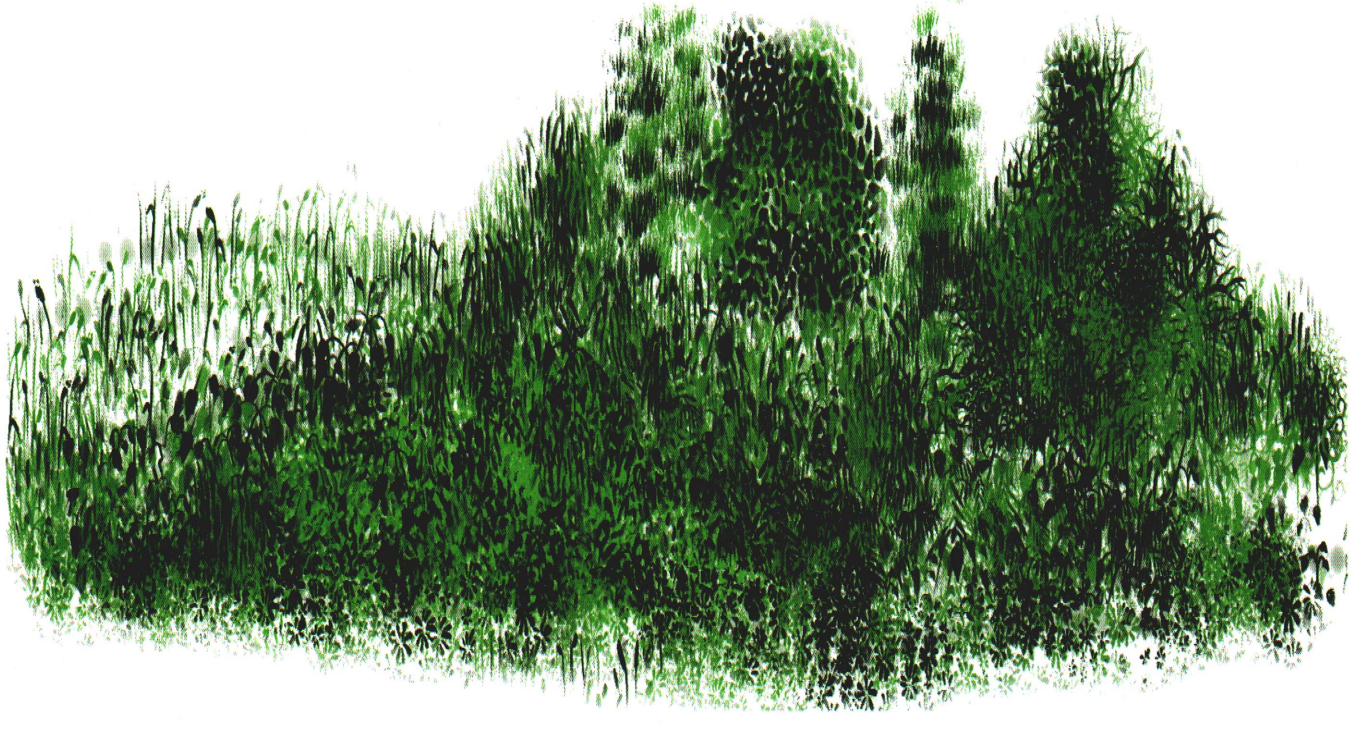
Tree Planting in Michigan
Michigan State University
Cooperative Extension Service
Douglas O. Lantagne and Melvin R. Koelling
Department of Forestry
June 1997
12 pages

Michigan State University Extension Bulletin E-771 ■ June 1997

TREE PLANTING IN MICHIGAN



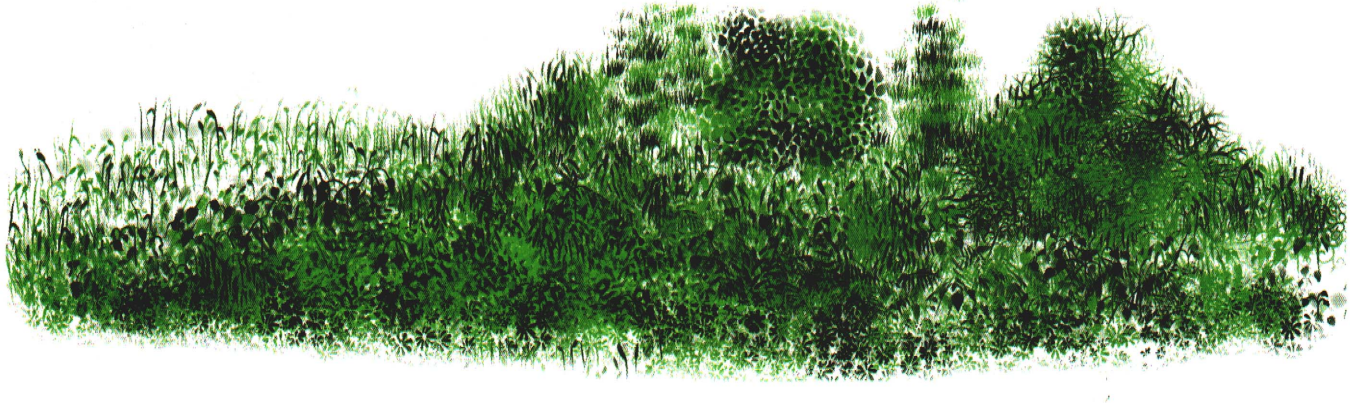
TREE PLANTING
in Michigan

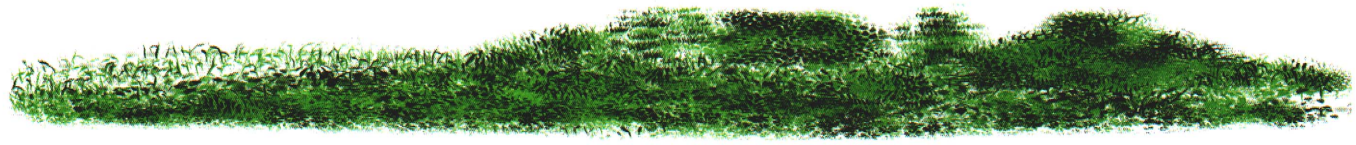
Douglas O. Lantagne
and
Melvin R. Koelling
Department of Forestry

Each year trees are planted on several thousand acres of Michigan land. Most are planted on cutover forest land or abandoned agricultural fields and more recently on highly erodible agricultural land enrolled in the Conservation Reserve Program.

Trees are planted for many purposes, including timber production, windbreaks, erosion control, Christmas tree production, wildlife habitat improvement, future investment, aesthetics and other landowner objectives. Tree plantings enhance the natural beauty of the state, protect watersheds, provide habitat for wildlife, and enable forests to contribute to the state's economy by ensuring a stable supply of wood while providing for enhanced recreational opportunities.

Each year many trees are planted by private forest landowners. Often these individuals are unfamiliar with planting techniques that will ensure high survival and good growth. To have a successful tree planting program, particular emphasis must be given to soil and species selection, soil preparation, nursery stock selection and handling, planting technique and follow-up care. Each of these aspects of tree planting is discussed in this bulletin.





Planting Considerations

Species and Soil Selection

Many trees grow under a wide range of environmental and soil conditions, but best growth in most trees is attained within a rather narrow range (1, 2). Tree species should be selected for their ability to grow on the proposed planting site. Not all trees perform satisfactorily on all soils, although they may grow well on different soils in the same area.

Tree species planted on unsuitable sites suffer high mortality, grow poorly and are more susceptible to insect and disease problems. To help ensure a successful planting, evaluate the soil-species combinations before trees are purchased and planted. Recommendations for coniferous species for various Michigan soil conditions are discussed in other extension bulletins available at local county extension offices. Important soil and site factors include air temperature (average, minimum and maximum), air drainage, wind exposure, soil moisture, soil drainage, soil texture and soil fertility. As a rule, hardwood species are better suited to loamy and clay loam soil types where soil moisture and fertility are generally higher. Although conifers will grow on heavier soils, they are more commonly planted on drier, coarser textured, and less fertile soils. All things considered, tree growth is most rapid where soil drainage is good and competing grasses and weeds are controlled.

Table 1 contains a list of tree and shrub species suitable for planting in different parts of Michigan. A brief description of some of the commonly planted species follows.

Pines

Red pine is the most extensively planted reforestation tree in Michigan. It has a high survival rate, grows well on a variety of upland soil types and is relatively free of serious insect and disease pests (1).

White pine grows well on well-drained sandy loam or clay loam soils, but it is not well suited to dry soils. It is susceptible to both white pine blister rust and white pine weevil (1). The former is a canker disease that often kills the tree. The latter, more of a problem in the northern part of the state, causes bushy growth or crooked stems by attacking and killing the growing terminal leader and branches. Nevertheless, white pine is a fast-growing tree that does well on good soils in the southern part of the state.

Jack pine is well adapted to growing on droughty, infertile sandy soils (1). It is often planted on sandy cutover sites where other trees do not grow or grow poorly. Recently it has been planted in several northern Lower Peninsula counties to create nesting habitat for the endangered Kirtland's warbler.

Scotch pine is extensively planted for Christmas tree production. Because it is highly susceptible to insect and disease damage, it is not recommended for reforestation purposes. Older Scotch pine plantations found in Michigan generally originated as Christmas tree plantations, but were abandoned over time. Today, these plantations act as a breeding ground for many tree insects and disease pests. Extension bulletins available at local county extension offices list recommended seed sources for pine, spruce and fir species appropriate for the production of Christmas trees in Michigan.

Spruce

White, black and Norway spruces are well suited to somewhat acid clay loam soils (1). Do not plant them on dry upland soils, especially in the southern part of the state. Black spruce is preferred for planting on poorly drained or wet soils found in some areas in the northern part of the state. White and Norway spruces have been planted for Christmas tree production on cooler, more moist north and northeast facing slopes with fine to moderately coarse textured soils. White spruce plantations for timber production are also planted on some soils in the Upper Peninsula.

Blue spruce is extensively planted for Christmas tree production throughout the state. As with Scotch pine, there are several seed sources available for planting. Blue spruce grows best on well-drained fine textured soils, although it is adaptable to a wide range of soils.

Firs

Balsam fir, Fraser fir and Douglas fir are planted for Christmas trees on well drained, fine textured soils similar to those used for spruce. Balsam fir and Douglas fir often have new growth killed back by late spring frosts, especially when planted in low-lying areas. Plant fir species on protected upland areas to ensure proper air drainage and to minimize frost damage or winter kill. Douglas fir is more susceptible to injury from very low temperatures than Balsam or Fraser fir. In many areas of the northern Lower Peninsula and in the Upper Peninsula, Balsam fir is a recommended species. However, care should be taken to not plant Balsam fir in areas with high concentrations of spruce

Table 1: Planting guide for various forest trees and shrubs under Michigan soil and climatic conditions.

SPECIES	DRY UPLANDS				WELL DRAINED UPLANDS						WET LOWLANDS	
	Very Coarse	Moderately Coarse			Medium			Fine			Mineral Soils	Organic Soils
		Loamy Sand, Sandy Loam			Fine Sandy Loam, Loam, Silt Loam			Sandy Clay Loam, Silty Clay Loam, Clay				
	Dune Sands, Sands	Level	Exposure[1]		Level	Exposure		Level	Exposure		Sands to Clays	Muck or Peat
			N&E[1]	S&W[1]		N&E	S&W		N&E	S&W		
CONIFERS (Evergreen)												
Douglas-fir			Yes		Yes	Yes	Yes	Yes	Yes	Yes		
Fir, balsam					Yes	Yes		Yes	Yes		Yes	Yes
Larch, European					Yes	Yes						
Pine, jack	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Pine, red	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Pine, scotch	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Pine, white			Yes		Yes	Yes	Yes	Yes	Yes	Yes		Yes
Spruce, black			Yes			Yes		Yes	Yes	Yes	Yes	Yes
Spruce, Norway[4]			Yes		Yes	Yes		Yes	Yes	Yes		
Spruce, white			Yes		Yes	Yes		Yes	Yes	Yes	Yes	
White-cedar, northern					Yes	Yes		Yes	Yes		Yes	Yes
BROADLEAVES (Deciduous)												
Ash, green					Yes	Yes	Yes	Yes	Yes	Yes		
Ash, white					Yes	Yes		Yes	Yes			
Basswood					Yes	Yes		Yes	Yes		Yes	
Cherry, black[4]					Yes	Yes		Yes	Yes			
Cottonwood	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes
Elm, American					Yes	Yes		Yes	Yes		Yes	Yes
Hickory, shagbark[4]					Yes	Yes	Yes	Yes	Yes	Yes		
Honeylocust[4]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Locust, black[4]					Yes	Yes		Yes[2]	Yes[2]	Yes[2]		
Maple, soft		Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes
Maple, sugar					Yes	Yes		Yes	Yes			
Oak, red					Yes	Yes	Yes	Yes	Yes	Yes		
Oak, white					Yes	Yes		Yes	Yes			
Walnut, black[3]					Yes	Yes		Yes	Yes			
Willow	Yes	Yes	Yes	Yes							Yes	Yes
Yellow-poplar[4]					Yes	Yes		Yes	Yes			
SHRUBS												
Ash, mountain					Yes	Yes		Yes	Yes	Yes	Yes	
Blackberry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Black-haw[4]					Yes	Yes		Yes	Yes		Yes	
Coralberry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Crab, wild		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Dogwood, gray					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dodwood, red-osier					Yes	Yes		Yes	Yes		Yes	Yes
Dogwood, silky					Yes	Yes		Yes	Yes		Yes	Yes
Elder					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hawthorn		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Hazel		Yes	Yes		Yes	Yes	Yes					
Honeysuckle		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Juniper, prostrate		Yes	Yes	Yes	Yes	Yes	Yes					
Nanny-berry					Yes	Yes		Yes	Yes		Yes	
Ninebark					Yes	Yes	Yes	Yes	Yes	Yes		
Olive-Russian		Yes	Yes	Yes	Yes	Yes	Yes					
Pea, Siberian		Yes	Yes	Yes	Yes	Yes	Yes					
Plum, wild		Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes		
Rose, wild	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Shadbush		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Snowberry		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes		
Sumac		Yes	Yes	Yes	Yes	Yes	Yes					

[1] Pronounced slopes facing north and east (N&E) or south and west (S&W)
[2] Not recommended when subsoil is compacted or impermeable
[3] Plant in mixture with other species on fertile soils in southern Michigan only
[4] Southern Michigan

Compiled by M. Koelling, 1978. Department of Forestry, Michigan State University

Figure 1: Bands of weed control in a newly established conifer plantation.

budworm. Fraser fir is less susceptible to spruce budworm damage.

Hardwoods

Hardwood plantations are typically more difficult to establish than conifers. In general, hardwoods require more fertile soils than conifers. Preferred soil textures include sandy loams, loamy sands, loams or clay loams. Because fertile soils typically have higher levels of grass and weed competition, intensive weed control is required to successfully establish hardwood plantations (Figure 1). Hardwoods may also require protection from rodents and may need corrective pruning to produce quality trees. Hardwood species planted most often include black walnut, black cherry, various oaks, sugar maple, yellow poplar, white ash and hybird poplars. Besides timber value, hardwood plantations can be designed for wildlife habitat, aesthetics, windbreaks and firewood production.

A new approach for establishing hardwood plantations involves the use of mini-greenhouses or tree shelters. Tree shelters are plastic cylinders 2 to 5 feet high and 3 to 4 inches in diameter that protect newly planted hardwood seedlings from animal browsing. In addition, tree shelters have encouraged rapid height growth of species such as oak and ash when placed over seedlings at the time of planting. Tree shelters are available from several commercial suppliers. For more information on tree shelters, visit your local county extension office to request an extension bulletin.

Mixed Species Planting

Special emphasis must be given to species selection in mixed plantings. Differences in species survival, growth rate, shade tolerance, and soil-site requirements are often responsible for uneven growth and unsatisfactory plantation development. While mixtures of hardwoods are generally compatible, conifer-hardwood and conifer-conifer mixtures usually do not develop good timberstands, although they are satisfactory as aesthetic or wildlife plantings.

In most mixed species plantations, weed control is difficult and often restricted to mowing. Many of the registered herbicides do not control undesirable woody and herbaceous competition in mixed conifer-conifer or conifer-hardwood plantations without damaging or killing one or more of the planted tree species.

Examples of successful hardwood-hardwood plantations include autumn olive with any other hardwood species and black locust/black walnut plantations. Autumn olive and black locust stimulate self pruning of the hardwoods with which they are planted. Furthermore, since both are legumes, they release nitrogen into the soil. Autumn olive is also a food source for wildlife. Black locust will produce firewood. The combination of these species with higher value species, such as red oak and black walnut, reduces establishment costs because fewer expensive oak and walnut seedlings are needed to fully stock the site.

Planting Season

Bare rooted seedlings and transplants must be planted during the dormant season if good survival is expected. Weather and soil conditions conducive to planting occur in both early fall and late spring. The spring season is generally considered the best time to plant, especially if planting is to be done on heavy loam or clay soils. Trees planted on heavy soils in the fall are susceptible to frost heaving and winter kill from dry winter winds. Winter damage from rodents and other wildlife species is also greater in fall-planted than spring-planted trees.

Start spring tree planting when the soil is free of frost. Do not plant when the soil is excessively wet or on hot, windy days. Dull, overcast, cool days are most favorable since evaporation and moisture loss from the planted trees is reduced. However, trees planted in the spring are susceptible to drought.

Tree Spacing

The distance among planted trees is determined by the species and the purpose of the planting. The goal is to plant enough trees to fully use the site but provide sufficient growing space to avoid a noncommercial thinning to maintain plantation vigor. No single spacing is ideal for satisfying all planting objectives. A dis-

tance of 6 to 12 feet between trees within planting rows will result in maximum growth and maintenance of tree quality for most species. Spacings of less than 6 feet require thinning before the trees are of commercial size and value and are not recommended. Tree spacings greater than 12 feet are also not recommended as the site is not fully used while the trees are young and weed control problems are prolonged.

Wide spacings also contribute to the development of trees with large branches and poor form. In general, hardwood seedlings are planted at wider spacing than conifer seedlings or transplants and are pruned to produce high quality stems. Access roads should be evenly spaced throughout a newly established plantation to facilitate future management.

General planting density recommendations for specific planting purposes are in Table 2. Typical tree spacing to reach recommended planting densities are listed in Table 3.

In general, rectangular spacings are advantageous because they require fewer passes over the site with planting or tending equipment and they create corridors of access for future operations. Rectangular spacings are not recommended for wildlife and esthetic plantings.

Table 2: Tree planting density recommendations for common planting purposes.

Conifers for timber production	600 to 1,000 per acre
Christmas trees	1,200 per acre
Hardwoods	300 to 500 per acre
Windbreaks	3 staggered rows

Table 3: Common tree spacings used to reach recommended planting densities.

Distance apart	Number of trees per acre
6 x 6	1,210
6 x 10	726
7 x 7	889
7 x 10	622
8 x 8	681
9 x 9	538
10 x 10	436
12 x 12	302

8 x 10 spacing is used to establish windbreaks and shelterbelts in three staggered rows.

Site Preparation

Site preparation reduces vegetative competition, may eliminate or concentrate any logging debris left on the site and in general improves soil conditions for tree growth. Several different procedures may be used. Furrowing or scalping, usually done with an attachment on a planting machine (Figure 2), plowing and disking, and herbicide treatments are all used to eliminate or reduce vegetative competition. In all cases, except scalping and furrowing, site preparation should occur in the year before planting.

Although furrowing does provide short-term vegetation control, it creates other problems. The most important is the loss of fertile topsoil from the immediate vicinity of the newly planted tree. Accordingly, the trees are generally planted in the less fertile subsoil after the surface layer is scalped. Furrows also encourage soil erosion on sloping sites and provide natural runways for rodents that may feed on the stems of newly planted trees. The physical presence of the ridges resulting from scalping also creates problems for workers and machines in future years.

Figure 2: A scalper and furrowing disc.

Herbicides are often used in combination with furrowing and plowing and disking to provide longer-term control of vegetative competition. If herbicides are correctly selected and applied, they are usually more effective in controlling competing vegetation and more cost effective than mechanical means. Many herbicides are labeled for weed control in forest and Christmas tree plantations. Contact a local county extension office for bulletins or additional assistance concerning herbicides.

Planting Stock

Types

Planting stock is available in a variety of species, sizes and ages. Seedlings usually are described as 1-0, 2-0 and 3-0. The first number refers to the number of years grown in a nursery seedling bed and the second to the number of years in a transplant nursery bed. Seedlings may be bare-root planting stock or container grown stock (Figure 3).

Transplants are commonly designated as 2-1, 2-2, and 3-2. The total age of the plant is the sum of the two numbers. For example, 1-0 refers to a 1-year-old seedling and 2-2 to a 4-year-old transplant.

Transplanted stock is more expensive than seedlings, but survival and growth after planting are often better. The improved survival and growth are attributable to the more thick and fibrous root system on transplanted planting stock. Order spruce, fir, and Douglas fir as transplant stock to help ensure planting success. For most pines, 2-0 or 3-0 stock is usually satisfactory.

Some seedlings and transplants are sold by height. This has the advantage of establishing a plantation that should develop uniformly. This is important for Christmas tree plantings where uniform growth is desired. Available sizes may range from 6 to 12 inches. A rule-of-thumb for planting success is to buy the biggest or oldest seedlings you can afford. In all cases avoid small (less than 6 inches tall) spindly planting stock. For hardwoods, look for seedlings with at least a ⅜ inch stem caliper (5) and at least six vigorous lateral roots (7). Avoid hardwood stock with a single large taproot.

In the past several years, container grown seedlings have become more commonly used for establishing plantations in Michigan. Container seedlings are grown in a greenhouse to reduce the time necessary to produce a seedling or transplant. Depending on the species, container grown seedlings may be ready for outplanting into a nursery bed or plantation in less than a year. This compares to the 2, 3 and 4-year old trees produced in standard outdoor nurseries. For most species, seedlings are started in containers in the greenhouse and then transplanted and grown for an additional time in regular nursery beds. If the seedling remains in the nursery bed for one year it is referred to as a plug-1 seedling. A plug-2 seedling remained in the nursery bed for two years. This practice reduces the amount of time to produce stock for these tree species and results in a plant with a better root system.

Figure 3: Red pine seedlings from a styroblock container.

Container grown seedlings experience less shock than bare-root stock at planting time because the seedling roots are not disturbed when outplanted. Containers come in various sizes to accommodate the rooting habit of the species being grown. Conifer shipping containers may hold 2 to 4 cubic inches of soil compared to 50 to 75 cubic inches of soil in large containers used for taprooted hardwood species such as walnut and oak. Again, avoid planting small container-grown trees.

Order planting stock well before the planting season to ensure availability of correct species, size and quality. Many of the nurseries that produce Christmas tree seedlings and transplants are sold-out of preferred planting stock the summer before the planting season. Planning is important and essential to a successful planting season.

Characteristics

Inspect tree quality before accepting seedlings or transplants from the seller. Tree seedlings and trans-

Figure 4: Typical seedling shipping bundles.

plants are typically packaged and shipped in rolls or boxes (Figure 4). Inspect boxes and rolls for crushed appearance and coolness. Figure 5 shows ideal examples of conifer and hardwood planting stock. Inspect trees for (3, 9):

- **healthy green color**
- **fibrous root system and/or many lateral roots**
- **good stem caliper (diameter)**
- **single versus double stems.**

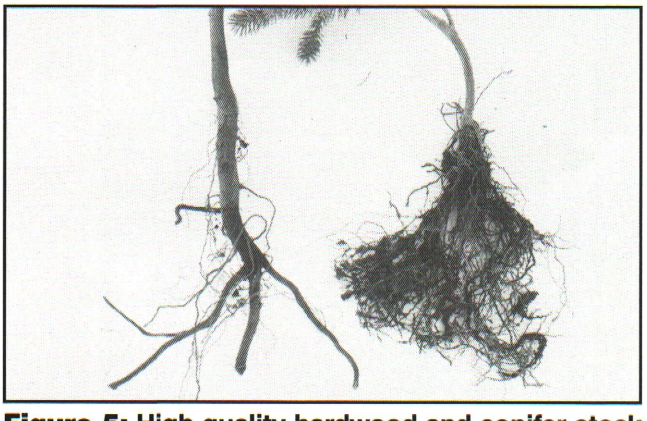


Figure 5: High quality hardwood and conifer stock.

Improper processing and/or handling of high quality planting stock by the nursery, or poor handling after purchase by the buyer, can reduce the quality of seedlings and transplants significantly. Reduced quality, in turn, means lower plant survival and slower growth. The following are signs of poorly handled planting stock (3, 9):

- **dry roots**
- **white root tips over ¼-inch long**
- **excess soil on roots**
- **growing or swollen buds**
- **mold on seedlings**
- **broken stems or root stripping**
- **damaged bags and boxes.**

Transporting and Storing

Improper care of planting stock upon receipt often contributes to poor survival and growth of trees. To curtail damage to planting stock, follow these recommendations (3, 9):

- **Never expose shipping containers to direct sunlight.**
- **Keep the temperature of the shipping containers near 35 degrees F during transport.**
- **Do not stack shipping containers closely together during transport or storage.**
- **Keep one side of each container exposed to open air.**
- **Transport and store containers on pallets.**

Good air circulation and careful handling are important steps in the maintenance of seedling or transplant vigor.

Best planting success occurs when the seedlings or transplants are planted soon after arriving from the nursery. If planting is delayed, keep the plants cool (35 degrees F). Make sure that roots are moist and that drying does not occur during storage. Store containers on the north side of a large structure, under dense conifer groves, in shaded snowbanks, in root cellars or other cool, moist locations. Make sure that reflective tarps or other covers placed over the containers allow air circulation and provide shade. Spray containers with water if the temperature rises above 50 degrees F.

How To Plant

Seedlings and transplants may be successfully planted by either hand or machine. Where conditions are favorable, machine planting reduces both time and labor. On particularly steep, rough or stony areas, or for interplanting between established trees, hand planting is often the only practical method. Handplanting may also be preferred for planting certain hardwood species, such as walnut and various oaks, which have long taproots.

Handling Planting Stock

Bring only the number of trees necessary for a single day of planting to the planting site. Moisten planting stock containers before they are removed from the storage area. Shield containers from the sun during the trip to the planting site. At the planting site, immediately place planting stock in a shady location. If necessary, use a vehicle to construct a lean-to for shade. Open only one container at any one time, and close it

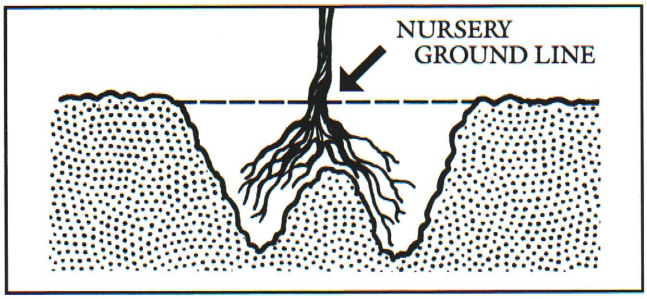


Figure 6: An example of the hole and shovel method of planting seedlings. (Adapted from U.S. Forest Service)

after the necessary bundles of trees have been removed. This prevents the remaining trees from drying out or overheating. Never sit or place heavy objects on containers so that seedlings are not crushed and damaged (3).

Carefully separate the seedlings or transplants in the extracted bundles to minimize the number of stripped or broken roots. If the roots of the trees were not pruned to an 8-inch length at the nursery, do so with clippers, sharp ax, machete or hatchet before planting. Root pruning makes planting easier and

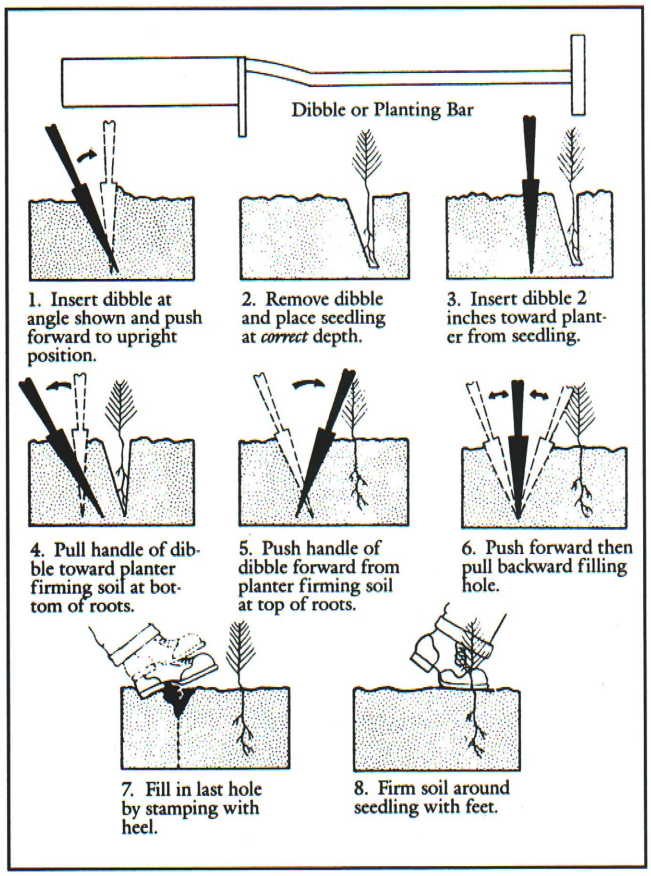


Figure 7: Using a dibble (planting bar) to plant seedlings. (Adapted from U.S. Forest Service)

increases survival rates. The actual root length can vary to accommodate the planting tool being used. In general, the depth of the planting hole and the root length should be the same, but not less than 8 inches.

Keep the tree roots moist and protected from the sun and wind while handling. However, it is usually not recommended to soak the tree roots in water before planting because protective soil particles are removed from the roots, making the roots more susceptible to drying. Place planting stock in white containers containing either moss from the shipping container, wet shredded newspaper, wet burlap or other similar material. This prevents the tree roots from drying out while planting. These materials should also be used in the tree holding boxes on planting machines. No more than one to two hours worth of trees should be carried by the planter.

Hand Planting

There are two general methods of hand planting: the hole method (Figure 6), and the bar or slit method (Figure 7) (8).

The hole method consists of digging a small hole in the soil to hold the roots of the tree. Either a shovel or small power auger can be used to make the hole. The holes should be large enough to spread the tree roots out in a natural uncrowded or un-twisted position. Soil is then added around the roots and tamped firmly to exclude air. Some variations of this method involve the use of a mattock or shovel to make a straight sided hole (Figure 8). The tree is then placed along this straight side and the soil replaced. The soil is then tamped.

Seedlings or transplants can also be planted by making a vertical slit in the soil, inserting the roots of the plant and re-closing the slit, both top and bottom. It is important that the roots are not crowded and the soil is firmly replaced around the roots. Roots should fall down in the hole to avoid the deformity called J- or L-rooting. Seedlings with J-roots are more susceptible to drought, disease and insect attack because the root system never develops properly. Root systems with a characteristic J or L shape are typically caused by not making the planting hole deep enough or twisting the tree into the hole.

Machine Planting

A planting machine is attached to a tractor and creates a slit in the soil as it is moved along. The seedlings or transplants are placed in the slit. A set of wheels on

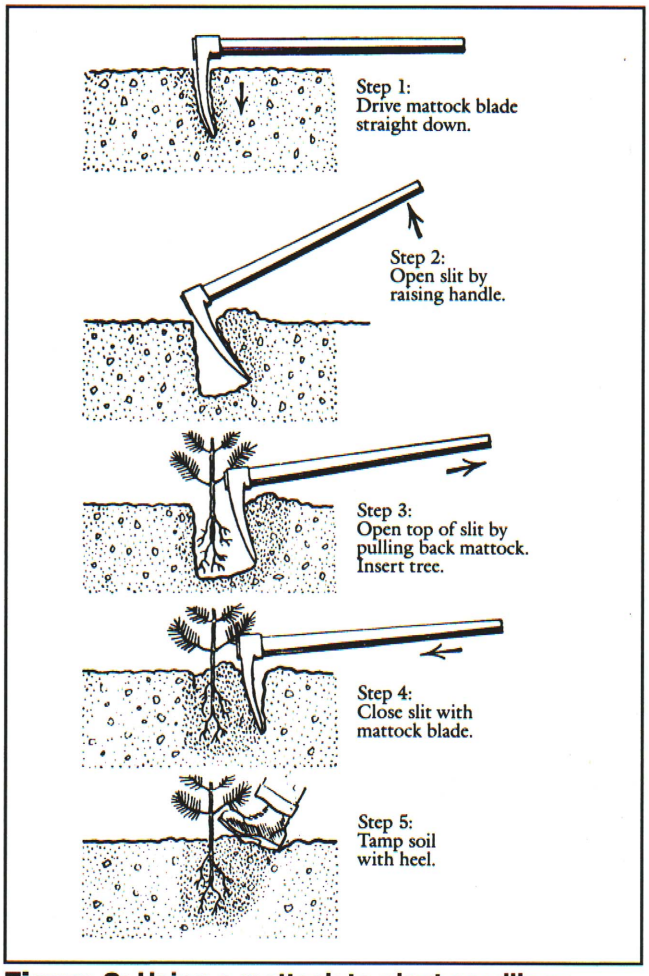


Figure 8: Using a mattock to plant seedlings.
(Adapted from U.S. Forest Service)

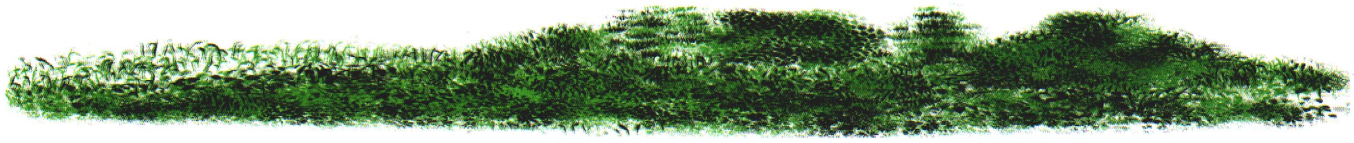
Figure 9: A planting machine.

the back of the planter closes the slit and packs the soil around the tree roots (Figure 9). Many types of machines are available, and each has some special advantage. Some are equipped with furrowing attachments to clear away competing vegetation. Others have spray attachments to apply chemicals for controlling weed growth around newly planted trees.

Planting machines are very helpful and efficient when planting large areas. During operation, check them occasionally to make sure trees are being planted at the correct depth and that the soil is being packed firmly around the roots. Changes in soil type and topography also may call for minor adjustments in the machine planter.

Summary of Planting Rules

- Plant trees one inch deeper than they were in the nursery.
- Plant trees upright, not at an angle.
- Plant trees in mineral soil, not in loose debris.
- Pack the soil firmly around planted tree roots.
- Keep tree roots cool and moist.
- Do not plant in excessively wet or sticky soil.
- Plant tree roots in a natural uncurled position.
- Make the planting hole deep enough to accommodate the roots.
- Remove or suppress competing vegetation on the planting site.
- Remove trees one at a time from the planting container.
- Do not remove trees from the planting container until the hole is prepared.



Follow-up Care

Plantation care after planting usually consists of eliminating weed competition and protecting the plantation from fire, grazing, rodents, diseases and insects. Early plantation care, especially vegetative competition control, determines whether trees will survive. This influences the eventual success or failure of the plantation. The development of trees with poor form, or with slow growth rates, is often the result of too much vegetative competition for soil moisture and nutrients. Weed control often means the difference between success and failure of the plantation.

Weed control can be accomplished by mowing, cultivation or chemicals. The first two require multiple treatments during each of the first three to five growing seasons. Herbicides, depending on the tree species planted, can often be used to control unwanted vegetation for one or more growing seasons in a single application. Contact a local county extension office for more information on herbicides.

Occasional examination of the trees for off-color foliage, needle drop, and broken or consumed foliage will help determine if insects and/or diseases are present. Once detected and identified, chemical or other types of control measures may be needed to prevent serious damage. Obtain assistance on insect and disease identification from a local extension office.

Special Considerations

Trees and forests greatly contribute to the quality of our environment. Therefore, many individuals plant trees for purposes other than producing forest products. Some of these purposes are wildlife habitat, Christmas tree production and aesthetics.

Wildlife Habitat

Many kinds of wildlife depend on the cover, food and environment trees provide. In fact, the extent and diversity of wildlife in many areas is determined by the amount, type, variety and extent of local forest conditions. Large and varied wildlife populations are not found in barren areas, nor are they found in large, old-growth forests. In general, the greater the variety of plant species and the greater the variety of plant sizes and ages, the better the habitat for a wide variety of animals and birds.

Plantings for wildlife need not be large. Actually, trees are of highest value when planted in scattered groupings throughout a property. Leave open spaces and use irregular shapes in plantings. Plantings of a single species are not as valuable as mixed group plantings that contain hardwoods, conifers, and food-producing shrubs (6). Wildlife packets, containing a variety of tree and shrub species, are available from many local soil conservation districts. The composition of the packets is varied to match the location in the state where they will be planted.

Christmas Trees

Michigan produces about one of every seven plantation grown Christmas trees in the United States. Growing Christmas trees has become a highly intensive business that requires significant knowledge, time and effort on the part of growers.

Christmas trees require consistent monitoring and care after planting. They require annual shearing, beginning in the third or fourth year following planting, and protection from insects and diseases each year.

Several species of conifers are used as Christmas tree stock. The most common are Scotch pine, Colorado blue spruce, Douglas fir and Fraser fir. For more information on growing Christmas trees, contact a local county extension office.

Aesthetic Considerations

Trees and forests are important to the quality of the environment. Tree cover moderates air temperature, suppresses noise, collects dust, dissipates odors, balances carbon dioxide and oxygen levels, and can even warn of dangerous levels of air pollution (4).

When planting trees to improve aesthetics, plan for future growth of the trees. Mixing species, such as conifers and hardwoods, lends to plant and habitat diversity. Planting low growing and tall trees in different locations adds contrast. Consider tree form, flowering habits, foliage patterns, and fall coloration when planting selections are made. Many of these features will increase the attractiveness of any planting in later years. In congested urban areas, select trees that posses some tolerance for confined conditions and are resistant to certain pollutants. In all plantings, consider soil properties, water availability, space and nutrient requirements before selecting and planting trees. Consult a local county extension office for further information on how to select the right tree species for your situation.

Michigan State University Extension has many more publications about forestry and forest products that may be of interest to you. Some of these are listed below.

E-721 **Selecting Coniferous Planting Stock for Michigan Soils.**

E-1578 **Improving Hardwood Timber Stands.**

E-1656 **Timber Sales Contracts.**

E-1758 **Michigan's Commercial Forest Act, Is It for You?**

E-2045 **Forest Pest Management.**

E-2584 **Using Tree Shelters to Establish Northern Red Oak and Other Hardwoods.**

NCR479 **Recommended Species for Christmas Tree Planting in the North Central U.S.**

To order these bulletins and for a free catalog listing all of our bulletins, visit your MSU Extension county office, or write to:

MSU Bulletin Office

Michigan State University

10-B Agriculture Hall

East Lansing, MI 48824-1039

References

(1) Burns, R.M. and B.H. Honkala (editors).1990. Silvics of North America. Vol. 1: Conifers. USDA Forest Service Agricultural Handbook No. 654. 675p.

(2) Burns, R.M. and B.H. Honkala (editors).1990. Silvics of North America. Vol. 2: Hardwoods. USDA Forest Service Agricultural Handbook No. 654. 877p.

(3) DeYoe, D.R. 1986. Guidelines for handling seeds and seedlings to ensure vigorous stock. Forest Research Laboratory, Oregon State University, Corvallis. Special Publication 13. 24p.

(4) Harris, R.H. 1992. Arboriculture: integrated management of landscape trees, shrubs, and vines. 2nd ed., Prentice Hall, New Jersey. 674p.

(5) Johnson P.S., C.D. Dale, K.R. Davidson and J.R. Law. 1986. Planting northern red oak in the Missouri Ozarks: A prescription. NJAF 3:66-68.

(6) Kitts, J.R. 1983. Management for Wildlife. University of Minnesota Extension Service Extension Folder 675. 6p.

(7) Thompson, J.R. and R.C. Schultz. 1995. Root system morphology of Quercus rubra L. planting stock and 3-year field performance in Iowa. New Forests 9(3):225-236.

(8) U.S. Forest Service. 1952. Tree Planting Techniques. Tree Planters' Notes No. 10. 40pp.

(9) Wenger, K.F. (ed). 1984. Forestry Handbook, 2nd edition. John Wiley and Sons. New York. 1335p.

MICHIGAN STATE UNIVERSITY EXTENSION

5M-TCM-MP-Revised 6:97-1.00