MICROSITE PLANTING

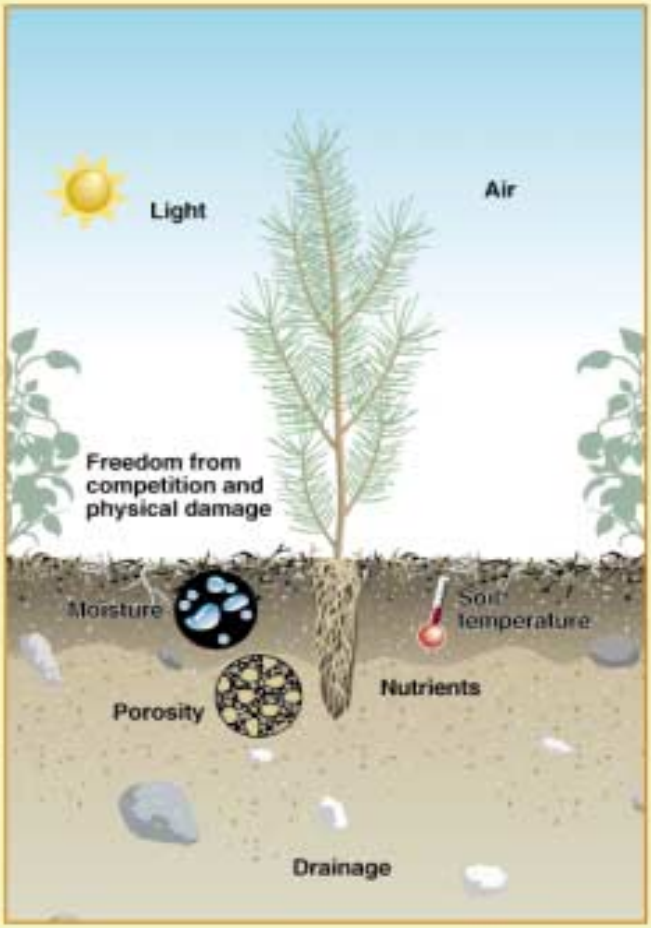
SEEDLING REQUIREMENTS AND

GROWTH LIMITING FACTORS

Trees have certain requirements to grow well. The closer the spot they are planted in comes to providing those requirements, the better off the trees will be. When conditions are just right, trees can grow very well indeed. For instance, on a rich site near sea level on Vancouver Island, this Douglas-fir grew 1.5 m taller in a single year! Of course, not every site has this kind of potential, but we still try to choose the spot that will provide the tree with as many as possible of its growth requirements.

Microsite planting means choosing a spot that has most of the good things seedlings need.

Conditions Important for Seedling Survival and Growth



Conditions above-ground and below-ground both affect how well trees will grow. Its 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.

Above ground

- Light
- Air
- Freedom from competition and physical damage from other plants

In the soil

- Moisture
- Nutrients
- Temperature
- Drainage
- Porosity

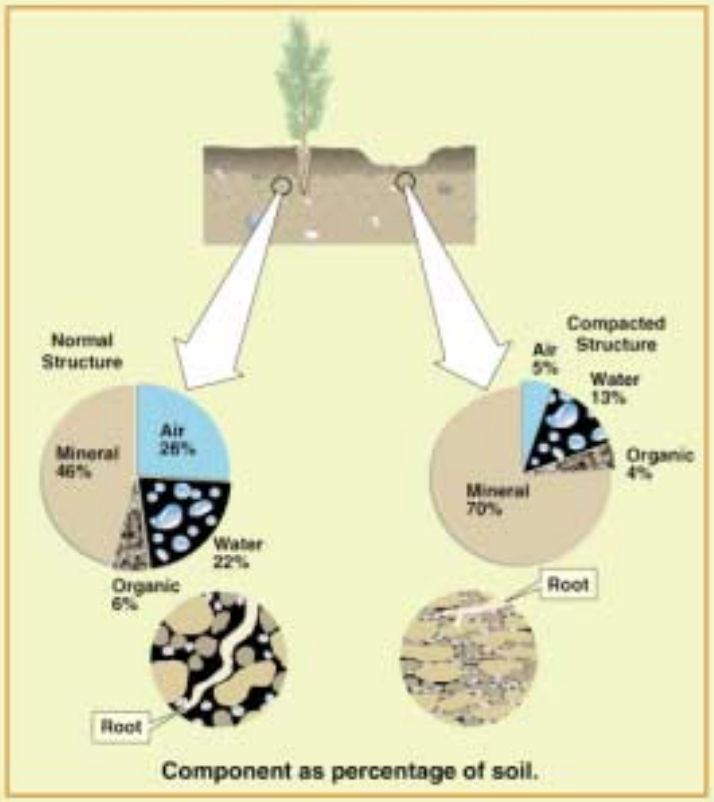
Few sites offer all the good conditions in ideal amounts. Some sites lack a particular condition so much that it limits seedling survival and growth. This is called a **growth limiting factor**.

Soil – The Growing Medium

Soil is often poorly understood, but it is home to thousands of organisms and is critical to the growth of trees. Forest soil usually consists of a layer of forest floor material over mineral soil.

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 normal structure, only about half 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.

Ideally, about half the pore spaces are filled with water and the other half are filled with air. Both water and air are necessary for seedlings to grow. We all know plants need to absorb water to grow, but they also need oxygen in their rooting environment so that cellular processes can be carried out. If soil is compacted, - for example, at the bottom of a heavy equipment tire rut, it looses its good structure.



Component as percentage of soil.

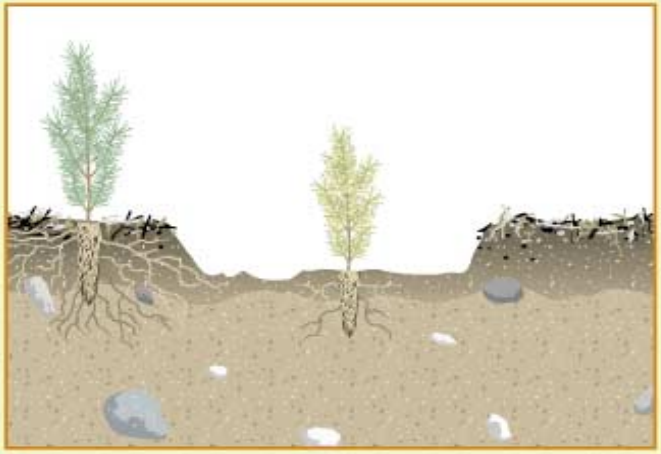
In the compacted soil, pore spaces have collapsed to less than one-quarter of the soil volume. This means the soil can hold less water and air, and root growing tips have a harder time forcing their way through the material.

Compaction degrades soil structure.

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 uncompacted ground a few inches away from the rut.

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

Where will roots grow best?



Roots will only grow in a favorable environment!

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, and it is easy to see that the seedlings with their roots growing in 20°C soil are the biggest. If we could see the root systems we would see that they are also largest at 20°C.

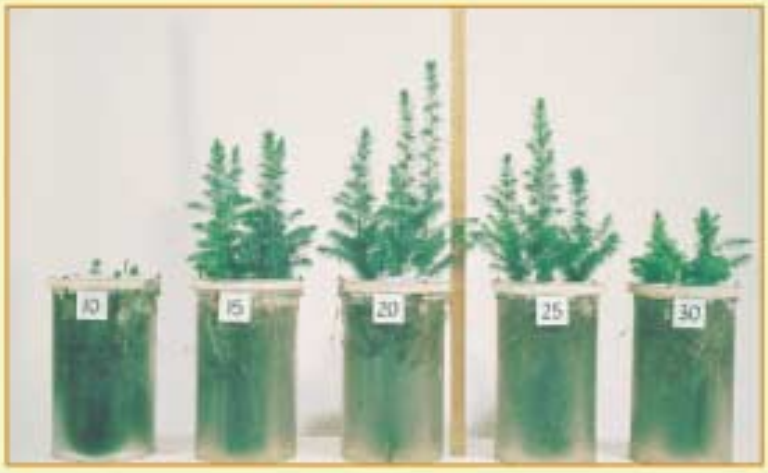
In northern B.C., cold soils are probably the most important **growth limiting factor**. In many areas, soils are only above 10°C for a short period every summer.

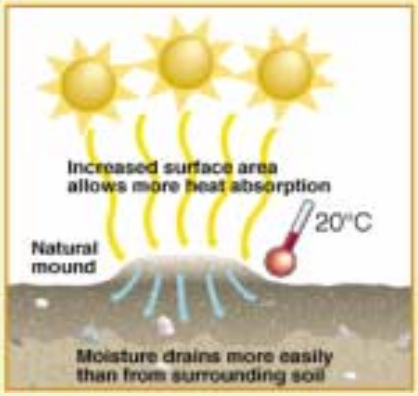
On sites with cold soils, the warmest microsites are mounds or high spots. There are several reasons for this. First of all, high spots are well drained, and when there is less water in the soil it takes less heat energy to warm it. Mounds are also warmer than flat spots because they have more surface area to absorb the sun's radiation. This means that snow melts earlier in the spring and the soil can warm more quickly around seedling roots.

High spots are warmest!

Depressions are coolest!

Soil temperature has a significant effect on seedling growth.





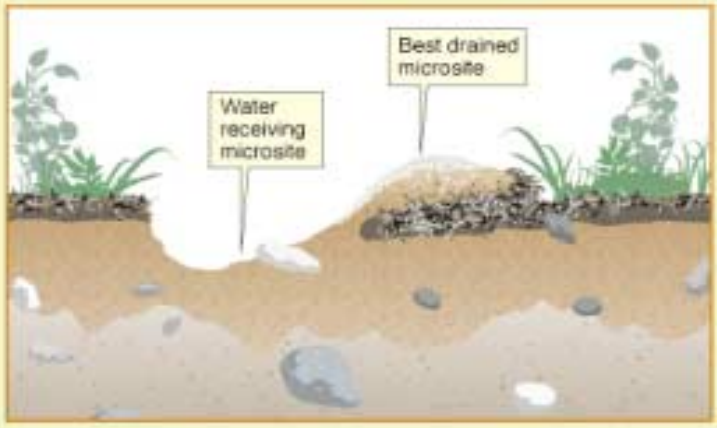
In some dry areas of the southern interior, soil temperatures can be much warmer than 20°C in the summer, especially when the site faces south. On those sites, the best microsites may be shady spots behind logs or bushes, or depressions.

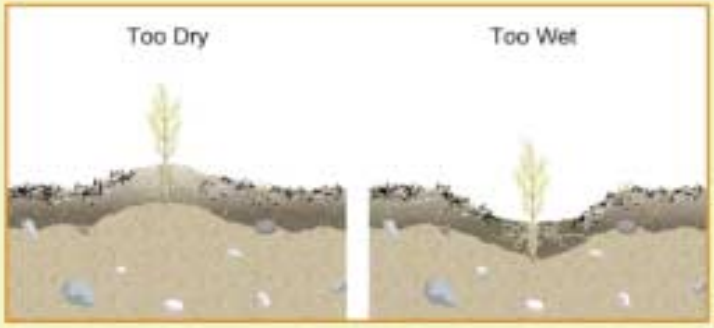
Soil water is often a critical problem.

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 had about half 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 southern sites, the best microsites may be the depressions, because water will be available to the seedling for a longer period during the summer.





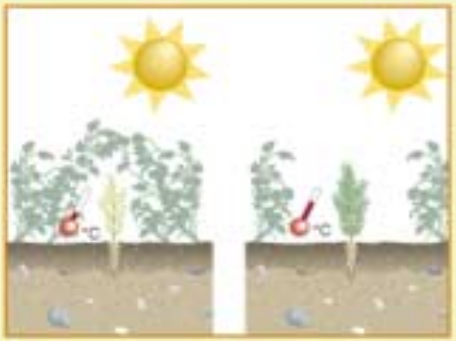
Moisture conditions vary from place to place in B.C., and when you are only planting on a site for a few days, its not always obvious whether moisture is a growth limiting factor. Usually your supervisor will talk about this during the pre-work conference, and if you are in doubt, ask.

Moisture conditions vary from site to site and change during the year.

Excess brush or grass competes for sunlight, soil moisture, and soil nutrients

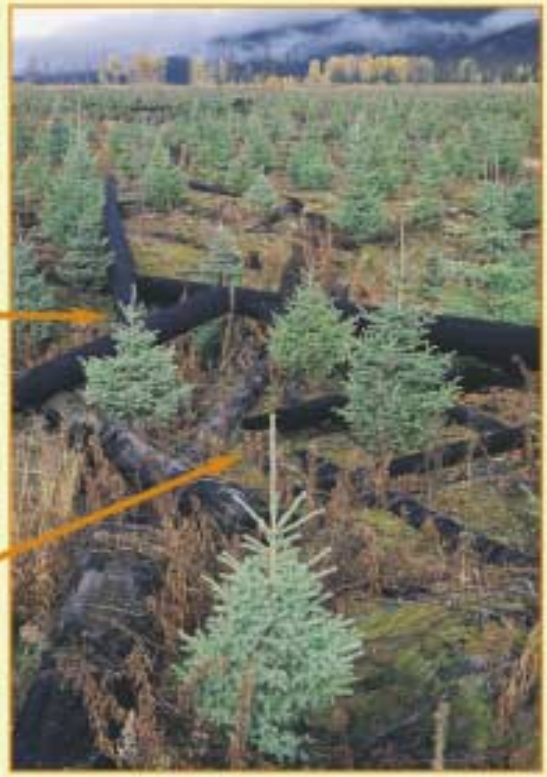
Competition from other plants can reduce the growth of young seedlings or even kill them. Many kinds of plants grow faster than conifer seedlings and they can create dense shade or use up most of the available water and nutrients. Vegetation can also cause physical damage to seedlings when it sheds its leaves or collapses in the fall.

Its important to remember that sites that are the most productive for seedling growth are also the best for brush. On these types of 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.



Soils that are most productive for seedlings = most productive for brush.

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

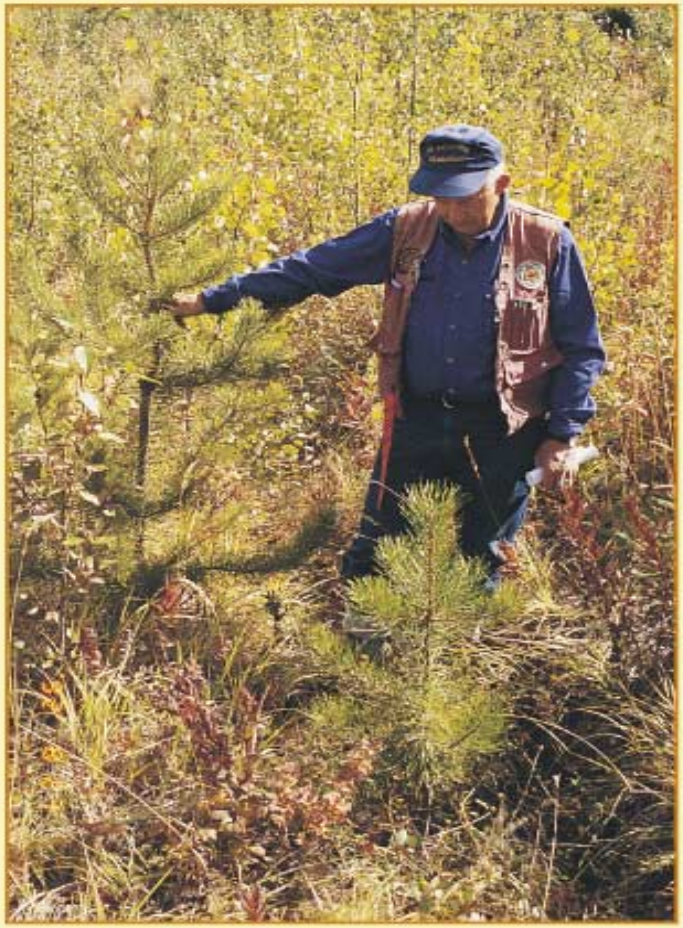
GROWTH LIMITING FACTOR.

Good microsite selection is about planting seedlings where they can best overcome growth-limiting factors. These factors vary from place-to-place in the 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. This site is west of Prince George, where cold soils are the main growth limiting factor. The trees that are doing well were planted on natural high spots and those doing not so well were planted in depressions. **But**, if these were pine trees planted on a dry site, those planted in low spots with more available water might be doing better.

THINK MICROSITE - IT MAKES A DIFFERENCE!

Again...the difference is microsite.



The growth limiting factor for the shorter seedling is cold wet soil.