Tending to your Tree Seedlings

Tending is required until the trees reach a 'free-to-grow' state. This means that they are taller than the surrounding competition and are no longer adversely affected by it. This usually takes 3 to 5 years. Site preparation generally provides competition control for one to two years. It is important to get out and check your trees periodically. Conifers (spruce, pine) generally require less tending than deciduous trees (maple, oak). The spacing of your planted trees will influence the choice of tending methods you may use. Some common methods of tending:

1. Manual tending—usually used on smaller scale and is relatively labour intensive. Manual tending includes both grass and weed control (trampling, hoeing, hand weeding and roto-tilling) and brush control (brush axe, brush saw, pruning shears and chainsaw).
2. Mechanical tending– preferred method for those looking to control competition in a larger plantation without using herbicides. The two common methods are mowing/ brush cutting then roto-tilling/ discing.
3. Mulching—this is an option on a small scale due to the cost of labour and materials. Both man-made (black plastic, woven black plastic, newspaper) and organic (straw, wood chips) are available. Apply mulch in a 60 centimeter (2 ft) radius around the base of the tree. When using organic mulches consider a depth of at least 5 to 10 centimeters. When using chips, try to have a mix of conifer and deciduous species, due to the resin in the conifer chips.
4. Tree guards-to protect seedlings from being mowed over and browsing by animals. Chicken wire works best. Try different arrangements (i.e. cylinder or pyramid) to determine which shape works best to prevent animal access. Remember the bottom of the wire should extend 5 centimeters into the ground. Check the wire every year to ensure that it does not constrict the tree.

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YOUR QUICK GUIDE TO TREE PLANTING

The Importance of Choosing the Right Tree

Even if you know very little about how our native trees and forests grow it is probably a good bet that you are aware that different species of trees are found on different sites. Like all other types of plants, trees have specific growing requirements. As a result, each site has its own capability, and in the same way, its own limitations for growing trees. One of the most important first steps a landowner can make is to ensure that the right species is chosen for their site. Choosing the right species for the site does not always guarantee success, but choosing the wrong species is sure to guarantee failure. So spend some time determining what your site characteristics are and if you are still unsure, consult a professional.

Getting to Know Your Site

When forest managers refer to site characteristics, they are talking about a broad range of physical and chemical properties. Once you know a site's characteristics, you can determine what species will grow well (and those that won't!). In most cases, there will be a few species that should do well on the site – think about the many different species you find in most natural forests. This gives you a chance to base your final species selection on additional considerations like long-term objectives, species availability and cost. Although your site may have several unique characteristics that separate it from others, only two, soil type and drainage, influence how well one species will do compared to another.

Soil Type

Although you don't have to be a soil scientist to plant trees, knowing a little about soil is valuable. Trees depend on soil to anchor them in place, provide moisture and nutrients, and to act as a seedbed for future generations. All soils are made up of four main ingredients: mineral particles (the bulk of the material), air spaces between the particles, water in varying amounts, and some organic matter from plant and animal debris. Classifying soils is primarily a quantification of the different ingredients found within it. Mineral particles range from boulders as large as basketballs, to tiny particles so small they can't be seen without a powerful microscope. Soil texture is the relative proportion of the individual particles. A handful of dirt rubbed between your fingers will have a certain amount of grittiness' to it. The more abrasive the soil feels the larger the individual particles; the smoother the soil feels the smaller the particles. This grittiness (or the lack of it) is a relative measure of three main soil particle sizes – sand, silt and clay. Sand has the largest particles, which feel "gritty". Silt has medium-sized particles that feel soft, silky or "floury". Clay has the smallest particles and feels "sticky". The amount of sand versus silt versus clay within the soil directly affects a tree species' ability to grow on a site.

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There are three broad texture classes: sandy soils, loamy soils and clay soils. The term loam refers to soils with more equal proportions of sand, silt and clay. Although there can be many combinations of classes such as sandy loam, loamy sand or even clay loam, it is only really necessary to determine which of the three general classes you have. Table 1 lists some common properties to look for when assessing a soil texture class. Grab a handful of soil – does it feel gritty or smooth? Squeeze the soil in your hand. Does it form a cast (clump)? Lightly wet the soil and try it again. Try to make a soil ribbon (Fig.1) by lightly wetting the soil until it feels like moist putty. Then, try to squeeze it between your thumb and forefinger upwardly into a thin flat ribbon – if a ribbon forms the soil contains clay. The longer the ribbon, the more clay it contains.

Figure 1: Making a soil ribbon

Source: www.gsfc.nasa.gov/globe/stories/clays.htm

Drainage

Drainage is the second site characteristic that needs to be assessed before making a species selection. How well your site holds water can have a dramatic impact on the long-term survival of different species. Drainage is influenced by soil texture. The smaller the particle size, the more water the site holds – a clay soil can hold considerably more moisture than a sandy soil. Soil depth, recent precipitation, topography, depth to the water table, and the amount and type of vegetation also influence drainage in one way or another.

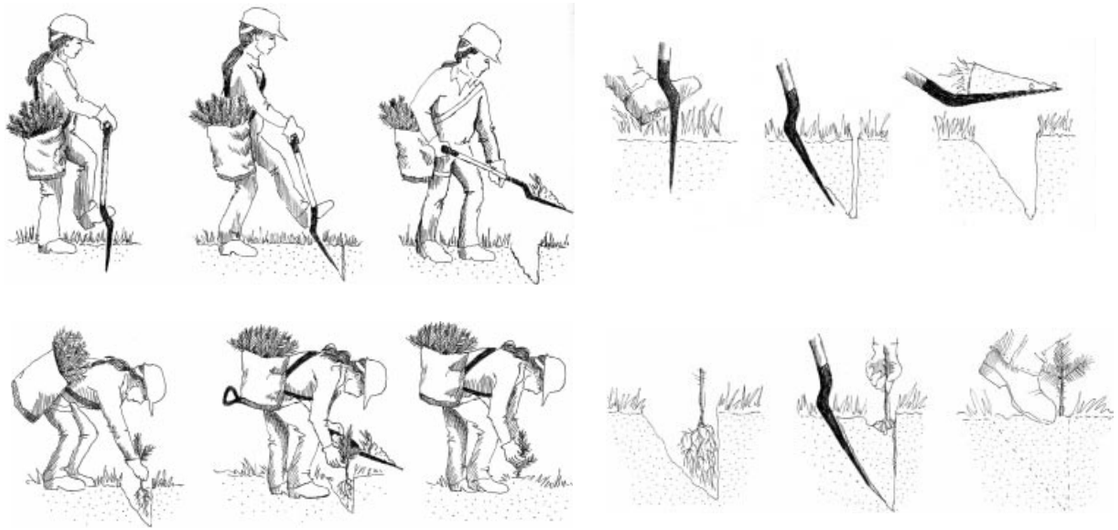
Table 1: Soil texture class assessment properties

Soil texture class	Visual appearance	Reaction when squeezed in the hand		Ability to form a ribbon
		DRY SOIL	MOIST SOIL	
Sand soils	- Granular with easily detectable particles easily falls apart	- Will not form a cast or, cast easily	- Forms a cast that crumbles	- Cannot form a ribbon
Loam soils	- Low to moderately granular - Can form clumps/ clods when dry	- Forms a cast that can be handled relatively easily	- Forms a cast that can be easily handled	- Pure loam cannot form a ribbon - Loam with more silt and clay will form a fragile ribbon
Clay soils	- Fine texture with very few large particles - When dry, forms hard clumps	- Forms a cast that can be handled freely	- Forms a cast that can be worked and is cohesive	- Forms a long, flexible ribbon

Adapted from the US Department of Labor Web site: www.osha-slc.gov/doc/outreachtraining/htmlfiles/soiltex.html

Planting your Tree Seedlings

- Choose the best site. Do not plant seedlings where there are water-holes, stumps or rocks and do not plant more than one tree per hole.
- Dig a good hole large enough to accommodate the entire root system. Don't let the soil dry out—plant the tree immediately after the hole has been dug.
- Carefully remove only one tree at a time and plant immediately. Do not carry a tree in your hand when digging the hole. Fine root tips can start to dry out in 20-30 seconds.
- Handle seedlings by the root plug (not the stem).
- Lay the roots straight down in the hole in a natural arrangement—do not bunch, twist, double-over or bend them.
- Keep organic matter, stones and twigs out of the hole. They create air pockets that dry out roots.
- Plant seedlings slightly above the root collar swelling. This swelling is approximately halfway between the top of the root plug and the bottom of the branches. Plant upright and cover the plug with soil. Do not bury live branches or foliage or leave any roots exposed to the air.
- Tramp soil with the toe (not the heel) to remove air pockets that dry out roots. Each planted tree must be capable of withstanding a reasonable tug by hand without being extracted from the soil.



Alternatively, the "L" method may be used to advantage:

1. Vertical straight cut down.
2. Second cut at right angle to form a capital "L".
3. Pry up the second cut to lift up the triangular piece of soil.
4. Place tree at the far end of the first cut without bunching roots.
5. Return piece of soil to its original position and tramp firmly with foot.

Here are some tips for proper handling and transportation of seedlings:

- If using an open vehicle, provide shelter by covering with a reflective tarp, keeping the white side up. At the very least, keep boxes covered to prevent sun exposure, windburn and/or extreme temperatures. If placing in a car trunk, minimize travel time. Trunks heat very quickly and don't provide adequate air circulation.
- Do not stack boxes more than 2 high when transporting or storing; do not stack filled boxes on their side (seedling bundles should be lying down on their side, not sitting upright on their root tips).
- Do not allow boxes/bags of seedlings to be tied down with tarps or ropes (it will squeeze and break seedlings).
- Do not transport seedlings together with any fuel or chemical or residues of fuel or chemicals.
- Handle seedlings carefully. Be sure not to damage the roots or stems; do not have any object(s) in contact with the tree tops; do not throw or drop bags of seedlings.
- On rough roads, drive as if the seedlings are boxes of eggs, not bales of hay.
- Park in the shade.

Ideally, you should plant the trees as soon as possible after picking them up. Do not store seedlings for more than 2 or 3 days. Unload your new seedlings immediately from the vehicle and have a cool, sheltered place to store your trees. Here are some tips for proper storage:

- Ensure the storage site is in the shade all day such as under conifer stands, along northern slopes, or the north side of a building.
- Storage temperatures should be 1 to 5°C. Higher temperatures will stress trees.
- Do not stack bags/boxes. Allow space around each bag for ventilation when storing or thawing but do not open saran wrap bundles until just before your plant.
- Do not allow the seedlings to dry out. Remember, "if they dry, they die". Container stock bundles wrapped with saran wrap should retain enough moisture as to not require additional water before planting. However, if the soil in the tree plugs has dried out (visible, and water cannot be easily squeezed out of a bundle) you may spray or mist them with water while still wrapped in saran wrap bundles. Do not keep them in water. This will drown the trees. Be sure that bag/boxes are slightly elevated so that they do not sit in puddles of water after misting.

Loading Planting Buckets (Bags) and Carrying Seedlings

- Load planting buckets in the shade and out of the wind.
- Tightly close the storage bag or boxes each time you remove trees.
- Do not use a bag with rips or holes or an oversized bucket that would allow air in to dry roots.
- Dip roots in well oxygenated (not stagnant) cool water for up to one minute before planting, if necessary. Alternatively, put 5 centimeters of fresh, cool water or saturated sponge moss in the bottom of the planting pail. Change the water as you add a new group of seedlings.
- Do not open saran wrap bundles until ready to plant. Reseal partially used bundles ASAP.
- Separate the bundle carefully without stripping roots or loosening plugs. Do not prune roots, especially if you see new white root tips.
- Place seedlings quickly into the planting pail. Place seedlings in an upright position and pack loosely so that removal will not damage the tender roots (do not pack so tightly that grabbing one seedling would rip against others as you pull). If using a planting bag, collapse the top to keep moisture in.
- Before stopping for a break, empty the planting pail. If you must stop with trees left in the container place it in the shade. Do not lay the trees out and then go back to plant them later.

Soil drainage can be classified into four different categories:

1. Well Drained water drains from the site rapidly; water seldom pools on the site even during a heavy rain or after snow melt;

2. Moderately Drained water may pool but only for brief periods;

3. Imperfectly Drained water pools on the site, sometimes for extended periods especially during the spring or in wet years;

4. Poorly Drained water drains slowly from the site throughout the year; soil may appear wet below the surface. Determining the drainage of your site is relatively easy and usually comes from observing what happens to the site in the spring and fall, as well as during and after a rainfall.

Site Variability

The area you intend to plant may not be uniform especially if there is variation in topography. You should assess the entire site looking for differences that might affect your choice of species. If your site differs in either soil texture or drainage you may need to choose different species for certain areas.

Choosing the Right Species for Your Site

Table 2: Species recommended for different site conditions

SOIL TEXTURE	NATURAL DRAINAGE		
	Well Drained	Moderately Drained	Poorly Drained
SAND	Red Pine Jack Pine Colorado (Blue) Spruce Red Oak Grey Birch Scotch Pine Fraser Pine	Red Pine White Pine White Spruce Norway Spruce European Larch Red Oak White Ash	White Pine White Spruce Black Spruce Tamarack White Cedar Willow Red Osier Dogwood
LOAM	Red Pine Jack Pine Black Spruce Colorado (Blue) Spruce European Larch White Cedar Norway Spruce Fraser Fir	White Pine White Spruce Balsam Fir White Birch Norway Spruce Red Maple White Ash Red Oak	White Pine White Spruce Black Spruce White Cedar Tamarack Silver Maple Willow Red Osier Dogwood
CLAY	White Spruce Norway Spruce White Cedar Poplar Bur Oak	White Pine White Spruce White Cedar European Larch Silver Maple Norway Spruce	Black Spruce White Cedar Tamarack Silver Maple Willow Red Osier Dogwood

Choosing a Species that Meets your Objectives

Choosing the right species is not just a matter of determining which ones will survive on your site and which won't. You need to consider your own long-term objectives for the trees. Are you planting a windbreak along a field, or are you establishing a stand of trees for wood products? Do you want to attract birds to your garden, or do you want to rehabilitate your cottage shoreline? What you want to do on the property affects how you will do it. The most appropriate choice of tree species is one that will thrive on your site once it is planted, and one that will also grow to meet your personal needs in the future. Table 3 lists some species that are suitable for some of the common tree planting objectives. Look for the species that are suited to your site and your objectives.

Table 3: Commonly planted species by property objective

Objective	Species
Timber	Red Pine, White Pine, White Spruce
Wildlife (cover or mast)	Fruiting Shrubs (Chokecherry, Pin Cherry), Mountain Ash, Cedar
Christmas Trees	Balsam Fir, White Spruce, White Pine
Windbreaks	White Spruce, Blue Spruce, Cedar, Poplar (fast)
Pulp & Paper	Jack Pine, White Spruce, Black Spruce
Riparian Buffer Zone	Cedar, Tamarack, Red-Osier Dogwood, Willow

Make a Map and a Site Plan

The best way to appreciate the site conditions is by making a thorough inspection of your planting site. A good first step is to prepare a sketch of your site. On the sketch, indicate the orientation of the site using a north arrow. Also show the location of the access routes, buildings and any relevant boundaries such as fences or edges of woodlots. Power line corridors and other areas which should not be planted must be shown on your map. Take climate and terrain into account. Is your site shady? Some trees need full light to flourish. As well, late spring frosts or frosts that settles in low areas can kill early growth on some species. Show steep slopes or other obstacles that may be a problem for equipment or species. Plantations of four or more hectares (10 acres) should have a well-planned road system. Roads as right angles to tree rows also make removal during thinning easier.

Planting Arrangement

Planting trees in relatively straight, equally spaced rows provide easy access for heavy equipment when mowing competition, spraying or other maintenance operations. If you do not like the appearance of rows, and are not concerned about access between trees, give your plantation a more natural appearance by planting in a random pattern, keeping the same general spaces between the trees. However, trees of different species seldom grow at the same rate on the same site. Often one species will outgrow and eventually eliminate the other. **If you wish to plant a mixture of species, plant each species in approximate squares or circles of no less than 20 trees.** This will ensure that some trees in the centre of each cluster will not be over grown by faster growing neighbours.

Spacing

If forest products are your primary objective, spacing and arrangement are critical to maximize growth and yield of your trees. For example, plant conifers for sawlog and pulp production in rows that are a minimum of 2.4 metres (8 ft) apart. Within a row, trees should be planted at 1.8 metres (6 ft) spacing. This will result in a plantation of 2,300 trees per hectare (900 trees per acre). Always take your planting objectives into account. If you wish to grow White Spruce for a windbreak, it will reduce wind speed for a distance of 15-20 times the height of the trees. Typically, in-row spacing for windbreaks can range from 2.4-3.6 metres (8-12 ft) and between-row spacing can range from 2.4-6 (8-20 ft) apart. Research proper spacing to match your planting objectives.

Site Preparation

Like vegetables in your garden, tree seedlings will benefit from the removal of competing weeds and preparation of the soil prior to planting. While inspecting your planting site you should determine what types, size and quantity of competing vegetation are presently growing there. Separate them into grasses, leafy weeds and brush. Site preparation is not necessary if the vegetation is very light (quite sparse, shorter than your knees). A weed-free zone of 60 centimeters (2 ft) on all sides of the seedling is recommended. If your planting site has dense, tall vegetation (higher than your knees and thick enough to hide soil below), consider controlling the vegetation across the whole planting site. This will reduce the possibility of seedlings being crushed by other weeds weighed down by snow and will reduce the losses to mice (that find thick vegetation in winter ideal habitat) or disease. Deal with brush first i.e. willow, alder, prickly ash and other shrubs that not only compete with seedlings but are physical obstacles during tree planting. The most common methods of site preparation include:

1. **Scalping**- removal of the sod layer to a depth of 4-6 centimeters (1.5-3 inches) in strips or patches at least 30 centimeters (1 ft) wide. Scalping can be accomplished manually with a shovel or a heavy hoe or mechanically with a shallow single furrow plough.
2. **Furrowing**- creation of deep, wide ruts/with mounds at regular spaces across the planting site. The primary purpose of furrowing is to create planting spots above the water table on wet sites, however this method provides weed control by overturning and burying the sod layer. Trees are planted on the 'top' of the over-turned soil mound deposited beside the furrow.
3. **Cultivation**– break up of the entire site by plough, followed by at least one pass with a disc harrow to break up and level the soil. Cultivation can be achieved with a garden type roto-tiller.

Handling and Storing your Tree Seedlings

On the journey from the nursery to the planting hole, seedlings typically become stressed through exposure to rapid heating, sudden freezing, lack of water, too much water, and physical abuse such as shaking, slapping, ripping and squeezing. Stressed seedlings must then divert their efforts from growth to survival, from growing new cells to repairing damaged cells. Remember– it is the cumulative effects of poor handling that jeopardize the survival and growth of the seedlings. Carelessness may be the straw that breaks the seedling's back.