approaches Are A Core Foundation

Low disturbance means minimizing disturbance of the soil surface. For example, avoiding excavating soils on upland sites and preserving the natural hummock and hollow microtopography on peatland sites.

By minimizing disturbance of the soil surface when constructing OSE sites, operators can preserve the natural abilities of a site to recover – much like a forest quickly emerges again after a wildfire. By using these low disturbance approaches, operators can help reduce reclamation costs and the time required to achieve reclamation certification.



On this OSE site, approximately half of the site had the soil left in place (i.e., low disturbance approaches) and the other half had the soil stripped. The vegetation indicates the positive effects of low disturbance approaches.



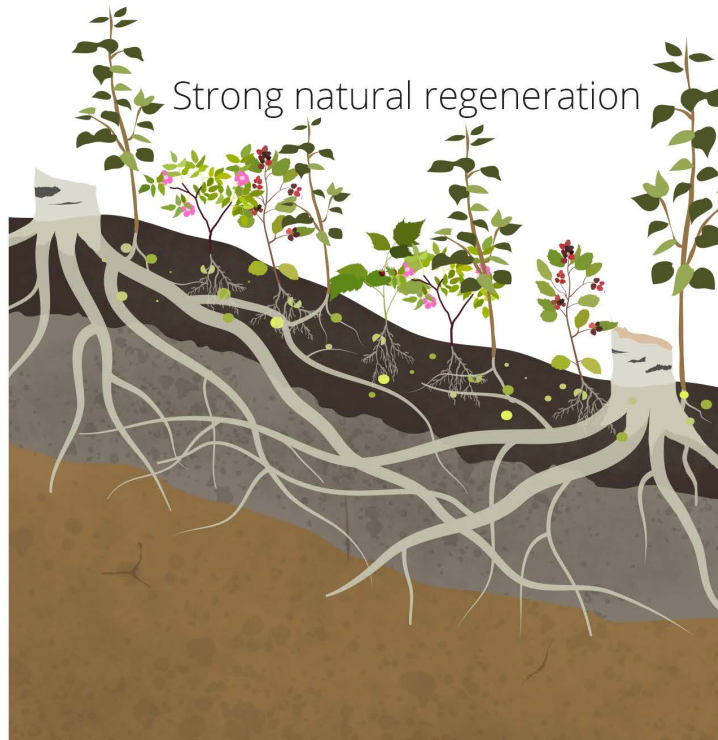
# Uplands Have a Natural Seed Bank Which Should be Preserved

Seeds and roots, which are essential to forest recovery, are naturally present within the surface soil layer. When these are preserved, they afford a rapid return to forest cover on upland OSE sites.

Seed bank is protected

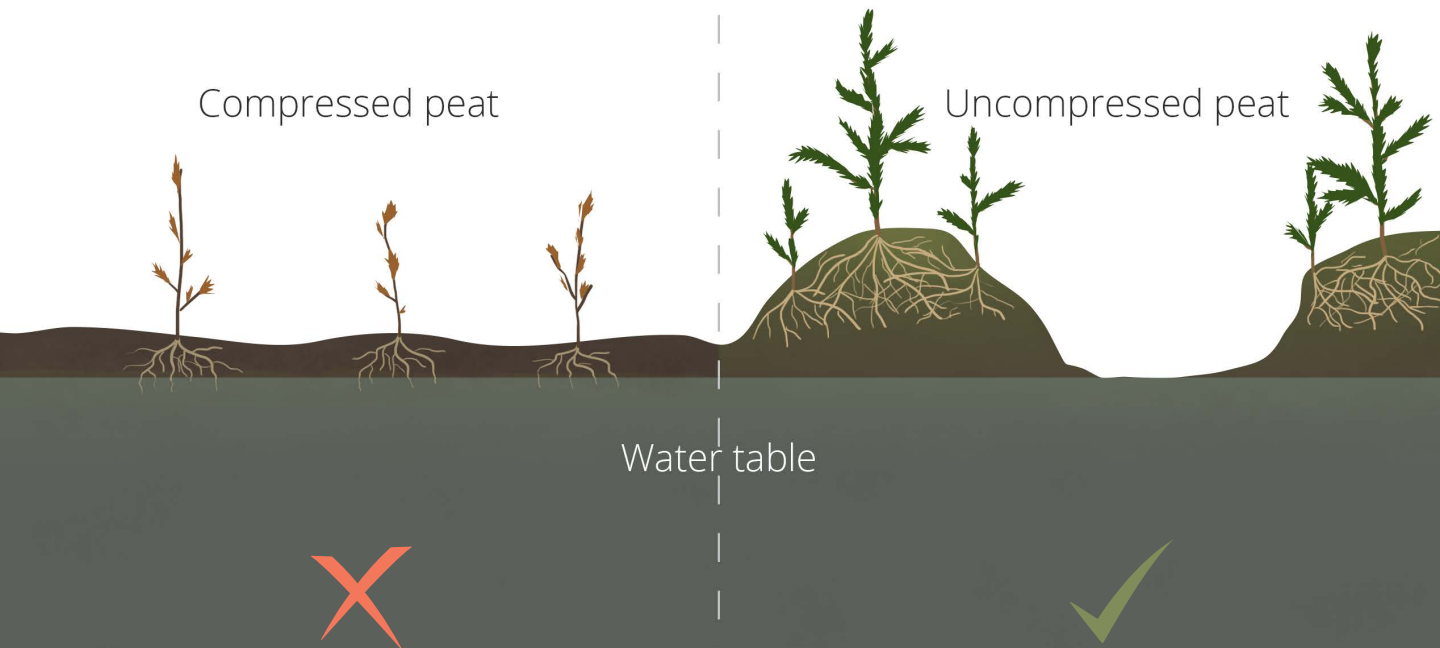


Strong natural regeneration



# Peatlands Require Natural Hummocks and Hollows

Natural hummocks and hollows on peatlands are critical for trees and shrubs to grow on. Many trees and shrubs are unable to grow on a site if the peat is compressed during construction and reclamation.





# UPLANDS



# Upland Sites - Minimizing Soil Disturbance

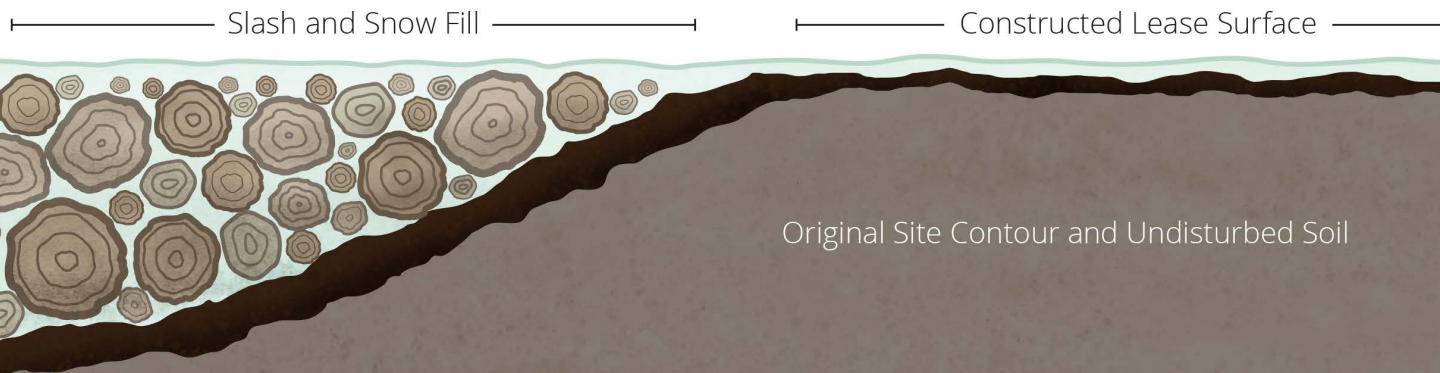
Low-disturbance operations on upland sites can dramatically improve the predictability and rate of recovery following disturbance. Dense aspen regeneration can be readily achieved on many boreal forest sites when proper practices are used. This helps companies achieve reclamation objectives sooner, more predictably, and at lower cost. Low disturbance techniques should be used whenever possible.



# Examples of How to Use Low Disturbance Techniques

Snow and woody material can be used to level minor slopes and overcome height variations on an OSE site. This enables operators to avoid cut and fill excavation. These materials can routinely be used to level sites with slopes of approximately 2%, or to smooth out terrain variations of approximately 1 m.

With enough material, even steeper slopes and more varied terrain can be levelled. To reduce the reliance on natural snow available on site, snowmaking equipment can be used.





# Woody Materials Should be Carefully Managed

Woody material is composed of all the debris and non-merchantable trees that are on a site during clearing. Excavators are preferred for redistributing woody material because the material can be distributed evenly over the site with minimal traffic.



Correct amount



Too little



Too much

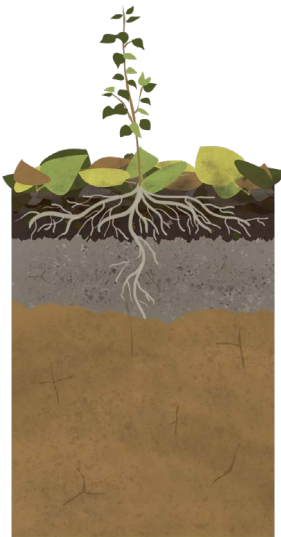


# Soil Salvage Depth Should Consider Preserving Roots

In most cases operators currently set soil salvage depths based on changes in soil colour. This practice is important for reducing the admixing of soils.

Within aspen stands, operators can experiment with a deeper soil salvage to reduce damage to roots and provide protective soil cover in the stockpile. This may mean salvaging soils slightly below conventional changes in soil colour. The minor increase in soil admixing is not a concern. Aspen roots that are less damaged and better protected from freezing and drying have a higher likelihood of surviving after reclamation – creating a rapid return to forest cover.

Use of excavators can also greatly assist in protection of roots during soil replacement operations.



**An example of how aspen roots can grow along and across different soil horizons (colour changes).**

# Recontouring Needs to Account for Settlement

A key objective of site recontouring is that the finished site should blend with the surrounding forest elevation.

However, because the reclaimed soil will likely contain ice and snow, it will slump after spring thaw. This slumping should be anticipated, and site contours should be slightly overbuilt to accommodate for this settlement.



Soil slumping is common and site contours should be slightly overbuilt to accommodate for this settlement.

# Rough Sub-Soil Placement is the Goal, Not Neat and Tidy

New research has shown that better forest regrowth results from a rougher soil surface. Deviations of 20–30 cm above or below grade are acceptable.

Some options for producing a rough sub-soil surface may be ripping the site before final surface soil placement, tilting the blade from one side to another to gouge the surface, or roughly placing soil without extra effort in smoothing the site.



Neat and tidy approaches like the example above should be avoided.



Approaches that keep the soil loose and variable should be used instead.



# Heavy Traffic Over Soils Impedes Forest Growth

Previously, soil replacement was accomplished with an excavator and a dozer, where the excavator pulled the stockpiled material out of the piles while the dozer spread the material over the site. These operations tended to produce relatively smooth surfaces with considerable traffic over the site. This results in sites with very poor capacity to recover to a forest.



**In this case, top soils were replaced and spread over the site with a dozer, resulting in a very smooth surface and considerable traffic on the soils. This site will likely struggle to recover quickly to a forest.**



# Achieving Rough and Loose Top Soil With Excavators

A 'rough and loose' surface is preferred because it benefits plant establishment and leads to a wider diversity of vegetation. The approach is shown below:



Initial surface soil removal from stockpile and forwarding across the site.



Strategically placed forwarded piles with replaced surface soil visible in the foreground.



Progressive placement of surface soil with no traffic over it.



Planned 'escape' route to be backfilled as the excavator progresses to exit.

# Partial Cut and Fill: A Special Case

A common practice on upland sites with simple slopes is to apply a cut and fill operation, where material from upslope is used to level the downslope lease surface.

However, too often during reclamation the removal of the upslope material from the undisturbed downslope area is not complete, thereby leaving the original forest floor buried by various depths of material.

Some options for ensuring all the soil is removed from the forest floor of the lower slope are freezing-in the surface of the lower slope with an ice layer, laying geotextile over the surface before placing fill over it, or simply marking the surface with existing snow.



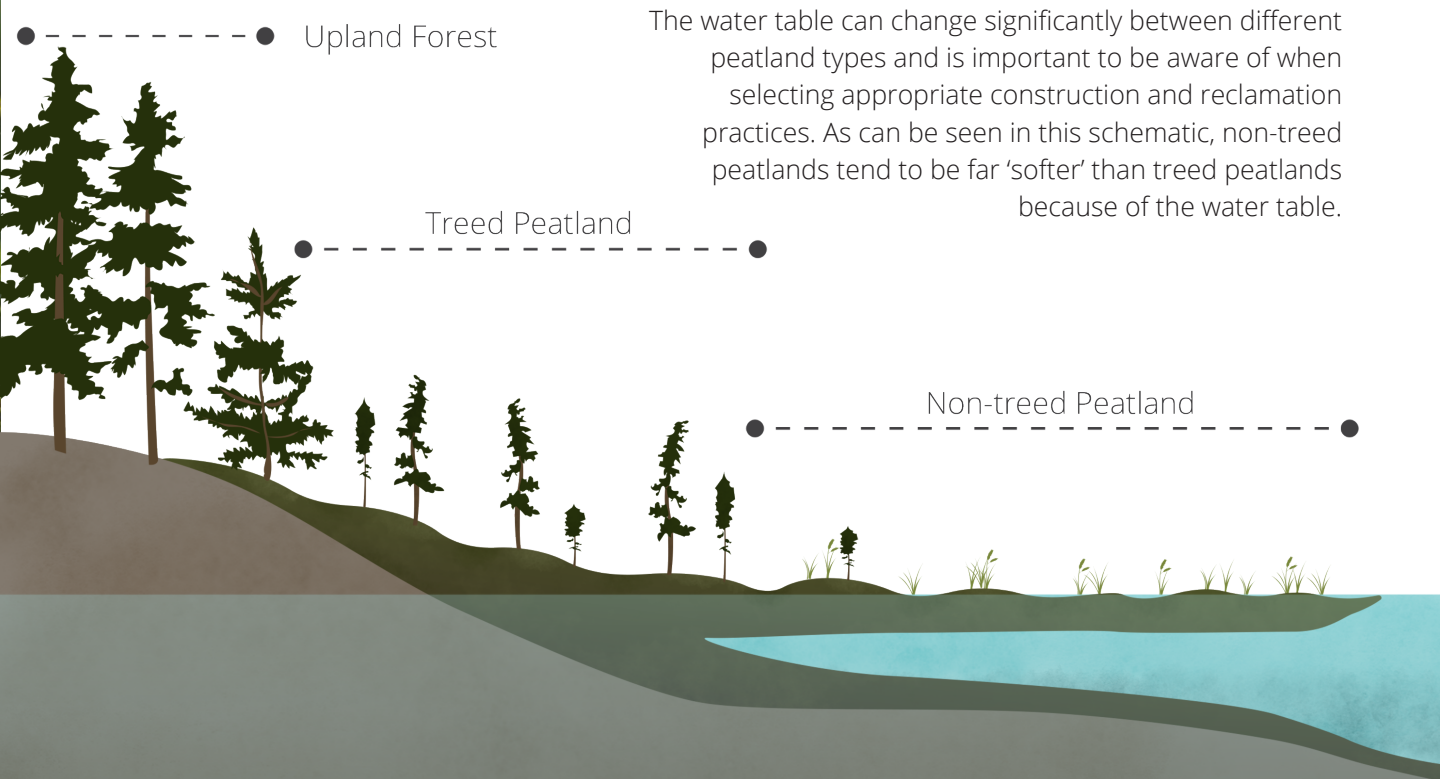
**Snow can be used as a marker for pulling back appropriate soil amounts after a cut and fill procedure.**



# PEATLANDS



# Understanding Water Table Depth To Inform Practices



(Adapted from Klinger, 1996).



# Post-Reclamation Surface on Peatlands Should Have Hummocks and Hollows

Ideally, a peatland OSE site will maintain most of its original hummocks and hollows after reclamation. This requires careful operations. While wood left on site should be redistributed, the extra traffic during reclamation can further compress the peat surface.

**Two key ways in which peat compression can be minimized during reclamation are:**

- Avoid redistributing trees that are already well dispersed.
- Restricting equipment travel to surfaces adequately protected by the trees. This allows the natural hammocking effect of the trees to support weight as the equipment works its way off the site.



**A peatland site that did not have surface roughness maintained.**



**A peatland site that had surface roughness maintained.**

# Low Disturbance Principles on Peatlands

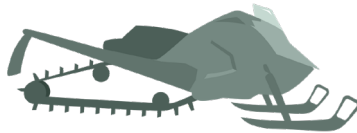
During site clearing, operators should make every effort to preserve the natural hummocks and hollows on peatlands. Some companies have found that keeping wood on site allows for a natural corduroy effect, reducing peat compression.



A second key to reducing impacts on peatlands is taking time to freeze-in a site, and reducing heavy equipment traffic early in the freeze-in process.



Take Your Time



Light equipment where possible

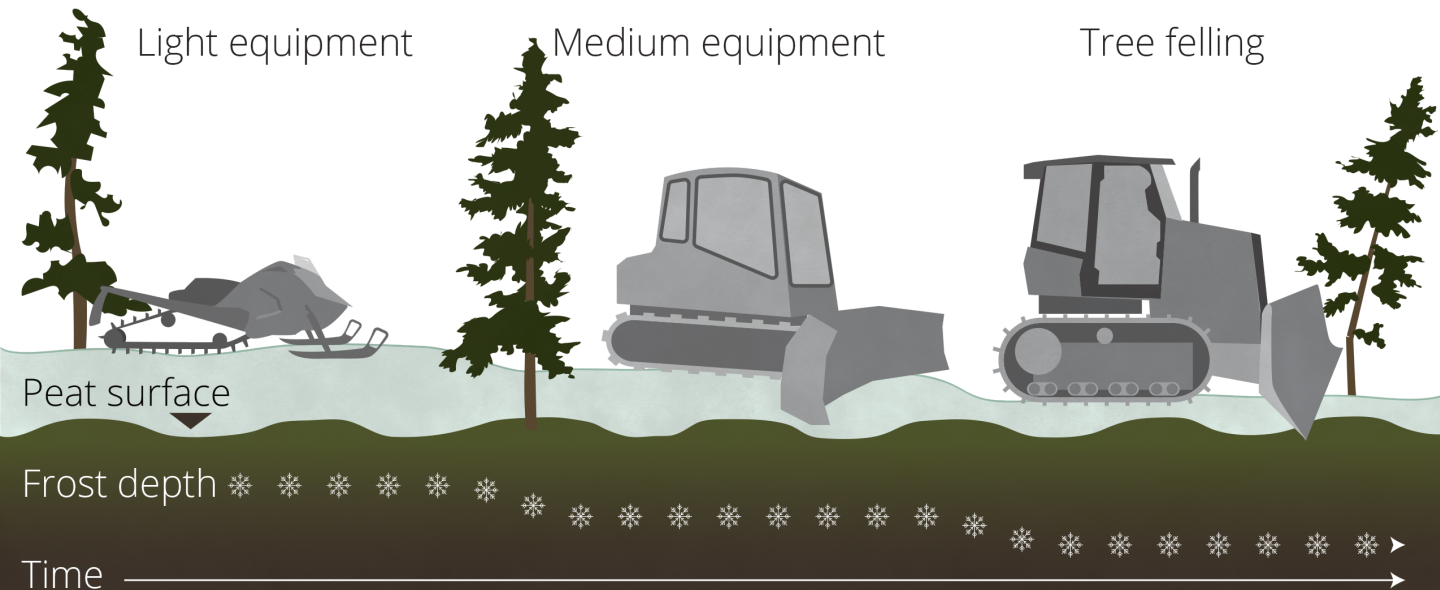


Start with ½ loads of water

# Different Approaches to Peatlands – Sparsely Treed

Depending on the density of trees on a site, different techniques can be used for promoting frost establishment.

## Sparsely treed sites



# Different Approaches to Peatlands – Densely Treed

## Densely treed sites

Tree felling

Light equipment  
(may not be necessary)

Medium equipment





# Approaches for Non-Treed Peatlands

Establishing frost on “non-treed peatlands” is like that on bogs and treed fens, but without the requirement to clear trees.

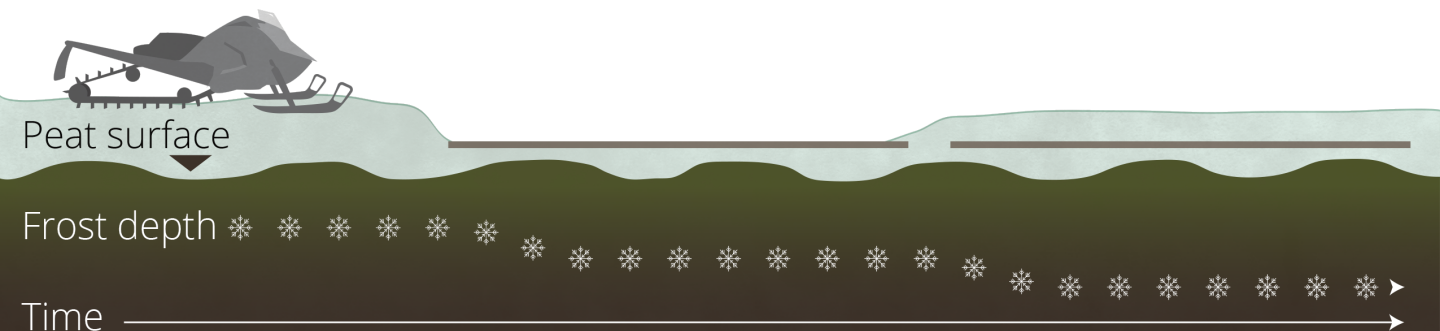
Because non-treed peatlands are often wetter and softer than treed peatlands, rig mats may be required. These can be applied once a shallow layer of frost has been established to support the mats.

## Non-treed sites

Light equipment

Install rig mat

Snow/ice pad on mat



# Recreating Hummocks and Hollows if They are Damaged or Compressed

Where hummocks and hollows were flattened during construction, surface roughness will need to be re-introduced mechanically during reclamation.



The preferred method is to create very large, elevated mounds on peatland sites during reclamation to introduce surface roughness.



Windrows in peat surface can also be produced by tilting the dozer blade and making parallel passes across the site. Widening the distance between passes and running a second set perpendicular to the first may produce a more natural-looking pattern.





ALL SITE TYPES



# Well Centres Must Accommodate Soil Slumping

A standard procedure following well completion and OSE abandonment is to cut and cap the well. Experience has shown that merely leveling this area to match the adjacent contours after the well has been capped often leads to soil sinking or slumping and water ponding at the well centre.



The solution to avoiding sunken well centres is to produce a mound of excess fill material at the well centre, which can settle over time to be roughly level with the remainder of the site. Well centre mounds should be high enough to account for settling over multiple years. Mounds should be 0.5 to 1.0 m tall in upland areas and 1.5 to 2.0 m tall in peatland areas.





