Forest Planting on Illinois Farms

Circular 477

UNIVERSITY OF ILLINOIS · COLLEGE OF AGRICULTURE
AGRICULTURAL EXPERIMENT STATION AND EXTENSION
SERVICE IN AGRICULTURE AND HOME ECONOMICS
In cooperation with Illinois State Natural History Survey

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Urbana, Illinois September, 1937

Printed in furtherance of the Agricultural Extension Act approved by Congress May 8, 1914. H. W. MUMFORD, *Director*, Extension Service in Agriculture and Home Economics, University of Illinois

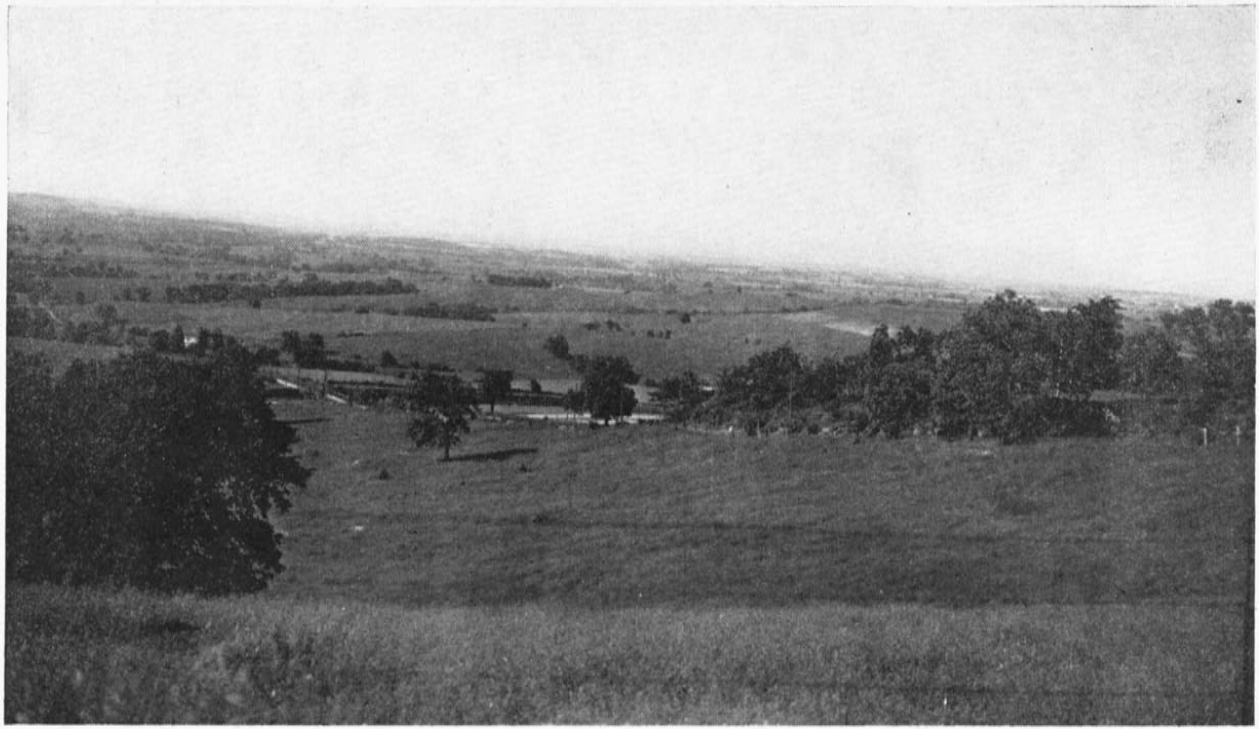

FIG. 1.—TIMBER FORMERLY COVERED THIS LAND

This typical rolling land of Illinois was once covered with fine stands of timber. Some of this land is now so badly eroded that it cannot be used even for pasture. Much of it will some day be as desolate as that shown in the scene at the top of page 7 if intelligent measures are not taken to prevent such tragedy.

Forest Planting on Illinois Farms

By J. E. Davis, Extension Forester[1]

FOR BETTER LAND USE and for soil erosion control, trees should be planted on the more than three million acres of land on Illinois farms which cannot profitably be used for annual farm crops at the present time.

Much of this land now worthless for growing agricultural crops was at one time good farming land, but has been ruined by erosion. Good topsoil has been washed away, particularly on steep slopes, and gullies have been formed that are constantly eating into good cropland and dumping poor subsoil on the fields below. Trees should be planted on this land to protect it from further destruction. They should also be planted on areas where the original forest growth was cleared from soil too poor ever to produce good crops. On these poorer soils trees will thrive because they have less exacting demands for food and moisture than have the annual farm crops.

That planted forests can produce profitable timber crops has been proved in Illinois, where forest plantations have produced fence posts in six years, Christmas trees in ten years, and timber trees cutting three 16-foot logs in fifty-five years. The last agricultural census found that Illinois farms used $2,132,000 worth of forest products during the year 1934.[2] Production of only a part of this on poor cropland, or on badly eroding land, would be a long stride toward more effective land use.

The planning and use of forest plantations is becoming a definite part of Illinois agriculture. The tree nurseries operated by the Division of Forestry of the State Department of Conservation are being brought into production in order to meet the needs of landowners. The Extension Service of the University of Illinois College of Agriculture, and the State Natural History Survey, thru the Extension Forester, advise on forest planting problems; and the U. S. Soil Conservation Service is assisting its demonstration cooperators in establishing forest plantations.

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[1]University of Illinois, College of Agriculture, and Illinois State Natural History Survey.

[2]U. S. Census for 1935. Information released in "Farm Woodlands of Illinois," Division of Private Forestry, Forest Service, U. S. Department of Agriculture.

To start a forest plantation is not difficult; it is not costly; and the plantation requires a minimum amount of care. Trees grow comparatively slowly, and the landowner who plants trees early will sooner harvest a wood crop.

PLANNING THE PLANTATION

Areas That May Be Profitably Utilized

Grazed woodlands, idle land, and land subject to destructive erosion are the three common kinds of areas on which forest trees should be planted in Illinois.

Woodlands that have been grazed so heavily that grass and weed growth is developing should be underplanted to insure the renewal of a stand of timber trees. Often a grazed woodland will have undergrowth made up entirely of hickory and elm, two low-value timber trees the leaves of which are less palatable to livestock than the leaves of other more valuable trees. In such cases it is desirable to thin out heavily the undergrowth and then underplant the woodland with seedlings of more valuable hardwoods. Evergreen trees, however, should never be used for this purpose, as they will not survive in the shade of the larger trees.

Land which has become idle, or land which can no longer be profitably used for crops or pasture, because of the poor character of the soil or because of soil erosion, should be used to produce crops of wood and furnish a haven for wildlife. Only by the planting of trees can such land ever be made to pay profits again.

Where destructive erosion has developed gullies, trees can be used to check the further cutting of these gullies and to prevent further erosion from menacing valuable cropland. In the areas of lighter soils trees may be used to stabilize blowing sand or to develop shelter belts to protect fields from wind erosion.

Native Hardwoods and Conifers Mainly Used

Any of the native hardwoods and conifers (commonly known as evergreens) and a few introduced conifers may be used for forest planting in Illinois. The best possible financial returns from a forest plantation should always be kept in mind, and therefore it is wise to use the most valuable kinds of trees which will grow satisfactorily in the conditions under which they are to be planted.

That good financial returns can be obtained from coniferous plantations in Illinois is evident from plantations already established. The

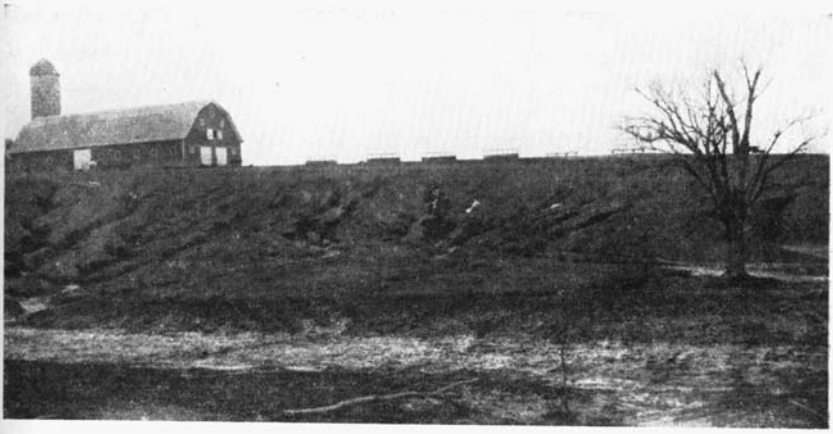

FIG. 2.—ONCE A GRASSY HILLSIDE

If erosion is not checked on this gullied pasture hillside, the barn will soon be in the gullies. The largest gullies are now 12 feet deep.

pines, in particular, make rapid growth and produce high-quality lumber. In southern Illinois cypress has possibilities, and in the northern third of the state European larch has outstripped all other trees in rapidity of growth. Altho the wood of the conifers is not so valuable as that of some of the better hardwoods, they produce a crop in from one-half to two-thirds the time of hardwoods and therefore are useful for farm planting where a return is desired as soon as possible.

FIG. 3.—TREES READY FOR SHIPMENT TO PLANTERS

A thousand trees are in this crate, ready for shipment from the state nursery operated by the Division of Forestry, Illinois State Department of Conservation.

Trees recommended for farm forest planting in Illinois under various planting conditions and for the production of various wood crops are listed on the opposite page.

Mixed Plantations Are Usually Best

A pure plantation is made up of only one kind of tree. A mixed plantation is made up of two or more different kinds of trees. It is good practice to make mixed plantings, since these tend to establish more natural forest conditions, to insure against serious losses from insects and diseases, and to provide a wider variety of wood crops. In small plantings, however, the use of more than three or four kinds of trees should be avoided, for such mixtures do not produce a worth-while crop of any one kind of wood. A mixture of two or three different conifers, or three or four different hardwoods, should be sufficient and will not too seriously complicate the job of planting; but the mixing of conifers and hardwoods in the same plantation should be avoided, for there is no evidence that such a mixture will prove satisfactory in this state.

There are few pure plantations of black walnut that have ever developed into a worth-while stand of timber. Black locust, on the other hand, should be planted pure, except when used to stabilize blow sand, where it seldom develops a satisfactory stand. Cypress, because of its adaptation to bottomland soils, will probably be used best in pure plantations.

Seedlings and Transplants for Different Situations

Small trees are usually offered for sale by nurseries in sizes best suited for forest planting, but among the conifers there is sometimes a choice between seedling stock and transplant stock. *Seedlings* have been grown one, two, or three years in seedbeds and have never been moved. *Transplants* have been transplanted into rows after one or two years in the seedbeds, and because of the transplanting have developed stronger, more compact root systems.

For white pine, red pine, pitch pine, Norway spruce, Douglas fir, cypress, and red cedar, transplants are preferred to seedlings. They will better withstand the competition of weeds and grasses and will become more quickly established in the field, thereby giving greater assurance of success. Shortleaf pine, loblolly pine, and European larch grow so rapidly in the nursery that they are seldom transplanted, and they may be used satisfactorily as seedlings. Transplants are more costly to produce than seedlings, and in some instances the matter of cost may be the deciding factor in a choice between the two classes of planting

TREES FOR ILLINOIS PLANTING

WITH INDICATED USE

Lumber

White pine	Cypress (S)	Tulip poplar
Red pine	Red cedar (•)	Black cherry
Shortleaf pine (S)	White oak	Hard maple (N)
Loblolly pine (S)	Red oak	Basswood
Norway spruce	Bur oak	Cottonwood
Douglas fir	Black walnut	
European larch (N)	White ash	

Ties and props

Red pine	Loblolly pine (S)	European larch (N)
Shortleaf pine (S)	Pitch pine	

Poles and posts

European larch (N)	Red cedar (•)	Osage orange
Cypress (S)	Black locust	

Christmas trees

Norway spruce	Douglas fir	Red cedar (•)

SOIL AND PLANTING SITE

For underplanting woodlands

White oak	Black walnut	Black cherry
Red oak	White ash	Hard maple (N)
Bur oak	Tulip poplar	Basswood

For idle land—poor soils, dry to fresh

White pine	Loblolly pine (S)	Black locust
Red pine	Pitch pine	
Shortleaf pine (S)	Red cedar (•)	

For idle land—fair soils, fair to good moisture

White pine	Cypress (S)	Black cherry
Red pine	White oak	Hard maple (N)
Shortleaf pine (S)	Red oak	Basswood
Loblolly pine (S)	Bur oak	Cottonwood
Norway spruce	Black walnut	Black locust
Douglas fir	White ash	Osage orange
European larch (N)	Tulip poplar	

For gully control

Black locust (plant other trees on gully borders according *to soil and use desired*)

For blow sand

Black locust in blow holes and on open sand dunes to establish a quick cover but not for post crops. Red pine, white pine, pitch pine, osage orange wherever sand has any *vegetative growth*

For shelter belts

Osage orange or any of the evergreens adapted to the planting site

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NOTE.—(N) Plant only in northern half of state. (S) Plant only in southern third of state. (•) Do not use red cedar where there is danger of transmitting cedar apple rust to apple orchards.

FIG. 4.—A RED AND WHITE PINE MIXED PLANTING

This photograph of a forest of red pine and white pine on sand land in Henderson county was taken eight years after the trees were set out. The stake is 3 feet high.

FIG. 5.—RED PINE ON SAND LAND

Red pine is probably the best all-round coniferous tree for reforestation in Illinois. It will grow on poorer soils and is more drouth resistant than white pine. The stake in this eight-year old plantation is 3 feet high.

stock. Hardwood trees develop such large roots in the nursery that they are usually sold only as one-year-old seedlings.

The largest coniferous transplants will probably not be over 18 inches in height, and seedlings may vary from 4 to 12 inches. Hardwood seedlings usually are not over 12 inches high, excepting black locust, which may vary from 6 to 36 inches in one-year-old seedlings.

Planting stock of the most valuable trees for Illinois is grown in nurseries operated by the Division of Forestry of the State Department of Conservation. Several private nurseries also specialize in growing trees for forest planting. Availability and costs of various kinds of planting stock change from year to year, and specific information may be had at any time by writing to the EXTENSION FORESTER, University of Illinois, Urbana, Illinois.

Spring Is the Best Time to Plant

Spring is the most favorable time for planting forest trees. The planting should be done as soon as the frost is out of the ground and the soil can be worked easily, so that the trees may have the advantage of early spring rains and may attain good growth before late spring drouths occur. In the southern part of the state the planting season may start in early March, while in the extreme northern counties trees often cannot be planted until the middle of April.

Planting in the fall, after the leaves have dropped from the trees, may be done on light porous soils, but this practice is not generally recommended. Fall-planted trees have no opportunity to take hold in the soil with new roots and are often seriously damaged by frost heaving during their first winter. The only point in favor of fall planting is the economy of getting the planting work out of the way of other spring farm work. Usually, however, trees can be planted before fields can be plowed or oats seeded. If fall planting is to be done, it should be confined to light soil. In areas where there is little or no snow cover, the trees should be mulched with old straw or ground cobs.

Forest Planting Helps Conserve Wildlife[1]

The demand for recreational facilities in the form of hunting is constantly increasing, and it is evident that wildlife management is necessary if the recreational needs of the people are to be met. A demand for good-quality paid shooting has already been voiced by numbers of Illinois sportsmen, and farmers could dispose regularly of a game crop

[1]Prepared with the assistance of R. E. Yeatter, Game Specialist, Illinois State Natural History Survey, Urbana, Illinois.

at a profit if a good stand of quail and other small game were available on their lands.

The landowner who is carrying out a tree-planting program is in a position to add his bit to wildlife conservation, and to add to his own possibilities of income by including planting that will encourage the development of wildlife. A solid coniferous plantation is not favorable to wildlife because, compared with open, weedy or brushy patches, it is practically barren of food plants and favorable ground cover for game. Conifers do, however, provide excellent winter cover, especially

FIG. 6.—COVER FOR WILDLIFE PROVIDED BY HEALED GULLY

Excellent cover for wildlife is provided by the healed gully in this evergreen plantation. A solid coniferous plantation is not favorable to wildlife because it is practically barren of food plants and good ground cover.

along the borders of a plantation, and a coniferous plantation broken up by open patches in which woody food and cover plants have been planted along with patches of grain makes an ideal game area.

An excellent example of what can be done in combining reforestation and wildlife conservation exists in western Illinois. Here a 10-acre field was so badly eroded that it could no longer be farmed, even for pasture, and several gullies too deep to be crossed had formed. To check erosion and to put the land to profitable use, conifers, principally pines, were planted between and around the gullies but not on the gully margins or in the gullies. Some willows were planted in the bottoms of

the gullies, and a few Russian mulberries were planted around the edges. The open spaces between the blocks of conifers were from 50 to 150 feet wide. The trees stopped the rapid run of water from the field, and the gullies soon grew in with briars, weeds, and grasses. Last spring this 10-acre area which was once bare, open land was found to harbor quail, woodcock, rabbits, and several species of song birds.

Planting for wildlife conservation can be made a part of any tree-planting program, and the food and cover plants set out at the same time. Setting out a large number of plants is not necessary; a few well-selected plants set in favorable places will do a lot of good. Several varieties of game food and cover plants can be obtained from the state nurseries, or a larger selection is usually available from commercial growers of ornamental shrubs. Many of the most useful food and cover plants are native and can be found locally, the only cost entailed in putting them in a new plantation being the time and labor of transplanting.

Trees, shrubs, and vines for game food and cover

Barberry, Japanese, *Berberis thunbergii*
Bittersweet, *Celastrus scandens*
Blackberry, *Rubus allegheniensis*
Buckthorn, *Rhamnus* spp.
Cherry, wild, *Prunus* spp.
Coralberry, *Symphoricarpus orbiculatus*
Cranberry, highbush, *Viburnum opulus*
Dogwood, panicled, *Cornus paniculata*
Elderberry, *Sambucus canadensis* and *S. racemosa*
Grape, wild, *Vitis aestivalus* and *Vitis cinerea*
Hazel, *Corylus americana*
Honeysuckle, *Lonicera tartarica*
Juneberry, *Amalanchier canadensis*
Mulberry, red, *Morus rubra*
Plum, wild, *Prunus americana*
Raspberries, *Rubus* spp.
Roses, *Rosa* spp.
Sheepberry, *Viburnum lentago*
Snowberry, *Symphoricarpus racemosus*

TREES RECOMMENDED FOR ILLINOIS

Eight Conifers From Which to Choose

White pine *(Pinus strobus)*. White pine is native in northern Illinois, but all evidence indicates that it will grow well thruout the entire state. It is adapted to a wide variety of soils but should not be planted on land subject to overflow nor on very poor, dry land. The growth of white pine is exceptionally good in this state, some trees making saw logs in 40 to 50 years. The wood is light, soft, straight-grained, and easily worked. It has a wide variety of uses and is always in demand on the market.

In practically all the native habitats of white pine this tree has been attacked by the white pine blister rust, a fungous disease which spends part of its life cycle on currant or gooseberry leaves. The blister rust has not been found on white pine in Illinois, but as a precautionary measure all currant and gooseberry plants should be removed from the white pine plantation and from an area surrounding the plantation not less than 1,000 feet wide.

Red (Norway) pine *(Pinus resinosa)*. The red pine is a native of the lake states and the northeastern United States but seems to be well adapted to Illinois. Its requirements are similar to those of white pine, except that it will grow on poorer soils and is more drouth-resistant. Its growth also compares well with white pine, and the wood, altho heavier and more resinous, is used for much the same purposes. Because of its adaptability to difficult planting sites and its relative freedom from insects and disease, red pine is probably the best all-round coniferous tree for reforestation in Illinois.

Shortleaf pine *(Pinus echinata)*. Shortleaf pine is a southern yellow pine which is found native in southern Illinois on poor, dry ridges of the Ozarks. It is adapted to practically all except wet soils and will grow on the poorest, driest soils. Its growth is very rapid, but the wood is heavy and hard, not so valuable as white pine, but widely used for construction and general lumber. This tree is useful in the southern third of Illinois, where poor planting sites and dry conditions may often be encountered.

Loblolly pine *(Pinus taeda)*. Loblolly pine is another yellow pine native of the South but making a good showing in southern Illinois. It demands more soil moisture than shortleaf pine and is not adapted to very poor, dry sites. The loblolly pine is one of the fastest growers of the yellow-pine group. The wood is hard, resinous, and coarse-grained,

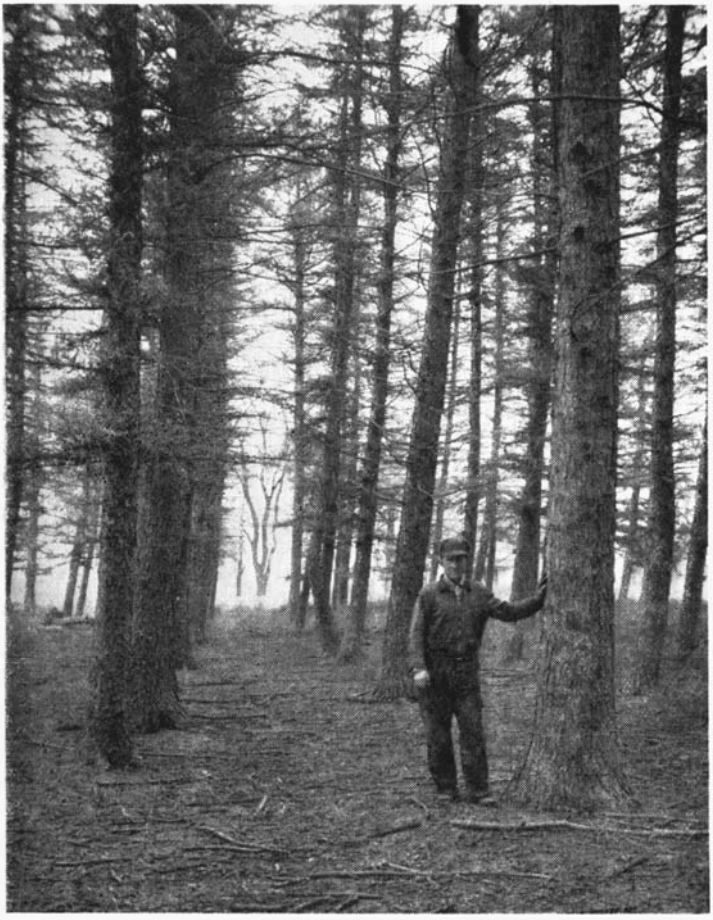

FIG. 7.—A EUROPEAN LARCH PLANTATION 55 YEARS OLD

This plantation contains 30,600 board feet of timber to the acre. European larch, with its rapid growth and heavy durable wood, has proved its value for farm plantings where timber for home use is desired. See page 16 for description.

with marked contrast between the spring and the summer wood. Planting of this pine should be restricted to the southern end of the state.

Pitch pine *(Pinus rigida)*. Pitch pine is also a yellow pine which has been introduced into Illinois, and will grow on the poorest, driest soils. Its growth is rapid, but the wood is hard, coarse, and brash, and its uses are more limited than are those of the other pines. It does have possibilities for use as ties and mine props, and may prove valuable for growing such crops on extremely poor sites.

Norway spruce *(Picea excelsa)*. Norway spruce can be grown thruout Illinois but makes greater height growth in the northern part. Spruce, and also pine, is short-lived on the prairie. The growth of Norway spruce compares well with white pine, but this tree does not produce so much wood per acre because of the rapid taper of the trees. The wood is light, soft, and strong, and makes good light lumber. Probably the best use for Norway spruce in this state will be for windbreaks and for Christmas trees, with the possibility of leaving thinned Christmas tree plantations to grow up to produce timber. It makes an excellent Christmas tree, having a rich green foliage and an even pyramidal form.

European larch *(Larix europaea)*. The European larch is a close relative to the tamarack found in northern Illinois, but unlike the tamarack it cannot stand excessive moisture. It prefers a deep, fresh, but well-drained soil, and is adapted only to the northern half of the state. Larch grows rapidly, making better height growth than any other conifers which may be planted in this part of the state. The wood is heavy, hard, and durable in contact with the soil. It is excellent for posts or poles and makes good rough lumber for general farm building and repair work. Several plantations of European larch set out 50 to 60 years ago have proved the value of this tree for farm plantings where rapid production of timber for home use is desired (Fig. 7).

Cypress *(Taxodium distichum)*. The cypress is native to southern Illinois, being found in deep swamps and wet bottomlands. It likes an abundance of moisture and should therefore be planted only on soils where the water table is usually high. Plantings should be confined to the southern part of the state. The growth of cypress is usually slow, but in a plantation on bottomland in Union county young cypress trees are making growth equivalent to pine. The wood is light, soft, easily worked, and is very durable in contact with the soil. In reforestation work the cypress is useful on wet bottomlands where other conifers could not survive.

Many Excellent Hardwoods Suited to Illinois

White oak *(Quercus alba)*. White oak is the commonest hardwood tree of Illinois and the most important commercially. It grows abundantly thruout the entire state but is not adapted to wet bottomland nor poor, dry soils. It makes its best development on deep, fresh loams. The growth of white oak is slow compared with the conifers, taking from 60 to 70 years to produce a 10-inch tree. The wood is heavy, strong, hard, tough, close-grained, and durable. It is used for con-

struction, furniture, flooring, interior trim, cooperage, wagons, and implements, and makes an excellent fuel wood.

Red oak *(Quercus borealis)*. The red oak is not so abundant as the white oak in Illinois, but it is nearly as well distributed thruout the state. It prefers well-drained loam, or clay loam, and in forest growth makes a tall, straight tree with a clear trunk. The growth is a little more rapid than white oak. The wood is hard, strong, and straight-grained but not very durable. It is used for construction, furniture, flooring, interior trim, and ties, and is good fuel wood. Because of the comparatively slow growth of both white oak and red oak, the most important use of these trees in tree planting is in the restocking of grazed woodlands, where conifers could not be used because of their intolerance to shade.

White ash *(Fraxinus americana)*. The white ash is found thruout Illinois, making its best development on deep, fresh soils in bottoms or on lower slopes. The ash makes fairly fast growth, developing a 10-inch tree in 40 to 50 years. The wood is hard, strong, tough and elastic, and these properties combined with its light weight make it very valuable. It is used for handles, agricultural implements, bats and athletic equipment, bending stock, and general manufacture. The white ash is useful either for open field planting or for underplanting woodlands.

Green ash *(Fraxinus pennsylvanica lanceolata)*. Green ash, which prefers moister sites, is not so widely distributed in Illinois as white ash. It is well adapted for reforestation uses and may be used for much the same purposes as white ash.

Black walnut *(Juglan nigra)*. Black walnut is the most valuable individual tree species found in Illinois. It is common thruout the state, but, contrary to general belief that black walnut will grow well anywhere, its satisfactory development as a commercial tree is limited to rich bottomlands and moist, fertile hillsides. In growth it is about equal to ash, taking 40 to 50 years to develop a 10-inch tree. The wood is hard, strong, durable, and moderately heavy. The rich chocolate-brown color of the heartwood, its ability to take a high polish, and its freedom from warping and checking make walnut highly valuable for furniture, cabinet work, and interior trim. The nuts are also highly prized and make a good commercial crop. The black walnut may be used for open field planting or for underplanting woodlands, but should always be planted in mixture with other trees. Favorable associates are ash and tulip poplar.

FIG. 8.—A BASSWOOD PLANTATION 49 YEARS OLD

This basswood plantation is a part of the University of Illinois forest plantation at Urbana in Champaign county. Well-drained loams or clay loams are particularly suited to basswood.

FIG. 9.—COTTONWOOD PLANTATION ON BLOW SAND

This cottonwood plantation on blow sand in Whiteside county was produced in twelve years. The front tree is 47 feet high and 12.5 inches in diameter. Cottonwood makes its best growth where there is plenty of water in the soil.

Tulip poplar *(Liriodendron tulipifera).* The tulip poplar, also known as tulip tree and yellow poplar, is native in southern Illinois, making its best growth in deep, moist soil along streams and in cool, moist ravines. It is a rapid grower, making a 10-inch tree in 35 to 45 years and developing a tall, straight, clear trunk. The wood is light, soft, and easily worked, and has a high commercial value. It is used for lumber, interior trim, veneer, vehicle bodies, and general manufacture. The planting of tulip poplar should be restricted to fresh loams and clay loams in the southern half of the state.

Basswood, or Linn *(Tilia glabra).* Basswood is fairly well distributed thruout the state, occurring on rich wooded slopes, moist stream banks, and cool ravines. Basswood makes rapid growth, developing a 10-inch tree in 30 to 40 years. The wood is light, soft, and tough, but not durable. It is widely used for woodenware, boxes, novelties, turning, and for lumber, where light weight is essential. Basswood may be planted on moist to well-drained loams or clay loams, and should be used in the northern half of the state for such situations as tulip would be used in the southern half.

Hard maple, or sugar maple *(Acer saccharum).* The hard maple is common thruout Illinois, and altho not so important commercially as the oaks, it has proved a valuable farm woodland tree in some sections. It is adapted to a wide variety of soils and grows faster than the white oak. The wood is hard, heavy, strong, and has a close, even grain. It is used for flooring, shoe lasts, and turning, and is very popular for furniture. The tree is also valuable for the production of maple sirup, an industry which can provide good cash income for farms during the late winter months and which has not been developed to its fullest advantage in Illinois. Vermilion county is the largest maple-sirup making county in the state, producing about 2,000 gallons of sirup annually. Hard maple is particularly useful for underplanting woodlands because of its ability to grow well under shade.

Cottonwood *(Populus balsamifera),* **Virginia cottonwood** *(Populus balsamifera* var. *virginiana).* Cottonwood is common thruout Illinois, preferring sites where plenty of moisture is available. It will grow on sandy soil where water is usually present not far below the surface, as well as on moist bottomlands. The cottonwood is a very fast-growing tree and grows to large size. It will produce a 10-inch tree in 15 to 25 years. The wood is light, soft, and fine-grained but fairly tough. It is used for boxes, crates, excelsior, pulp, and light lumber. For reforestation the cottonwood is useful on bottomlands

subject to overflow where other trees could not survive and on sandy soils. It is best propagated by cuttings.

Black locust *(Robinia pseudoacacia).* Black locust, altho native to southern Illinois, is now found thruout the state on practically all except wet soils. It is a very rapid-growing legume and develops a

FIG. 10.—BLACK LOCUST IS EXCELLENT FOR EROSION CONTROL

This planting of black locust in Schuyler county, made six years ago, will now cut 500 7-foot posts with 4-inch tops, to the acre.

spreading, fibrous root system which has made it useful for erosion control. Planted on gully banks this tree has checked soil erosion and at the same time produced trees in six years large enough to cut 7-foot posts with 4-inch tops. The wood is heavy, hard, strong, and very durable in contact with the soil, and is widely used for fence posts.

The black locust is generally attacked by the locust borer, and plantations may be destroyed by this insect unless the trees are making rapid growth. Black locust should, therefore, not be planted on extremely dry, poor sites, except where soil-erosion control is imperative and where the wood crop is not an important consideration.

PLANTING SEEDLINGS AND TRANSPLANTS

How to Prepare the Planting Site

Plowing rarely desirable. Areas which are to be reforested are generally not suited for agriculture and would not lend themselves well to plowing or fitting. Usually in Illinois, land to be reforested has been abandoned for agriculture because of soil erosion, and plowing would aggravate the erosion and tend to defeat the purpose of tree planting. For this reason plowing of planting sites is not recommended as a general practice. On grassland the sod is removed at the time of planting, from an area about 18 inches square, and the tree planted in the center of this open space.

An exception is in the use of black locust on level land for a specialized post crop, where the land may be plowed and fitted and the trees cultivated after planting. Gully sides may also be plowed down to prepare a planting site for black locust, but this is expensive and is recommended only where gullies are so steep that it is necessary to slope the soil to make tree planting possible.

Shallow furrows may be used on level areas. Shallow furrowing is advantageous on sandy soils and may be used on other soils provided the area is fairly level. *Furrowing should not be done on slopes unless the services of a person experienced in laying out level contours are available,* for a furrow dipping downhill will cause a concentration of water at the low point and may start a serious gully. Where furrows are used, the trees should be planted in the furrow and not on the turned-over sod.

Poisoning effective with weed trees. If weed trees, such as thornapple, black jack oak, and hickory, are sufficiently numerous to interfere with the plantation, they may be killed by poisoning with sodium arsenite.[1] The poison is used in a solution—1 pound to 2 pints of water—and poured into ax cuts made thru the bark near the base of the tree. Edges of the cuts should be not more than one inch apart,

[1]More detailed instructions are available in the mimeographed leaflet, "Killing Undesirable Trees With Poison," from the Extension Forester, University of Illinois, Urbana.

FIG. 11.—SHALLOW FURROWS ADVANTAGEOUS ON SANDY SOILS

Where the land is level, trees may be planted in shallow furrows, as in the sandy soil above. *(Photo by U. S. Forest Service)*

and only enough solution used to fill each cut. To be most effective the poisoning should be done in November or early December.

Small brush may be left. Small brush need not be removed from the planting site. Where it can be left in strips or patches, it will provide open areas for wildlife. Scattered thorn apple, wild crab, plum, and cherry should also be left near such open patches and along the borders of the plantation.

Nursery Stock Must Be Planted Promptly

Nurseries usually ship trees by express in wooden crates or burlap bundles, with the roots packed in moist moss. The purchaser is notified when his trees are shipped, and he should keep in close contact with the express office, so that the trees may be taken to the planting site immediately upon arrival. A delay may cause heating and killing of the roots. At the planting site the trees should be unpacked, heeled-in, and planted as soon as possible.

By heeling-in is meant the placing of the trees upright in a trench and the packing of soil firmly around the roots to keep them moist. To do this make a trench deep enough to accommodate the roots of the trees without bending, and make one side of the trench even and slightly sloping. Cut the strings around the bundles of trees and

spread the trees along the side of the trench. Replace the soil and be sure that it is worked in around the roots and packed tightly. Do not leave any roots exposed. After the trees are heeled-in, water the trench thoroly and put up a burlap or board shade if the trench was not made in a shady place.

Keep Tree Roots Moist During Planting

Trees are best carried in the field in a galvanized bucket about one-fourth filled with water. The bucket can be loosely filled with trees from the heeling-in trench, and the roots kept moist while being carried in the field. Before taking hardwood seedlings into the field, prune off any broken roots above the break with a smooth slanting cut to lessen possibilities of root decay. If coniferous seedlings or transplants have exceptionally long roots, prune off the long, straggling roots, but be careful not to remove more than one-fifth of the root system. In planting, take the trees from the bucket *one at a time, after* the hole for the trees is prepared.

Care must be taken at all times to keep the roots of the trees moist. Drying of the roots will kill the trees.

Vary Spacing With Kind of Tree

A spacing of 6 by 6 feet is recommended for most planting operations. This spacing will require 1,200 trees an acre. Christmas trees may be planted 4 by 4 feet, or 2,700 an acre, since the crop will be harvested before serious crowding develops. Black walnut should be given more room than other trees, or 8 by 8 feet; and other species, when planted in mixture with walnut, will require an 8-by-8-foot spacing, which means 680 trees to the acre.

In underplanting woodlands a regular spacing can seldom be used; the trees are planted irregularly in the open places. The more open the woodland, the denser the planting required. Where there is no undergrowth present in the woodland, a spacing as nearly equivalent to 8 by 8 feet as possible should be used.

Organized Planting Crew Speeds Work

Tree planters can work best in crews of two or three, with one man digging holes and one or two men planting trees. If four men are used, they can be divided into two crews of two each.

In planting hardwood trees, two men can usually plant an average of 600 trees a day. Under favorable planting conditions, or as planting experience is gained, this speed of planting may be increased con-

FIG. 12.—THREE-MAN CREW SPEEDS PLANTING

A three-man crew can plant over a thousand coniferous seedlings or transplants in a day. Hardwood trees are much slower to plant.

siderably. Coniferous seedlings and transplants usually do not require as deep holes as hardwoods and can be planted much faster, two men often planting a thousand trees in a day.

When planting is done by two, three, or four workers, straight rows can best be kept by means of flags set up in accordance with the spacing and direction of the rows to be made (Fig. 13). Four or six flags on poles of length equal to the spacing to be used will usually do. Two or three flags are set in line about 100 feet apart on the first row and at the side of the field opposite the starting point of the row. The second row is measured off from the starting point of the first row,

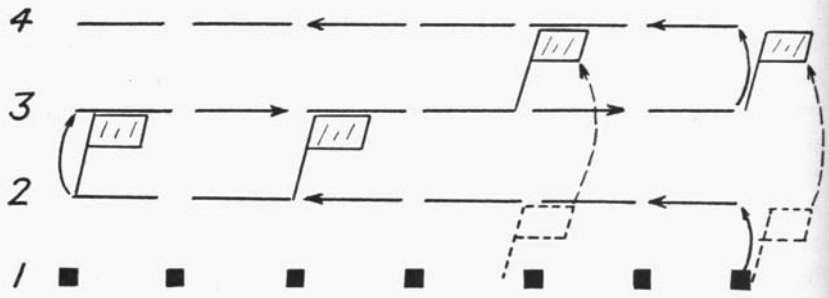

FIG. 13.—METHOD OF LINING AND SPACING ROWS WITH FLAGS

Flags are often used for lining and spacing rows when planting is done by one or two crews. Row 1 in the diagram has been planted and the flags have been moved to Row 3. The solid arrows indicate the direction of planting.

and flags are set up in line on the second row. The poles are of use in spacing the rows, and at the completion of each row the flags are moved over two rows to be ready for the return trip. Spacing in the row is kept by pacing, which can be checked occasionally with one of the measured poles.

When a large planting job is to be done, a planting party consisting of several two-man or three-man crews and a foreman is most effective. The simplest way to keep such a planting party organized

FIG. 14.—METHOD OF LINING AND SPACING ROWS WITH A GUIDE LINE

The use of a guide line is recommended in planting large areas. Five crews are needed for this guide line, one crew at each mark, with two additional men to run the line.

in the field is by the use of a guide line marked with the spacing to be used in the plantation (Fig. 14). The marks on the guide line equal the number of crews to be used, and each end is fastened to a pole equal in length to the spacing to be used. Two men are needed to run the line. The party stands behind the line, one crew at each mark, and as soon as they are in their places the guide line is moved forward by ending-over the poles. As soon as the first set of trees is planted the whole party moves up to the line, and the line is again moved forward. By this system, the party is kept compact and under easy super-

vision, and the crews waste no time trying to figure out spacing. It may be necessary for the linemen to set up flags across the field to keep the first strip straight, but thereafter the line across the field is kept by simply following the last row of trees planted.

Planting Tools Are Few and Simple

For practically all types of planting the grub hoe, or mattock, is the most satisfactory tool. Where hardwoods with long taproots are

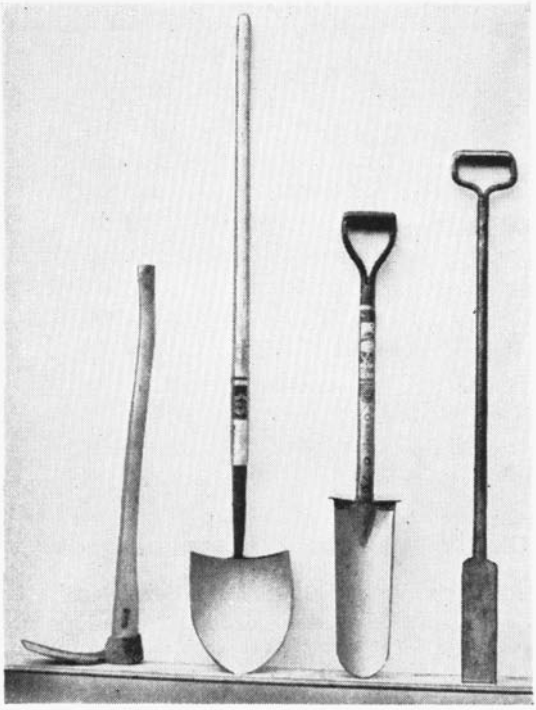

FIG. 15.—FOUR PLANTING TOOLS COMMONLY USED

The grub hoe, round-pointed shovel, tiling spade, and planting bar *(left to right)* are the tools most commonly used for planting trees.

to be planted, and the soil is not stony, a tiling spade is an effective planting tool. In planting cuttings or seeds of the oaks or nut trees, a planting bar is most satisfactory (Fig. 15). The only equipment needed other than digging tools is a 12- or 14-quart bucket for each crew.

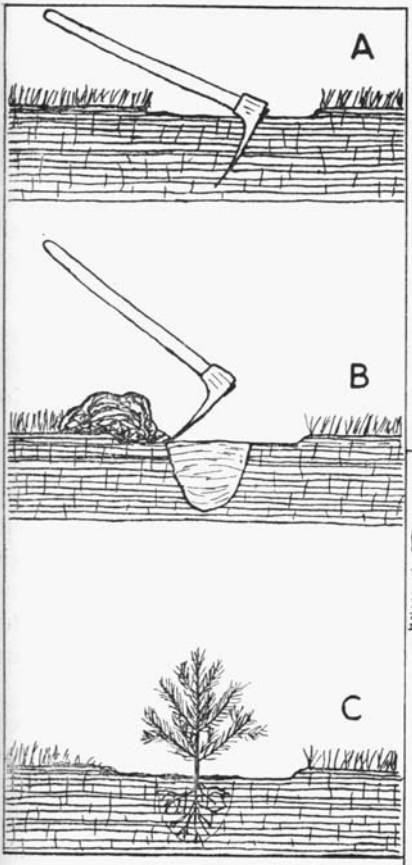

FIG. 16.—HOLE METHOD OF TREE PLANTING

All types of trees can be planted by the hole method and it can be used on all types of soils. Two or three persons form the planting crew. The three operations illustrated are discussed in the text on the following page.

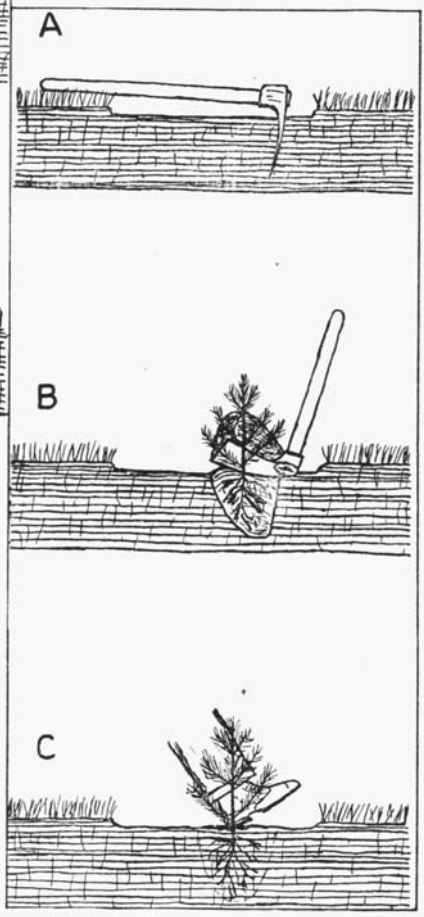

FIG. 17.—MATTOCK-SLIT METHOD OF TREE PLANTING

Evergreen seedlings or transplants are best set out by the mattock-slit method. One person can work alone when using this method (see directions in text) or two persons can work together.

Several Satisfactory Methods of Planting

Several methods of planting trees are used successfully and each method has its merits. Two of the most common and most successful methods are known as the hole method, in which any tool can be used with which a hole can be dug, and the mattock-slit method, in which only the mattock can be used. Whatever method is used, care must be taken to set the trees in an upright position at the same depth at which they stood in the nursery, and to pack the soil firmly about their roots.

The hole method. The hole method can be used on all types of soils, and is particularly well adapted to planting hardwood seedlings which have long taproots. Two or three persons—one to dig holes and the others to plant trees—form the planting crew. In planting by this method a square of sod is first removed and a hole dug in the center of this open space (Fig. 16-A). The width and depth of this hole depends on the size of the roots of the tree to be planted. The soil removed is pulverized and placed in a mound beside the hole (Fig. 16-B). The planter follows immediately, planting a tree in each hole before the soil has a chance to dry out (Fig. 16-C). The roots of the tree should be spread out in the holes in a natural position. The soil should be worked in around the roots and packed firmly, using the feet to do the packing after the hole has been completely filled.

The mattock-slit method. The mattock-slit method is adapted mostly to planting evergreen seedlings or transplants, since it does not make a hole deep enough for most hardwood seedlings. This method, however, is simple, rapid, and adapted to use in all soils except those that are excessively stony or very loose and sandy. Even in sandy soil it may be used readily following a rain when the sand is still moist. One person can work alone when using this method or two persons can work together, one wielding the mattock and one planting the trees.

To plant by the mattock-slit method, first clear away a square of sod, strike the blade of the mattock in the ground to its full depth at the far side of the open space (Fig. 17-A), raise the handle and with the same motion twist it to one side slightly so as to open the ground at the end and one edge of the mattock blade. Insert the tree in this hole in an upright position (Fig. 17-B), shake the tree to spread out the roots, remove the mattock, and allow the soil to sink back into the hole. Then tramp this soil firmly into place with the heel (Fig. 17-C).

Other methods. The use of furrows has been previously mentioned; and warning is again given not to use furrows on steep slopes unless accurate contour lines can be laid out and followed. Where furrows are used on slopes, the ridge should be turned downhill. In

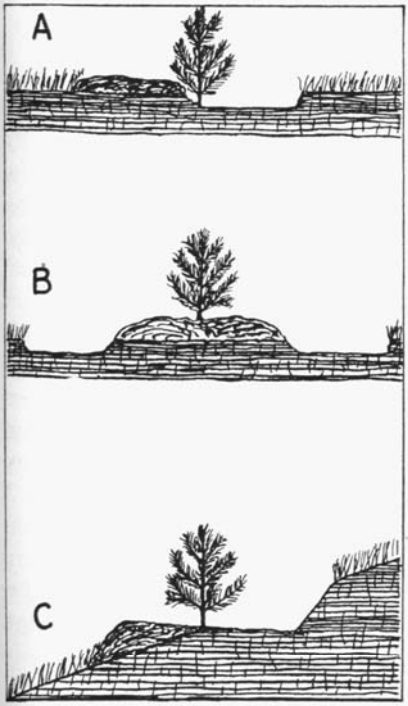

FIG. 18.—THREE OTHER TYPES OF PLANTING

The single furrow (A) may be used on sandy soil or on other soils if the land is level; fall plowing of two furrows (B) is adapted for use on wet land; shelving (C), for planting on steep slopes.

planting in furrows, the trees should not be set on the ridge nor against the land side, but in the furrow next to the ridge (Fig. 18-A).

On bottomland, where the site ordinarily is too moist to get trees started, fall plowing of two furrows with the ridges thrown together will make raised strips on which trees can be planted the following spring (Fig. 18-B).

In planting on the sides of gullies, best results can be obtained if each tree is planted on a shelf cut in the side of the bank and sloping back slightly. The shelf will act as a small terrace retarding the run-off of water, conserving moisture, and reducing erosion of the slope. The shelf should be at least 18 inches square and the tree should be planted at the point where the original surface of the slope meets the shelf (Fig. 18-C).

Testing the planting. Whatever method is used, test the planting job by grasping the tree by the top and tugging at it lightly. If the tree remains firm in the soil, it is well planted; if it loosens, it is poorly planted and should be reset. Try this test occasionally to see that the planting is being well done.

PLANTING WITH SEED AND WITH CUTTINGS

A Few Trees May Be Planted From Seed

Forest plantations are most commonly established by planting seedlings or transplants, but there are a few trees which can successfully be started in the field from seed. These are the trees of which the seed is a large nut, particularly black walnut and the oaks. Planting of seed is inexpensive, since the seed can usually be collected locally. The long taproots of the seedlings can develop without being broken, an accident that often happens to nursery-grown seedlings. Direct seeding is useful in restocking woodlands where it would be difficult to dig holes in the root-filled soil.

Because of the possibility of severe losses due to rodents, the seed should be collected in the fall, layered in sand over winter, and planted in the spring. It can be stored safely in a pit, or in a wooden box placed in a pit, with alternate layers of seed and moist sand 2 to 3 inches thick. The pit should be located so that water will not drain into it, and it should be covered over with soil. Red-oak acorns may be air-dried for a short time before being stored, but white-oak acorns should be gathered and stored as soon as they fall from the trees. The pulpy outer shuck should be removed from black walnuts before they are stored.

Planting the seeds should be done as early in the spring as possible. In planting, clear a space about 18 inches square, loosen the soil, plant at least two seeds one to two inches deep, and then firm the soil over them. If more seeds than one germinate, the extra seedlings should be removed within two years.

Cuttings Used for Cottonwood and Willow

Cottonwood, often used for planting on moist bottomland, and willow, used for planting along stream banks and the bottoms of gullies, can be planted at least expense in the form of cuttings. Cuttings may be purchased from commercial nurseries or may be collected locally. The cuttings should be collected in the fall, after the leaves have fallen, and stored over winter.

To make cuttings, cut sections 15 to 18 inches long from the branches of the cottonwood or willow, being sure that these are taken from two-year-old wood and that each cutting includes at least three buds. To store the cuttings, tie them in convenient-sized bundles and bury them in the soil in a well-drained place. They also may be placed in moist sand in a wooden box and the box buried in the soil.

Planting should be done in the spring as soon as the frost is out of the ground. In planting place the cuttings in the soil with the buds pointing upward and at a depth of at least two buds below the surface. A planting bar, a light crowbar, or a dibble made from any long, wooden tool handle will be satisfactory. Thrust the bar into the soil deeply enough to make a hole to accommodate the cutting, insert the cutting in this hole, then thrust the bar into the soil at the side of the hole, and push the soil solidly around the cutting.

CARE OF THE PLANTATION

Provide Protection Against Injuries

Once a plantation is successfully established, little further work will be required other than protection against injuries. Plantations must be protected against damage from grazing, fire, insects, and

FIG. 19.—A FIRE LINE SHOULD ALWAYS BE PROVIDED

Six or eight furrows plowed around a plantation are effective as a fire line. Where plowing might aggravate soil erosion, the fire line should be made by clearing a strip of weeds and brush.

disease. Plantations established under the Agricultural Conservation Program will not be approved unless adequate protection has been provided.

Livestock of all kinds must be kept out of forest plantations. Live-

stock destroy trees by browsing, injure them by trampling, and pack the soil so that favorable growing conditions do not exist. If land can be successfully developed for permanent pasture and the area is needed for pasture according to the best farm plan, then it should not be planted to trees.

Protection from fire is also essential. In a few moments a fire can destroy a plantation it has taken years to develop. Fire protection should be made effective and yet as simple as possible. The best fire protection is *fire prevention*—careful watchfulness for fires which may burn into the plantation and the enlistment of the cooperation of neighbors to watch for fires and to use care in burning refuse. Disseminating information on state forest fire laws to neighbors and local sportsmen's organizations should also be helpful in reducing fires locally.[1] Forest fires destroy not only food and cover for wildlife, but they destroy a great amount of wildlife itself. If wildlife conservation is included in a reforestation program, sportsmen will be particularly interested in helping protect such plantations from fire. Actual protection of the plantation can be provided by fire lines of six or eight furrows plowed around the plantation. Where furrows plowed down a slope might aggravate soil erosion, the fire line should be made by clearing a strip of weeds and brush and keeping this strip cleared except for a close sod.

Insects and diseases may injure plantations, but this subject is too broad to be discussed in detail here. Protection consists of watching for evidence of outbreaks of diseases or insects, identification of the pest, obtaining control recommendations, and applying control measures as recommended. To identify forest tree pests, send specimens showing the damage to the EXTENSION FORESTER, University of Illinois, Urbana, Illinois.

Replanting Necessary in Young Plantations

If the planting work is well done and seasons are favorable, the loss of trees in a new planting should not be more than 5 to 10 percent. If over 20 percent of the trees are lost, the stand will not be dense enough to develop a satisfactory forest and the area should be replanted. Replanting should be done in the planting season following occurrence of losses and, if possible, stock larger than the original planting stock should be used.

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[1]Detailed information about Illinois forest fire laws may be found in "Illinois Forestry Laws" available on request from the Division of Forestry, Department of Conservation, Springfield, Illinois.

Cleaning, Pruning, and Thinning Necessary

Often volunteer native growth of inferior trees may come up in a planted field and seriously interfere with the development of the plantation. If this happens, it will be advisable to clean the plantation by cutting back the interfering trees. These need not be cut off close to the ground, but they will sprout less if lopped off two or three feet above the ground. A heavy corn knife is a convenient tool for doing this work.

To produce clean, high-quality, knot-free logs, it is advisable to prune planted forest trees. The trees are planted close together so that they will make rapid, straight height growth and will kill off the lower side branches by shading. The dead side branches, however, may persist for several years, and each branch forms a knot so long as it stays on the tree. Pruning need not be done until the trees are from 3 to 5 inches in diameter at breast height, and then only the best trees, selected to make a stand of 200 to 300 trees an acre, need to be pruned. The poorer trees will eventually be removed in thinnings. Selecting crop trees 12 to 15 feet apart will leave a satisfactory stand, but often it is neither advisable nor possible to follow this spacing exactly.

Pruning should always be done with a saw, and the branches should be cut off flush with the bark of the main stem. It is not harmful to remove a few live branches, but a tree should never be pruned up more than one-half its height. In black locust plantations early pruning may be necessary to assure development of straight fence posts, since these trees often branch out heavily. The branches removed should be left on the ground to decay and return to the soil.

COSTS AND RETURNS

Planting Costs Range From $10 to $15 an Acre

The probable cost of establishing a forest plantation will often determine the extent of planting that can be done in any one year. An exact statement of the costs cannot be given since costs will vary with the cost of the trees, including shipping charges; prices of labor and planting experience of labor; type of ground cover; kind of soil; and the method of planting.

Two men, working together, may plant anywhere from 600 to 1,000 trees a day. The cost of planting will vary accordingly from $10 to $15 an acre. Where trees are purchased from the Division of

Forestry of the Department of Conservation, the cost of establishing plantations will average about $12 an acre.

It should always be kept in mind that careful planting is worth more than low costs. A hurried job may mean careless planting, resulting in a heavy loss of trees and necessitating replanting, which may double the cost over that of careful planting at the beginning.

Returns Indicated by Present Illinois Plantations

The wide variation in the growth of different kinds of trees on different soils, coupled with the fact that there are so few plantations in the state old enough to have a market value, make it difficult to say what returns may be expected from each kind of tree over a definite period of years. Even with definite growth figures available for Illinois, possible fluctuations in stumpage values in future years would make it difficult to estimate the value of trees on any given date.

The timber grower can be assured that the outlook for future timber prices is bright. The value of standing timber seldom goes down, and will probably tend to rise in the future. At the same time, costs of planting are being reduced by the development of less costly planting stock, better planting methods, and the availability of information that will help the tree planter to do a more successful job. The Agricultural Conservation Program of the Agricultural Adjustment Administration recognizes the value of reforestation, and offers benefits in the form of practice payments and diversion payments for the planting of trees for soil conservation.[1] Thus the landowner who plants trees today can do so at a minimum of expense and can probably expect greater returns in the future than the wood crop he plans to grow would bring on the market today.

Some of the forest plantations in Illinois which have reached merchantable size can be used as indicators of what results may be expected from reforestation. For instance, a 55-year-old plantation of European larch in Bureau county now has trees over 20 inches in diameter at breast height and contains 30,600 board feet of merchantable timber an acre (Fig. 7, page 15). Occasionally a few trees are removed to furnish lumber for building or repairs, and every tree removed has cut three 16-foot logs besides the topwood. This is by no means as good growth as these trees could have made had they not been overcrowded for the last twenty years. Studies of the stumps

[1]Because of possible changes from year to year, details are not given here. For further information consult your county Agricultural Conservation committee.

showed that the trees had made about three quarters of their growth in the first 35 years. Based on the current price of lumber commonly used for the purpose for which the larch is now being used, this plantation has a value on the stump of $460 an acre.

FIG. 20.—MERCHANTABLE PINE LOGS PRODUCED IN FIFTY YEARS
This white pine plantation set out fifty years ago in Grundy county now contains about 27,000 board feet of timber an acre.

A plantation of white pine in Wayne county is 25 years old and contains trees 12 inches in diameter at breast height. If the present growth continues, these trees will make good merchantable logs in 40 years, totaling about 40,000 board feet an acre and worth at least $600 on the stump, which represents an annual earning of $15 an acre. White pine planted on sandy soil in Ogle county has reached 14 inches in diameter in 33 years and will be merchantable as saw logs in 50 years. Another plantation of white pine in Grundy county (Fig. 20), containing 27,000 board feet an acre, is merchantable at 50 years.

The hardwoods are slower growing and cannot be expected to produce a wood crop so quickly as the conifers. Growth studies made in Illinois[1] indicate that it takes black walnut 40 to 50 years to make a 10-inch tree; white oak, 60 to 70 years; red oak, 50 to 60 years; tulip poplar, 35 to 45 years; ash, 40 to 50 years; and cottonwood, 15 to 25 years. Where hardwoods are to be planted, a long rotation must be planned. Probably cottonwood, tulip poplar, basswood, black locust, and osage orange are the only hardwoods that can be expected to produce merchantable wood crops under 70 years of age.

FIG. 21.—"PAY" LOGS CUT FROM A FARM WOODLOT IN WHITESIDE COUNTY, NORTHERN ILLINOIS

Well-managed native woodlands have for years produced crops like this. Now many far-sighted farmers and landowners are reforesting areas from which the natural tree growth was unwisely removed.

In planting forest trees a mixture may often be planned so that certain trees can be cut for short-rotation crops to bring in an intermediate return to support carrying charges for the longer-rotation timber crop. Thus European larch planted with white pine or red pine may be removed at an early date and used for posts or poles. Spruce planted with pine may be cut for Christmas trees. Also thinnings in pine plantations may be utilized for mine props to bring in an early return. In a pine plantation in western Illinois, Norway spruce

[1] "Third Report on a Forest Survey of Illinois," C. J. Telford, Illinois State Natural History Survey, Urbana, Illinois.

was used to fill in spaces where the pines had failed. The spruce trees are now seven years old and 75 percent of them are ready to be used for Christmas trees.

The growing of Christmas trees for a short-rotation tree crop deserves greater consideration in Illinois. Christmas trees are shipped into Illinois from as far away as the West Coast, while thousands of acres in this state lie idle and subject to soil erosion. One Christmas tree plantation in Livingston county, planted in 1932 with 1,200 trees to the acre, was selling at an average of 40 cents a tree in the winter of 1936-37 (Fig. 22). About 1,000 trees an acre survived, and at this rate the plantation is worth $400. Costs have been about $50 an acre,

FIG. 22.—NORWAY SPRUCE FOR USE AS CHRISTMAS TREES

This five-year-old Christmas tree plantation in Livingston county shows what can be done with Norway spruce as a short-rotation tree crop. These trees sold at an average of 40 cents each in the winter of 1936-37.

leaving a net earning of $70 an acre a year. This plantation is on better soil than would ordinarily be reforested, but if it took these trees 15 years to become marketable, the return would still be about $20 an acre a year.

The black locust makes another short-rotation tree crop, to be harvested in the form of fence posts, but black locust should usually not be planted in mixture with other trees. In 1931 black locust was planted on badly eroding land in Schuyler county to stop gullies from cutting into good cropland. These trees have completely checked the erosion and today an acre will cut 500 fence posts measuring 7 feet by 4 inches (Fig. 10, page 20).

The financial considerations are naturally important in a tree-planting enterprise, where an investment is concerned in land and land improvements. However, landowners in Illinois are cautioned not to look only to the dollar to be earned, but to consider also other benefits to be derived from reforestation. There are thousands of acres of land in Illinois from which rapid runoff water and serious losses of soil can be checked successfully only by the use of trees. If loss of water and erosion from such land can be stopped with trees, tree planting is profitable regardless of the cash value of the trees. It is profitable not only because of the saving of the area actually planted, but more so because of the prevention of further erosion into good cropland adjacent, and because of the conservation of water.

STATE AND FEDERAL ASSISTANCE

STATE AND FEDERAL AGENCIES STAND ready to assist Illinois farmers who desire to establish forest plantations on their lands.

The State Department of Conservation, thru its Division of Forestry, has established tree nurseries, where stock suitable for Illinois plantations is being grown for distribution to landowners.

The Extension Service of the University of Illinois, College of Agriculture, and the *State Natural History Survey,* jointly thru the Extension Forester, will advise farmers on their forest planting problems. They will also assist 4-H club members enrolled in forestry projects in starting plantations of their own.

Within C.C.C. camp areas the *U. S. Soil Conservation Service* is helping soil-conservation cooperators to establish forest plantations where they will control soil erosion.

For further particulars, write:

EXTENSION FORESTER, UNIVERSITY OF ILLINOIS
URBANA

FOREST PLANTING IS THE SOLUTION to the problem of idle or eroded land on many Illinois farms. Acres of once good crop or timber land can be saved from further destruction by being planted to trees. Shelter belts will help to lessen wind erosion. Sandy wastes can be redeemed. And these wooded acres will provide a haven for wildlife, an economic as well as a pleasure asset to any farm or community.

To start a farm plantation is neither costly nor difficult. Maintenance is simple. And added to the other benefits are the ultimate returns to be realized in usable or marketable timber.

Where other generations have thoughtlessly destroyed, this generation has an opportunity to build.

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