Forest Trees and Shrubs, What, Where and How to Plant
Michigan State University Extension Service
T.D. Stevens
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FOREST TREES AND SHRUBS

What - Where - How to Plant

By T. D. STEVENS

Contour tree planting on hilly land.

MICHIGAN STATE COLLEGE

EXTENSION SERVICE

EAST LANSING

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Forest Trees and Shrubs

What, Where, and How to Plant

By T. D. STEVENS

PLANTING UNPRODUCTIVE AND IDLE LANDS TO FOREST TREES OFFERS A practical way to change those areas from liabilities to assets. The value of areas planted to forest trees increases from year to year as the trees grow in size and quality.

WHY PLANT FOREST TREES AND SHRUBS?

1. To improve the appearance and value of worn-out or badly eroded land.
2. To produce a valuable crop of saw timber, poles, posts, cordwood, or Christmas trees.
3. To prevent the loss of top soil by checking wind and water erosion.
4. To provide food and cover for wildlife.
5. To provide windbreaks for the protection of the home, fields, and livestock.
6. To make the farm home a more attractive and satisfying place to live.
7. To provide recreational areas.

WHERE TO PLANT TREES

Most of the farm land in need of reforestation is composed of badly eroded hillsides, deep dry sandy soils, or blow sand. Odd corners of fields that are not easy to farm usually make excellent places to grow Christmas trees, timber trees, or wildlife food and cover trees and shrubs.

Openings in woodlands may be planted to thicken the stand of trees. It is not advisable, however, to plant a cut-over woods unless the original stand of trees was quite thin because sprouts and seedlings that grow after cutting will usually crowd out newly planted trees.

Planting trees in swamp or marsh land is seldom practical because of unfavorable soil conditions and competition with grass and shrubs. Small swamps should be left open for the benefit of wildlife.

Trees planted as windbreaks offer excellent protection for home and field. Plant windbreaks for home protection on that side of the buildings against which blow the prevailing winter winds. Locate the windbreak several rods away from buildings since drifting snow will accumulate on the lee side of the windbreak. Windbreaks for the protection of fields should be located to protect the crop from the most damaging summer winds. A separate folder discussing windbreaks may be obtained from the Forestry Department of Michigan State College, East Lansing.

CHOICE OF SPECIES

While many species adapt themselves to a wide range of conditions, nevertheless it is best to choose those species which will make their best development on the proposed planting site.

Important site factors are temperature and soil moisture.. Very low temperatures may affect young trees through the lack of available soil moisture owing to the frozen condition of the soil. Young trees may be pushed out of the soil by frost heaving, the result of the soil's swelling and shrinking while freezing and thawing. Frost heaving is more common in heavy clay or organic soils. During the dry periods in the summer very high surface soil temperatures may damage the stems of young trees. Bare soils facing south or west have highest surface temperatures.

Soil type and drainage are very important in deciding the kind of trees to plant. In general, the heavier loamy soils retain more moisture and are more fertile than the lighter sandy soils. Conifer or evergreen trees are much better adapted to poorer soils than are broadleaf or deciduous trees. Species of trees to be planted in poorly drained soils or soils subjected to flooding should be chosen with care, as only a few species are suitable for planting on wet sites. Groups of one species interspersed with groups of other species, according to soil and moisture requirements, are preferable to continuous plantings of a single species (Fig. 1).

Pines grow well on deep dry sand, stabilized blowsand, and south and west slopes of eroded hillsides. Excellent growth is usually made on sandy loam soils not fertile enough to farm.

Jack and Scots pine are best for very infertile and blowing sand.

Red pine will develop best on well drained upland loam and sandy loam soils. However, red pine will grow well on less fertile sands, gravels, and moderately heavy clay that has been eroded. Red pine is comparatively free from disease and insect enemies in Michigan at the present time and may be planted throughout the state for lumber production.

Fig. 1. Group planting according to soil and moisture requirements. Spruce was planted on the bottomland and jack and Scots pine on the drier eroded hillsides and ridges.

White pine makes its best development on well drained upland loam and sandy loam soils; do not plant it on very dry sands or poorly drained clays. It is advisable to thoroughly remove all currant and gooseberry bushes on and within 1,000 feet of the planting area since they are carriers of blister rust, a serious disease of white pine.

Spruce and fir grow well on damp areas where the water table is fairly high. Nevertheless, do not plant them in standing water. Best growth will occur on moist well drained loam or sandy loam soils. While considerably more tolerant of shade than pine, spruce and fir should not be planted in dense shade.

Hardwoods or broad-leaved trees, when grown for timber production, should be planted on fairly good agricultural land. Cottonwood, honey locust, and willow will grow on sands. Black locust is recommended for planting in eroding gullies. Black cherry, hickory, locust, yellow poplar, and black walnut should be planted only in the southern part of the state. See Table 1, a planting guide, for species recommended

for various sites. For information concerning special planting problems address the Forestry Department, Michigan State College, East Lansing.

SIZE AND AGE OF PLANTING STOCK

Use the smallest stock that can be planted with safety. Where soil and moisture conditions are favorable, two- and three-year-old coniferous seedlings will be satisfactory. On dry and exposed sands or on sites densely covered with shrubs, weeds, or grass it is generally desirable to use three- to four-year-old transplant stock. Transplants are much better than seedlings for Christmas tree and pulpwood plantings. The older and larger stock is also superior for planting heavier soils where frost heaving is likely. One-year-old seedlings or two-year-old transplants are satisfactory for white ash, green ash, yellow poplar, sugar maple, American elm, black locust, and basswood. Where squirrels are not too numerous the nuts or acorns of black walnut, hickory, and oak may be planted directly on the area where the trees are to be grown. Cottonwood and willows are easily started from cuttings in the early spring.

Fig. 2. Eroded land planted to pine and other wildlife food and cover species. Black locust has checked active erosion in the gully at the extreme right. (Soil Conservation Service photo.)

TABLE 1—*Planting guide*

SPECIES	DRY UPLANDS				WELL-DRAINED UPLANDS						WET LOWLANDS	
		Sand			Sandy Loam			Clay—Clay Loam				
	Dunes and Shifting Sand	Level	Exposure[2]		Level	Exposure		Level	Exposure		Sands to Clays	Muck or Peat
			N & E[2]	S & W[2]		N & E	S & W		N & E	S & W		
Forest Trees												
CONIFERS (Evergreen)												
Cedar, Northern White	.....	.....	.....	.....	Yes	Yes	.....	Yes	Yes	.....	Yes[1]	Yes[1]
Fir, Balsam	.....	.....	.....	.....	Yes	Yes	.....	Yes	Yes	.....	Yes	Yes
Fir, Douglas	.....	.....	.....	.....	Yes	Yes	Yes	Yes	Yes	Yes	.....	.....
Larch, European	.....	.....	.....	.....	Yes	Yes	.....	.....	.....	.....	.....	.....
Pine, Jack	Yes[1]	Yes[1]	Yes[1]	Yes[1]	Yes	Yes	Yes	Yes	Yes	Yes	.....	.....
Pine, Red	Yes[1]	Yes[1]	Yes[1]	Yes[1]	Yes[1]	Yes[1]	Yes[1]	Yes[1]	Yes[1]	Yes[1]	.....	.....
Pine, Scots	Yes[1]	Yes[1]	Yes[1]	Yes[1]	Yes	Yes	Yes	Yes	Yes	Yes	.....	.....
Pine, White	.....	.....	Yes	.....	Yes[1]	Yes[1]	Yes[1]	Yes[1]	Yes[1]	Yes[1]	.....	Yes
Spruce, Black	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Yes[1]	Yes[1]
Spruce, Norway**	.....	.....	.....	.....	Yes[1]	Yes[1]	.....	Yes[1]	Yes[1]	Yes	.....	.....
Spruce, White	.....	.....	.....	.....	Yes[1]	Yes[1]	.....	Yes[1]	Yes[1]	Yes	Yes	.....
BROADLEAVES (Deciduous)												
Ash, Green	.....	.....	.....	.....	Yes	Yes	Yes[1]	Yes	Yes	Yes	.....	.....
Ash, White	.....	.....	.....	.....	Yes[1]	Yes[1]	.....	Yes[1]	Yes[1]	.....	.....	.....
Basswood	.....	.....	.....	.....	Yes	Yes	.....	Yes	Yes	.....	Yes	.....
Cherry, Black**	.....	.....	.....	.....	Yes[1]	Yes[1]	.....	Yes[1]	Yes[1]	.....	.....	.....
Cottonwood	Yes[1]	.....	.....	.....	Yes	Yes	.....	Yes	Yes	.....	Yes	Yes
Elm, American	.....	.....	.....	.....	Yes	Yes	.....	Yes	Yes	.....	Yes[1]	Yes[1]
Hickory, Pignut**	.....	.....	.....	.....	Yes	Yes	Yes	Yes	Yes	Yes	.....	.....
Hickory, Shagbark**	.....	.....	.....	.....	Yes	Yes	Yes	Yes	Yes	Yes	.....	.....
Locust, Black**	.....	.....	.....	.....	Yes	Yes	.....	Yes	Yes	Yes	.....	.....
Locust, Honey**	Yes[1]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	.....	.....
Maple, Soft	.....	Yes	Yes	.....	Yes	Yes	.....	Yes	Yes	.....	Yes	Yes
Maple, Sugar	.....	.....	.....	.....	Yes[1]	Yes[1]	.....	Yes[1]	Yes[1]	.....	.....	.....
Oak, Red	.....	.....	.....	.....	Yes	Yes	Yes[1]	Yes	Yes	Yes[1]	.....	.....
Oak, White	.....	.....	.....	.....	Yes	Yes	.....	Yes[1]	Yes[1]	.....	.....	.....
Poplar, Yellow**	.....	.....	.....	.....	Yes	Yes	.....	Yes[1]	Yes[1]	.....	.....	.....
Walnut, Black*	.....	.....	.....	.....	Yes	Yes	.....	Yes	Yes	.....	.....	.....
Willow	Yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	Yes	Yes
SHRUBS AND WOODY VINES												
Ash, Mountain	.....	.....	.....	.....	Yes	Yes	.....	Yes	Yes	Yes	Yes	.....
Blackberry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	.....	.....
Black-haw**	.....	.....	.....	.....	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
Dogwood, 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
Grape, Wild	.....	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	.....	.....	.....	.....	.....
Withe-rod	.....	.....	.....	.....	Yes	Yes	.....	Yes	Yes	.....	Yes	.....

*Plant in mixture with other species on fertile soils in southern Michigan only

**Southern Michigan

[1]Especially recommended for this planting location as bringing high returns in the production of wood products

[2]Pronounced slopes facing north and east (N & E) or south and west (S & W)

TABLE 2—*Use of different species*

SPECIES	Wood Production					Cover or Food for Wildlife								Miscellaneous Uses				
	Lumber	Posts	Pulp	Ties	Baskets	Beaver	Deer	Fish	Grouse	Pheasant	Songbirds	Rabbit	Squirrel	Christmas trees	Christmas Greens	Erosion Control	Honey	Windbreak
Forest Trees																		
CONIFERS (Evergreen)																		
Cedar, Northern White	.....	Yes	.....	.....	.....	.....	Yes	Yes	Yes	Yes	Yes	Yes	.....	.....	Yes	.....	.....	Yes
Fir, Balsam	Yes	.....	Yes	.....	.....	.....	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	.....	.....	.....
Fir, Douglas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Yes	Yes	.....	.....	Yes
Larch, European	Yes	Yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Yes	.....	.....	.....	.....	.....
Pine, Jack	Yes	.....	Yes	.....	.....	.....	Yes	.....	Yes	Yes	Yes	Yes	Yes	Yes	.....	Yes	.....	Yes
Pine, Red	Yes	.....	.....	.....	.....	.....	Yes	.....	Yes	Yes	Yes	Yes	Yes	.....	Yes	Yes	.....	Yes
Pine, Scots	Yes	.....	Yes	.....	.....	.....	Yes	.....	Yes	Yes	Yes	Yes	Yes	Yes	.....	Yes	.....	Yes
Pine, White	Yes	.....	.....	.....	.....	.....	Yes	.....	Yes	Yes	Yes	Yes	Yes	.....	Yes	Yes	.....	Yes
Spruce, Black	.....	.....	Yes	.....	.....	.....	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	.....	.....	.....
Spruce, Norway*	Yes	.....	Yes	.....	.....	.....	Yes	.....	Yes	Yes	.....	Yes	Yes	Yes	Yes	.....	.....	Yes
Spruce, White	Yes	.....	Yes	.....	.....	.....	Yes	.....	Yes	Yes	Yes	Yes	Yes	Yes	Yes	.....	.....	Yes
BROADLEAVES (Deciduous)																		
Ash, Green	Yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Yes	.....	.....	Yes	Yes	.....
Ash, White	Yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Yes	.....	.....	.....	Yes	.....
Basswood	Yes	.....	.....	.....	.....	.....	Yes	.....	Yes	.....	Yes	.....	Yes	.....	.....	.....	Yes	.....
Cherry, Black*	Yes	.....	.....	.....	.....	.....	.....	.....	Yes	Yes	Yes	Yes	Yes	.....	.....	.....	Yes	.....
Cottonwood	Yes	.....	Yes	.....	Yes	Yes	.....	Yes	Yes	.....	.....	.....	Yes	.....	.....	Yes	Yes	Yes
Elm, American	Yes	.....	.....	.....	Yes	.....	Yes	Yes	.....	Yes	Yes	Yes	Yes	.....	.....	.....	Yes	.....
Hickory, Pignut*	Yes	.....	.....	.....	.....	.....	Yes	.....	.....	.....	.....	.....	Yes	.....	.....	.....	.....	.....
Hickory, Shagbark*	Yes	.....	.....	.....	.....	.....	Yes	.....	.....	.....	.....	.....	Yes	.....	.....	.....	.....	.....
Locust, Black*	.....	Yes	.....	Yes	.....	.....	.....	.....	.....	Yes	Yes	Yes	Yes	.....	.....	Yes	Yes	.....
Locust, Honey*	.....	Yes	.....	.....	.....	.....	.....	.....	.....	Yes	.....	Yes	Yes	.....	.....	.....	Yes	.....
Maple, Soft	Yes	.....	.....	.....	Yes	Yes	Yes	Yes	Yes	.....	Yes	Yes	Yes	.....	.....	.....	Yes	.....
Maple, Sugar	Yes	.....	.....	Yes	.....	Yes	.....	.....	Yes	.....	Yes	Yes	Yes	.....	.....	.....	Yes	.....
Oak, Red	Yes	Yes	.....	Yes	.....	.....	.....	.....	Yes	Yes	.....	Yes	Yes	.....	.....	.....	Yes	.....
Oak, White	Yes	Yes	.....	Yes	.....	.....	.....	.....	Yes	Yes	.....	Yes	Yes	.....	.....	.....	Yes	.....
Poplar, Yellow*	Yes	.....	.....	.....	.....	Yes	.....	.....	.....	.....	.....	.....	Yes	.....	.....	.....	Yes	.....
Walnut, Black*	Yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Yes	.....	.....	.....	Yes	.....
Willow	.....	.....	.....	.....	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	.....	.....	.....	Yes	Yes	Yes
SHRUBS AND WOODY VINES																		
Ash, Mountain	.....	.....	.....	.....	.....	.....	Yes	.....	Yes	Yes	Yes	.....	Yes	.....	.....	.....	Yes	.....
Blackberry	.....	.....	.....	.....	.....	.....	.....	.....	Yes	Yes	Yes	Yes	Yes	.....	.....	Yes	Yes	.....
Black-haw*	.....	.....	.....	.....	.....	.....	Yes	.....	Yes	Yes	Yes	.....	.....	.....	.....	.....	Yes	.....
Coralberry	.....	.....	.....	.....	.....	.....	.....	.....	Yes	Yes	Yes	Yes	.....	.....	.....	Yes	Yes	.....
Crab, Wild	.....	.....	.....	.....	.....	.....	Yes	.....	Yes	Yes	Yes	Yes	Yes	.....	.....	.....	.....	.....
Dogwood, Gray	.....	.....	.....	.....	.....	.....	Yes	Yes	Yes	Yes	Yes	Yes	.....	.....	.....	Yes	Yes	.....
Dogwood, Red-Osier	.....	.....	.....	.....	.....	.....	Yes	Yes	Yes	Yes	Yes	Yes	.....	.....	.....	Yes	Yes	.....
Dogwood, Silky	.....	.....	.....	.....	.....	.....	.....	Yes	Yes	Yes	Yes	Yes	.....	.....	.....	.....	Yes	.....
Elder	.....	.....	.....	.....	.....	.....	Yes	Yes	Yes	Yes	Yes	Yes	Yes	.....	.....	.....	Yes	.....
Grape, Wild	.....	.....	.....	.....	.....	.....	.....	.....	Yes	Yes	Yes	Yes	Yes	.....	.....	Yes	Yes	.....
Hawthorn	.....	.....	.....	.....	.....	.....	Yes	.....	Yes	Yes	Yes	Yes	Yes	.....	.....	Yes	Yes	.....
Hazel	.....	.....	.....	.....	.....	.....	.....	.....	Yes	Yes	.....	Yes	Yes	.....	.....	.....	Yes	.....
Honeysuckle	.....	.....	.....	.....	.....	.....	Yes	.....	Yes	Yes	Yes	Yes	.....	.....	.....	.....	Yes	.....
Juniper, Prostrate	.....	.....	.....	.....	.....	.....	.....	.....	Yes	Yes	Yes	Yes	.....	.....	.....	Yes	.....	.....
Nanny-berry	.....	.....	.....	.....	.....	.....	Yes	.....	Yes	Yes	Yes	.....	.....	.....	.....	.....	Yes	.....
Ninebark	.....	.....	.....	.....	.....	.....	Yes	.....	.....	Yes	Yes	.....	.....	.....	.....	Yes	.....	.....
Olive, Russian	.....	.....	.....	.....	.....	.....	.....	.....	.....	Yes	.....	Yes	.....	.....	.....	Yes	Yes	.....
Pea, Siberian	.....	.....	.....	.....	.....	.....	.....	.....	Yes	Yes	.....	Yes	.....	.....	.....	Yes	Yes	.....
Plum, Wild	.....	.....	.....	.....	.....	.....	Yes	.....	Yes	Yes	Yes	.....	Yes	.....	.....	.....	Yes	.....
Rose, Wild	.....	.....	.....	.....	.....	.....	.....	.....	Yes	Yes	Yes	Yes	.....	.....	.....	Yes	Yes	.....
Shadbush	.....	.....	.....	.....	.....	.....	Yes	.....	Yes	Yes	Yes	.....	.....	.....	.....	.....	Yes	.....
Snowberry	.....	.....	.....	.....	.....	.....	Yes	.....	Yes	Yes	Yes	Yes	.....	.....	.....	.....	Yes	.....
Sumac	.....	.....	.....	.....	.....	.....	Yes	.....	Yes	Yes	Yes	Yes	.....	.....	.....	.....	Yes	.....
Withe-rod	.....	.....	.....	.....	.....	.....	Yes	.....	Yes	Yes	Yes	.....	.....	.....	.....	.....	Yes	.....

*Plant in mixture with other species on fertile soils in southern Michigan only

**Southern Michigan

WILDLIFE SPECIES

Planting species to provide food and cover for wildlife usually makes it possible to increase the amount of game and other wildlife. Food and cover species may be planted on ditch shoulders, rough land, eroding slopes, odd pieces of waste land, and around or mixed with plantations of trees for timber (Fig. 2). See Table 2 for suitable wildlife food and cover species.

WHEN TO PLANT

Early spring planting is preferable to fall planting as the trees are not in immediate danger of being heaved out of the soil by alternate freezing and thawing. Fall planting may be satisfactory for light sandy soils. Direct sowing of nuts and acorns is best accomplished in the fall; however, spring sowing is recommended, if there is danger of rodents disturbing the seed during the winter.

CARE OF TREES ON ARRIVAL

Trees are shipped with their roots packed in damp moss, shingle tow, or other similar material. When the trees are to be planted within 48 hours, they may be left in their shipping container if stored in a cool place and kept moist. If the trees are not to be planted within a day or two they should be "heeled-in". This consists of digging a trench in a shady place with one side sloping at a 45-degree angle. The trench should be deep enough to accommodate the entire root system and the lower portion of the stem. Cut the strings on each bundle of trees, dip the roots in water, and spread the trees evenly along the sloping side of the trench. Cover the roots with soil, pack well to eliminate air pockets, and keep moist. "Heeled-in" trees will keep in good condition for two weeks or more but should be permanently planted before new growth starts.

SOIL PREPARATION

Some form of soil preparation is most always desirable as a means of eliminating competition with weeds and grass. The three common methods of preparation are scalping, furrowing, and plowing.

Scalping consists of removing the sod from an area about 2 feet square. Be sure all surface roots are removed with the sod scalp to prevent immediate regrowth of grass and weeds. After the sod is removed, a tree is planted in the center of the scalped area. A shovel, grub hoe, or mattock is a satisfactory hand tool for scalping.

Furrowing consists of plowing shallow furrows and planting the trees in the bottom of the furrow. Furrows should be plowed either

on the contour when the planting site is hilly (see page 1) or at right angles to the prevailing winds when the planting site is comparatively level. Where the water table is extremely high, it is recommended that the trees be planted on the furrow slice; plow the furrow in the fall and plant on the slice the following spring.

Plowing the entire planting area is decidedly beneficial when heavy sod is present or when it is planned to plant hardwoods, or evergreens for Christmas trees. The area should be plowed in the fall and disked in the spring before planting the trees. To increase the chances of survival, the trees should be cultivated the first year and preferably the second as well. Cultivation helps to conserve moisture and keep down the competition of weeds and grass. Generally, two cultivations a year will be sufficient to control the weeds.

PLANTING METHODS

Carry the trees in a pail partly filled with water to keep the roots moist. If the roots are permitted to dry out, the trees may die.

Hole Method:

A shovel, grub hoe, or mattock is the most practical planting tool for the hole method. Dig a hole large enough to accommodate the roots when spread out in their normal position. Insert the tree into the hole ½ inch deeper than it was in the nursery, being careful not to crowd the roots. NEVER DOUBLE UP THE ROOTS (Fig. 3). Cover the roots with moist fine soil and press down with the back of the hand (Fig. 4). No grass, leaves, or stones should be in contact with roots. Fill in the remaining soil and firmly pack with the heel of the shoe (Fig. 5). Leaves and grass may be placed around the newly planted tree to form a moisture conserving mulch. Inexperienced men can plant 300 to 400 trees per day by the hole method.

Slit Method:

The slit method of planting is often preferred because it is more rapid than the hole method. Nevertheless, the slit method should only be used with small-sized planting stock and sandy soils. The most practical planting tools for this method are the common spade, tiling spade, or planting bar. A planting bar may be constructed from a steel bar 4 inches wide by 12 inches long by ¾ inch thick and a 30-inch piece of ¾-inch iron pipe; draw one end of the bar to a knife-like edge and weld the other end to the iron pipe which serves as a handle.

Insert the planting tool into the soil, moving it back and forth to form a V-shaped slit. With the planting tool still in the slit, insert the

Fig. 3. Dig a hole large enough to accommodate all the roots without crowding.

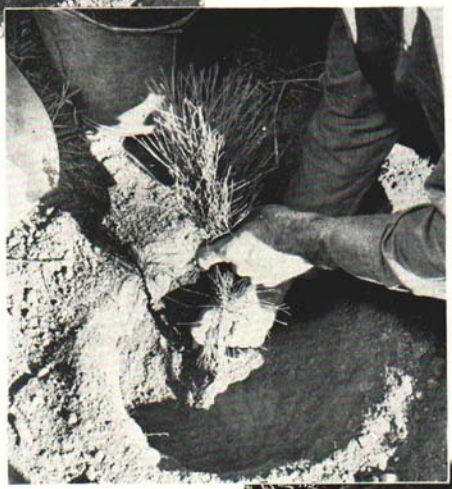

Fig. 4. Set the tree about one-half inch deeper than it grew in the nursery, cover the roots with moist fine soil, and press down with the back of the hand.

Fig. 5. Fill in the remaining soil and firmly pack with the heel of the shoe so the tree cannot easily be pulled out.

young tree to the proper depth, making sure the roots are not doubled up. Remove the planting tool and close the top of the slit with the heel of the shoe. To close the bottom of the slit and assure that no air pockets are left around the roots, insert the planting tool about 2 inches back from the slit and again work it back and forth to pack the soil firmly against the roots of the tree; the success of the planting may depend on the thoroughness with which this step is completed. Inexperienced men can plant 600 to 900 trees per day by the slit method.

SPACING

Evergreen trees for forest plantations should be spaced 6 x 6 to 8 x 8 feet. 5 x 5 or 6 x 6 feet is suitable spacing for Christmas trees. Spacing for hardwoods may vary from 8 x 8 to 12 x 12 feet. Table 3 shows the number of trees required per acre for different spacings.

TABLE 3—*Trees per acre for different spacings*

Spacing in feet	5 x 5	6 x 6	6 x 7	6 x 8	8 x 8	10 x 10	12 x 12
Number of trees per acre	1,742	1,210	1,037	908	680	435	302

WHERE PLANTING STOCK CAN BE PURCHASED

The trees and shrubs which are printed in bold face type in the planting guide (Table 1) may usually be obtained, at low cost, from the Department of Forestry, Michigan State College, East Lansing. Pine trees are produced by the Division of Forestry, Michigan Conservation Department, Lansing. Planting stock from either of these sources may not be used for ornamental purposes or resold with roots attached. Order blanks may be obtained from your county agricultural agent, the Extension Forester at Michigan State College, East Lansing, and from the State Forester, State Office Building, Lansing. Many species may also be purchased from private nurseries.

GLOSSARY OF COMMON AND SCIENTIFIC PLANT NAMES

Conifers (Evergreen)

Cedar, Northern White ..... *Thuja occidentalis* L.
Fir, Balsam ..... *Abies balsamea* (L.) Mill.
Fir, Douglas ..... *Pseudotsuga taxifolia* (Poir.) Britt.
Larch, European ..... *Larix decidua* Mill.
Pine, Jack ..... *Pinus Banksiana* Lamb.
Pine, Red ..... *Pinus resinosa* Ait.
Pine, Scots ..... *Pinus sylvestris* L.
Pine, White ..... *Pinus Strobus* L.
Spruce, Black ..... *Picea mariana* (Mill.) B.S.P.
Spruce, Norway ..... *Picea Abies* (L.) Karst.
Spruce, White ..... *Picea glauca* (Moench) Voss.

Broadleaves (Deciduous)

Ash, Green	*Fraxinus pennsylvanica lanceolata* (Borkh.) Sarg.
Ash, White	*Fraxinus americana* L.
Basswood	*Tilia americana* L.
Cherry, Black	*Prunus serotina* Ehrh.
Cottonwood	*Populus deltoides* Marsh.
	Populus deltoides virginiana (Castiglioni) Sudw.
Elm, American	*Ulmus americana* L.
Hickory, Pignut	*Carya glabra* (Mill.) Sweet.
Hickory, Shagbark	*Carya ovata* (Mill.) K. Koch.
Locust, Black	*Robinia Pseudoacacia* L.
Locust, Honey	*Gleditsia triacanthos* L.
Maple, Soft	*Acer rubrum* L.
	Acer saccharinum L.
Maple, Sugar	*Acer saccharum* Marsh.
Oak, Red	*Quercus borealis* Michx.
	Quercus borealis maxima (Marsh.) Ashe.
Oak, White	*Quercus alba* L.
Poplar, Yellow	*Liriodendron Tulipifera* L.
Walnut, Black	*Juglans nigra* L.
Willow	*Salix* spp.

Shrubs and Woody Vines

Ash, Mountain	*Sorbus americana* Marsh.
Blackberry	*Rubus* spp.
Black-haw	*Viburnum prunifolium* L.
Coralberry	*Symphoricarpos orbiculatus* Moench.
Crab, Wild	*Malus* spp.
Dogwood, Gray	*Cornus racemosa* Lam.
Dogwood, Red-Osier	*Cornus stolonifera* Michx.
Dogwood, Silky	*Cornus Amomum* Mill.
Elder	*Sambucus canadensis* L.
	Sambucus pubens Michx.
Grape, Wild	*Vitis vulpina* L.
Hawthorn	*Crataegus* spp.
Hazel	*Corylus americana* Walt.
	Corylus cornuta Marsh.
Honeysuckle, Bush	*Diervilla Lonicera* Mill.
Honeysuckle, Fly	*Lonicera canadensis* Marsh.
Juniper, Prostrate	*Juniperus communis depressa* Pursh.
Nanny-berry	*Viburnum Lentago* L.
Ninebark	*Physocarpus opulifolius* (L.) Maxim.
Olive, Russian	*Elaeagnus augustifolia* L.
Pea, Siberian	*Caragana arborescens* Lam.
Plum, Wild	*Prunus nigra* Ait.
Rose, Wild	*Rosa* spp.
Shadbush	*Amelanchier canadensis* (L.) Med.
Snowberry	*Symphoricarpos albus* Blake.
Sumac	*Rhus glabra* L.
	Rhus typhina L.
Withe-rod	*Viburnum cassinoides* L.

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