Introduction

The specific location in the ground where you plant a tree is known as a microsite. Choosing the right microsite has a clear and measurable influence over the eventual success of that tree.

The purpose of this module is to give you knowledge that will enable you to make good decisions about where to plant trees. It will explain the factors that contribute to a seedling's successful growth, which include:

- Soil structure
- Soil temperature
- Soil moisture
- Competition

This module goes on to discuss how to choose the best microsite, as well as some of the ways that microsites are prepared by machines to help a tree's growth.

Microsite Treeplanting – What is it?

Microsite planting is choosing the best location to plant a seedling to ensure its optimum health and growth. This spot must have most of the good things a seedling needs.

The necessary spacing between planted trees will dictate the general area for the planting of the tree. Microsite treeplanting is finding the best site within this area.

Why do it?

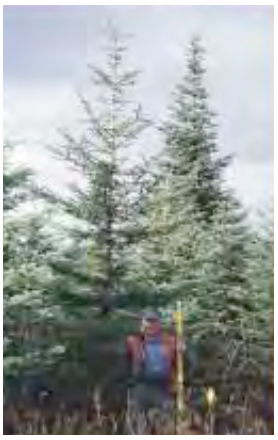
Planters are the last critical link in the long chain of events that strives to grow high quality trees. Being able to quickly select the best microsite will increase seedling survival and growth and will greatly benefit the forest that will follow.

What's in it for the treeplanter?

Planting the best microsite does not have to slow you down! Generally, the best microsite is the easiest to plant. You will learn that a good spot, such as a natural raised mound, can have less hard soil, rock or other impediments to planting.

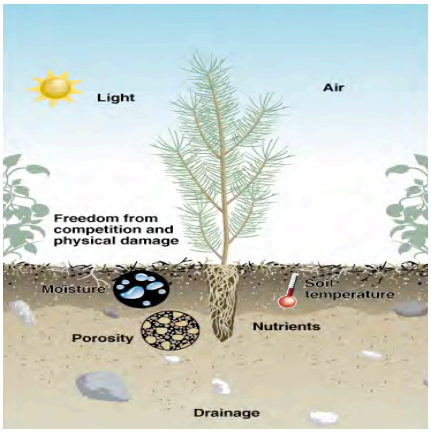
Microsites – They Make a Huge Difference

Both of these trees are 15 years old. They are the same type of tree and they are on the same site. The only difference is the microsite.



The extra thought and effort you take to select a good microsite will greatly benefit the forest that follows.

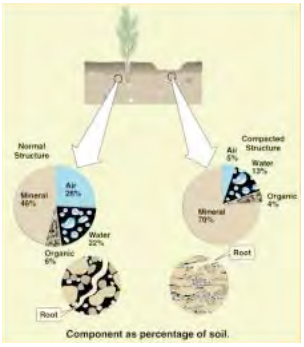
Seedling Requirements



Conditions above-ground and below-ground both affect how well trees will grow. It's easier for us to understand what is going on above ground because we can see it, but the soil environment is just as important. This illustration shows some of the conditions that are important to seedlings, and which we will discuss in detail.
They are:

Light	Air	Moisture
Nutrients	Temperature	Drainage
Porosity	Competition-Free Environment	

Seedling Requirements (continued)



Few sites offer all the good conditions in ideal amounts. Some sites lack a particular condition so much that it limits seedling survival and growth. This is called a growth-limiting factor. When mineral soil has good structure, it is easy for seedling roots to grow, and water and nutrients can move through the soil to the roots. In a soil with undisturbed structure, only about half of the volume is actually solid material. The other half consists of small pore spaces. Pore spaces are important because roots don't actually penetrate solid material; rather, they grow in these tiny pore spaces between the soil particles, gradually pushing them apart as they get larger.

Soil Structure

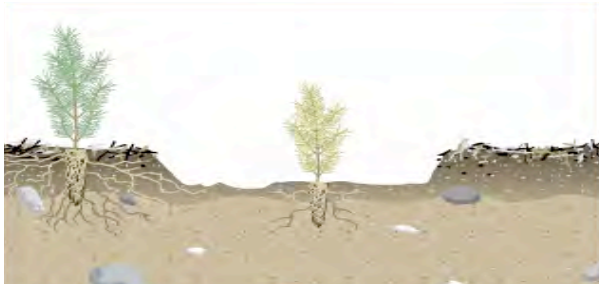
Porosity

Ideally, about half of the pore spaces are filled with water and the other half are filled with air. Both air and water are necessary for seedlings to grow. We all know that plants need to absorb water to grow, but they also need oxygen in their rooting environment so that cellular processes can be carried out.

Compaction

If soil is compacted, for example, at the bottom of a heavy equipment tire rut, it loses its good structure. In this compacted soil, pore spaces have collapsed to less than one-quarter of the soil volume. This means that the soil can hold less water and air, and root growing tips have a harder time forcing their way through the material.

Here's another photo and illustration to show what happens when soil becomes compacted by heavy equipment. Ruts are great for walking in, but seedlings do poorly when they are planted into the compacted soil. From a microsite perspective, it would be much better to plant in the non-compacted ground a few inches away from the rut.



Soil Structure (continued)

Compaction

Sometimes you may be specifically asked to plant on old skid trails or landings to aid their rehabilitation, but only do so if you are asked.

Soil Temperature

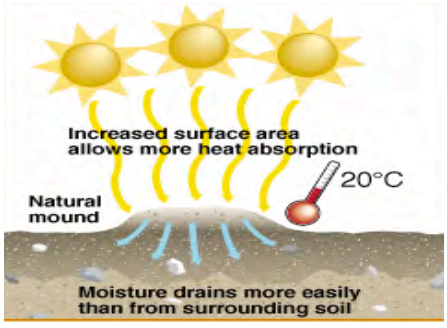
Soil temperature is also a critical factor for seedling growth-seedlings grow best when it is not too cold and not too warm. The photograph shows an experiment where seedlings were grown in different temperature soils. It is easy to see that the seedlings with their roots growing in 20 degree Celsius soil are the biggest. If we could see the root systems we would see that they are also largest at 20 degrees Celsius.

In northern B.C. and Alberta, cold soils are probably the most significant growth limiting factor. In many areas, soils are only above 10 degrees C for a short period every summer.

On sites with cold soils, the warmest microsites are mounds or high spots.

High Spots are the Warmest

- First of all, high spots are well drained, and when there is less water in the soil it takes less heat energy to warm it.
- Mounds are also warmer than flat spots because they have more surface area to absorb the sun's radiation. This means that snow melts earlier in the spring and the soil can warm more quickly every day around seedling roots.



Soil Temperature (continued)

Low Spots are the Coldest

In some areas of the southern interior, soil temperatures can be much warmer than 20 degrees Celsius in the summer, especially when the site faces south. On those sites, the best microsites may be the shady spots behind logs or bushes, or depressions.

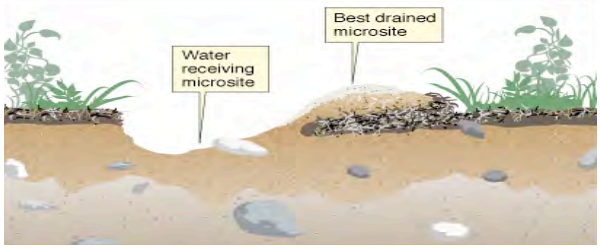
In northern areas, cold air can pool in low spots. This can cause soil temperatures to be kept low, longer into the day. In those areas, the best microsite could be on the south-facing slope.

Soil Water

Soil water is often an important growth limiting factor to seedlings. We know that seedlings can die without enough water, but too much water can be just as bad. Not only do really wet soils take a long time to warm up, they also lack oxygen for root growth. That's because all the pore spaces are filled up with water.

Thinking back to the diagram about soil structure, the ideal soil has about half of the pore spaces filled with water and the other half filled with air. On wet sites, the best microsites are high spots or mounds because the excess water drains away. Avoid depressions where water collects.

On dry sites in southern BC and Alberta southern sites, the best microsites may be in the depressions where water will be available to the seedling for a longer period during the summer.



Moisture conditions vary from place to place and when you are only planting on a site for a few days, it's not always obvious whether moisture is a growth limiting factor. Usually your supervisor will talk about this during the pre-work conference. If you are in doubt, ask.

Competition

Competition from other plants can reduce the growth of young seedlings or even kill them. It's important to remember that sites that are most productive for seedling growth are also the best for brush. Many kinds of plants grow faster than conifer seedlings and can create dense shade or use up most of the available water and nutrients. Vegetation can also cause physical damage to seedlings when it sheds its leaves or collapses in the fall.

On competition-friendly sites the best microsites are open spaces away from dense patches of vegetation. Sometimes you may also be asked to plant next to stumps or logs, so that seedlings have less chance of being crushed by vegetation and heavy snow during the winter.

During winter months, snow can accumulate on the vegetation surrounding the seedling. As the weight of the snow increases, the supporting vegetation can fall down on the seedling. This is called snow press and it can be quite damaging to the seedling. To avoid snow press, the area around the seedling is screefed and the vegetation is removed.

Microsite Selection

Good microsite selection is about planting seedlings where they can best overcome growth-limiting factors. These factors vary from place-to-place in each province, and so will the characteristics of a "good" microsite. Being aware of the principles behind microsite planting, however, will help you understand why you may be asked to select different types of planting spots for different sites.

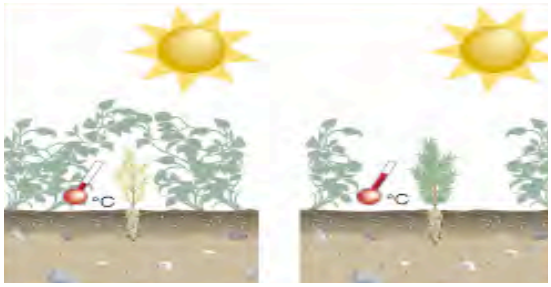
You can see the effects of good microsite selection in this photograph - some trees have much better growth than others. On this site, cold soils are the main limiting factor. The trees that are doing well were planted on the natural high spots and those doing poorly were planted in the depressions. However, if these were pine trees planted on the dry site, those planted in the low spots with more available water might be doing better.

Mechanical Site Preparation

Introduction

Sometimes, growth-limiting factors are so severe that even the best planting spots do not provide the conditions for good seedling growth. In that case, foresters may decide to create better microsites with mechanical site preparation (MSP). MSP is done before planting, with machines that dig, plow, scrape, or mix the soil. Depending on the machine used, mounds and depressions can be created, or characteristics of the material at the soil surface can be significantly changed.

MSP techniques are tailored to create microsites that offset the growth-limiting factors. For example, on cold sites, the objective would be to create high spots to improve drainage and soil temperature. On hot, dry sites, the objective would be to create depressions, so that seedlings could have more access to soil water and increased protection from the sun.



Mechanical Site Preparation

What Does MSP Do?

Mechanical site preparation:

- ✓ Creates well-drained microsites when the soil is too wet.
- ✓ Creates sites that retain moisture when the soil is too dry.
- ✓ Creates porous microsites when the soil is too compacted.
- ✓ Creates raised planting sites that dry out and warm up faster than the surrounding ground on cold sites.
- ✓ Clears competing vegetation out of the way to give seedlings a head start.

Where an area has MSP, it is important for you to recognize the best microsites and to know how to plant them. On MSP sites you should be told where to plant. If in doubt, ask your supervisor.

Powered Disc Trencher

Disc trenchers create continuous furrows with a raised berm that is topped with mineral soil. They are used on cold, wet sites to create raised microsites and reduce vegetation competition. Seedlings are usually planted on the top or side of the berm.

Ripper Plow

Ripper plows create continuous trenches with a side cast on both sides. They are used on dry sites to create microsites that conserve moisture and reduce vegetation competition. Seedlings are usually planted just above the natural ground level so the roots are through the double-thick organic layers of the soil.

Inverted Mounds

Mounders create small to large individual mounds that are capped by mineral soil. They are used on wet sites to create better drainage and increase soil temperature, and also to reduce vegetation competition. Seedlings are usually planted on the top or the side of the mounds.

Mounds can be made by excavators (pictured) or bulldozer pulled implements that create rows of mounds.

Mulched Mounds

V-H Mulchers mix mineral soil and the forest floor and create crescent-shaped raised spots or depressions, depending on site conditions. The result is looser, warmer rooting conditions and some relief from vegetation competition. Seedlings are usually planted in the middle of the mulched spot.

Conclusion

Seedlings are delicate and fragile, and have to endure enormous challenges to successfully establish themselves as a tree in nature. Planting a tree in a good microsite will contribute to its survival. A poor microsite choice will cause it to suffer avoidable stress, which will lead to stunted growth or death.

Your microsite choices are a critical step in the long chain of events that will eventually lead to a mature forest.