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SUCCESSFUL TREE PLANTING

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Successful tree planting is measured in terms of survival and growth. An essential ingredient leading to success is planning. This is necessary whether the planting be for large-scale reforestation, farm woodlot, home landscape or for windbreaks and shelterbelts. Some considerations in planning are:

1. What is the purpose of the planting?
2. What kind of trees and stock should be used? Or will seed be used?
3. What kind of site preparation is needed?
4. Is the planting site and location appropriate?
5. What future maintenance and care will be needed?

SPECIES AND SITE SELECTION

There are numerous tree species that are available for planting in Minnesota. It is important that the selected species be suitable for the purpose intended as well as for the conditions of the planting site. Knowledge about soil and moisture characteristics as well as temperature conditions are important when selecting a species to plant.

Most conifers will grow reasonable well on sandy soils especially the pines. Spruce and fir prefer somewhat less sandy soils and require more moist conditions. Generally most hardwoods do best on finer textured soils such as silt or loam and in some cases grow well on soils with partial clay content. Abandoned agricultural fields look like ideal planting sites but these sites also often result in increased grass and herb vegetative competition which will require future control.

Low areas where there is danger of frost damage should be avoided when considering spruce and fir. Certain hardwoods as well as conifers are also subject to damage from drying winds when planted in exposed locations. Potential disease and insect problems should be another consideration -- such as the use of white pine in high risk zones for blister rust. When using other than native species, it is important that they have the ability to withstand Minnesota winter conditions. Many species are not hardy and should not be used. Selection of appropriate seed sources depending on planting location is a must and should not be overlooked.

Species selection is usually dependent on the objective of planting - whether it be for timber production, wildlife use, erosion control, windbreaks or aesthetics.

PREPARATION OF THE PLANTING SITE

Depending on the condition of the site, some site preparation is usually necessary. This involves making and keeping the planting site in a receptive condition for the tree. It usually involves controlling vegetative competition. This can be done by hand methods, but on large plantings is usually expensive and ineffective. An alternative to hand methods is the use of herbicides. There are numerous herbicides available that are labeled for special uses and can be very effective when used properly. There are a number of mechanical methods that can also be utilized such as discing, scalping or trenching. Care should be used with mechanical methods so the nutrient rich soil organic layer is not destroyed. Often a combination of mechanical and chemical methods is the most effective.

PLANTING LOCATION AND SPACING

It is important to consider the height and crown width trees and shrubs will reach when full grown. Enough space must be allocated so they will not be crowded or cause problems that require premature removal. For example, Christmas trees should be planted no closer than 6 feet apart for pines. Spruce and fir have a narrower crown but still should not be placed closer than 5 feet apart. Trees such as red (Norway) pine and silver maple grow to large sizes at maturity and ample space must be provided for their development.

The table below gives trees per acre based on various spacings. To obtain number of trees per acre, multiply the spacing between rows x spacing within rows and divide into 43,560 square feet per acre. When planning a planting, remember to allow room for vehicle access roads.

Spacing (ft)	Trees Per Acre	Spacing (ft)	Trees Per Acre
3x3	4840	6x7	1037
4x4	2722	7x7	890
5x5	1742	8x8	680
5x6	1452	9x9	538
6x6	1210	10x10	436

STOCK SELECTION

The customary designation for catalog listings of nursery stock makes use of two numbers, as 1-0, 2-0, 2-1, 2-2, etc. The first number is the number of years the trees have been in a seedbed, and the second number is the length of time the trees were grown as transplants in a transplant bed. For example, 2-0 stock means that the trees were grown from seed for 2 years, and were not moved into a transplant bed. They are two years old when planted into the field. The designation 2-2 means that the trees are 4 years old, 2 years of which were in a seedbed and 2 years in a transplant bed.

Transplant stock generally has a more fibrous root system and larger stem caliber. They are relatively expensive but are recommended for planting sites where conditions are harsh and survival is likely to be a problem. They are also often chosen for conifer plantings of slow-growing species such as spruce and fir. One-year-old seedlings are recommended for most hardwood plantings. Some exceptions would be for slower growing trees such as oaks or walnut. Tree seedlings are also sold by height class as they are graded at private nurseries.

An alternative to bareroot seedlings are containerized seedlings. These are grown in a small container in a greenhouse. They are usually planted as a "soil plug" extracted from the container cavity. They were originally developed for the advantage of being able to plant longer into the growing season than is possible with bareroot stock. They are available in a number of sizes and varieties. Container-grown trees do provide some alternatives in timing of planting as compared to bareroot stock.

Potted stock which is in larger containers and varies in age is another alternative for small plantings. This type of stock is very expensive and is most feasible for landscape or similar purposes.

GROWING TREES FROM SEED

Perhaps you wish to collect or purchase seed and grow your own trees. This can be fun but exasperating depending on the time you have and your patience. Some knowledge about when and how to collect seed is essential. You also must know something about seed storage and things that you must do to get certain seeds to germinate. Some seeds require cold treatment to break dormancy while others require scarification of hard seed coats. This information is available for all the tree species in USDA Agricultural Handbook No. 450, Seeds of Woody Plants in the United States. This book is available in most libraries and is a must for anyone wanting to work with tree seeds. Another useful source of information is the University of Minnesota Extension Folder 249, "Growing Trees From Seed".

If you are interested in using conifer seed, you must collect cones. These must be picked or collected before they open on the tree and disperse their seed. An alternative is to spread a sheet or tarp on the ground beneath a tree to catch the seeds as they fall. If you collect unopened cones, you will have to place them in a warm, dry place such as an attic so they will open and drop their seeds. An oven can be used to open cones but care must be taken so excessive heat does not destroy the seed.

Seed collection must be timed so the seed is ripe and will germinate. Some common trees and approximate seed collection times are shown below:

Tree	Collection Time	Tree	Collection Time
Ash	August-September	Hackberry	September-October
Aspens	May-June	Hemlock	September-October
Balsam Fir	August-September	Hickories	September-October
Basswood	September-October	Ironwood	August-September
Paper Birch	August-September	Red Maple	April-June
Yellow Birch	September-October	Silver Maple	April-June
Butternut	September-October	Sugar Maple	September-October
Red Cedar	September-November	Oaks	September-October
White Cedar	August-September	Pines	August-September
Cherries	July-September	Spruces	August-September
Cottonwood	May-June	Tamarack	August-September
Boxelder	September-October	Walnut	September-October
Elms	May-June	Willow	May-June

Seed storage and germination requirements vary a great deal and USDA Handbook No. 450 should be referred to.

CARE OF PLANTING STOCK

Careless handling procedures are a primary cause of tree mortality. Planting stock must be given proper care as soon as it is received. Trees should be in dormant condition when received, i.e., the bud should not be flushed. They should be kept in this condition until planted in order to insure highest survival. It is important not to let the roots dry out or allow them to freeze. This will likely kill the trees, but since the crown will remain green for a period of time there is no obvious clue that the trees are worthless as planting stock.

To minimize risk of tree roots drying during shipment, it is recommended that growers request nurseries to ship by the most direct and swiftest transportation available. If the grower picks up the trees, care should be taken to protect them from drying or heating when in transit.

PLANTING PROCESS

The best time to plant is in the spring as soon as the frost is out of the ground. At this time the soil is moist and the climate is somewhat mild. There is normally ample rainfall in the spring which also helps to establish a new planting. Fall planting is usually less successful but dependent on soil moisture, can be accomplished. Container-grown seedlings can be planted later into the growing season than can bareroot stock.

Trees may be either hand planted or planted with a machine. Regardless of method, trees should be planted at the same depth or slightly deeper than they grew in the nursery. Three general precautions which apply to any planting method are (1) plant the tree in a vertical, upright position so as to avoid crooked stems, (2) place the roots in the planting hole in a normal position without twisting or bending them, (3) carefully firm the soil around the roots to eliminate air pockets.

There are two general methods of hand planting. One of these is the "hole" method. A hole is dug with a shovel, mattock, or grub hoe. The tree is placed in the hole, the roots are evenly distributed, and the soil is firmly packed around them. This is a good method but is quite slow and not recommended for large plantings.

The "bar" method is most commonly used when a large number of trees are being planted because it is faster. A spade or planting bar is inserted into the soil to form a V-shaped slit. The tree is inserted in the ground to the proper depth, the planting bar or tool removed, and the earth firmed against the roots of the tree. This can be done by inserting the planting bar approximately three inches from the seedling, pulling back the bar to firm soil around the roots then pushing forward on the bar to seal the top. The last step is to close the newly formed hole. Care should be taken to be sure the tree is planted in vertical position, roots are properly placed, and soil firmly packed around the roots.

Mechanical tree planters can also be used for planting. There are several types of tree planting machines which open the planting hole and plant the trees in a single operation. This greatly speeds up a tree planting operation and for any big planting job, consideration should be given to using a machine. There are essentially three parts to a planting machine: (1) the cutting disk or Coulter cuts through sod and roots, (2) the split plowshare or trencher makes the planting trench, and (3) the packing wheels close the planting trench and tamps the soil in place around the trees. Some of the newer planting machines have spray attachments for applying chemicals for grass and weed control at the same time the trees are planted. Trees must be placed in the planting trench in an erect position at the proper depth. The planted trees should be checked periodically to be sure the packing wheels are adequately firming the soil around the roots.

Another possible method of planting trees that is often overlooked is with a tractor-mounted auger or hand-held power auger. This is useful for only small plantings, but it is easy and effective. The auger makes the planting hole and provides loose soil for packing.

Whatever method is selected for planting, it is important that the trees be protected from drying out. If hand planting, carry the trees in a bucket with water or something that will keep the roots moist. Do not carry a bundle of trees in your hand while planting as they will dry out before you get them all in the ground. If using a planting machine, be sure to keep the trees covered and out of the sun or wind.

Root pruning is sometimes necessary before planting. Roots should not be twisted or jammed into the planting hole. Those that are too long and will not fit should be cleanly cut off and not torn or ripped. Pruning back of hardwood crowns at time of planting is sometimes necessary to compensate for loss of root system. This should be carefully done and usually involves a minimum amount of clipping.

The same general rules apply for planting of container stock as for bareroot stock.

Use of a mulch around the tree might be considered on sites that are very exposed and dry out easily. There are several commercial mulching materials available and other materials such as newspaper, shredded and unshredded, have been used effectively. Mulching material should allow rainfall to infiltrate while at the same time act as a barrier for growth of competing vegetation.

Plastic tubes such as Tubex[R] have been used very effectively when planting some hardwoods, especially the oaks. The tube protects the seedling from rodent or deer damage and also acts as a small greenhouse thus encouraging rapid growth. The top of the tube should be covered with a screen to prevent birds from entering them. There are a number of documented cases of bluebirds entering and not being able to escape.

<u>CARE AFTER PLANTING</u>

Work does not end after the tree has been planted. The period after planting is often the most critical to being successful. The plantings may need irrigation at least the first growing season. This may be impossible to provide on large plantings. Vegetative competition must be controlled either through hand weeding, mowing or use of herbicides. Herbicides are usually most effective since other methods are very temporary and will probably have to be repeated several times. The plantings should also be periodically inspected for insect and disease problems.

Rodents such as pocket gophers and mice can also create problems. Deer browse can be very serious on new plantings. Some type of enclosure or protection around the seedling is the only effective means of control. There are a number of deer and rodent repellents on the market that may provide temporary control. Maintenance of a firebreak around the plantings should also be a consideration depending on location and susceptibility. The plantings may also need some corrective pruning if double stems develop.

Often trees do not die until the second or third growing season. Proper care and maintenance can often prevent costly inter-planting or in some cases entire replacement.