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THE UNIVERSITY OF NEBRASKA
AGRICULTURAL COLLEGE EXTENSION SERVICE

November, 1927 Extension Circular 1721

Planting and Caring for Forest Trees in Nebraska

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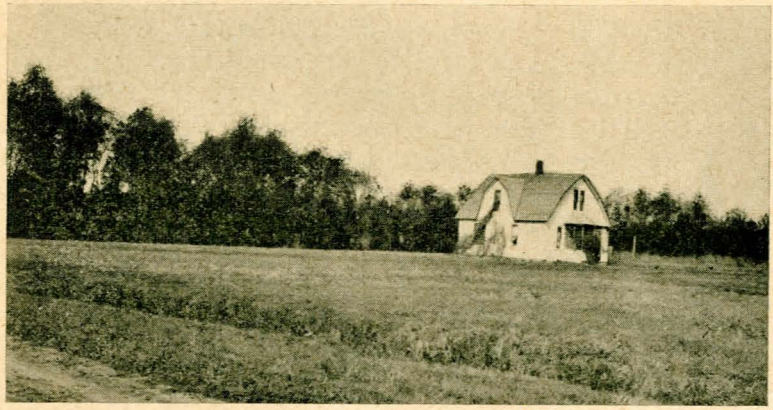

UNITED STATES
DEPARTMENT OF AGRICULTURE
CO-OPERATING

Plant Carefully, Till Thoroughly and Trees Will Grow

The primary purpose of farm forestry in Nebraska is wind protection for farm crops, farm buildings, and livestock. However, there are many other benefits derived from a general tree planting program. Trees are capable of producing posts, poles, lumber, and fuel from otherwise unproductive land. A farm well planted with trees is a more attractive and more interesting place to live than one barren of any tree growth. Something permanent that is growing and developing from year to year not only adds interest but is a sign of progress. The purpose of this bulletin is to emphasize the importance of careful planting and thoro care of forest tree seedling stock, and to mention briefly methods of managing the farm woods.

Planting and Caring for Forest Trees in Nebraska

CLAYTON W. WATKINS, EXTENSION FORESTER

Forestry in an agricultural state must be handled so that it will fit in with the general scheme of farm management. One of the first things to consider is making every acre pay. Many farms in Nebraska have small irregular or inaccessible areas from which no revenue is realized. Here is where tree planting will reclaim an otherwise unproductive area. Every farm has use for posts, poles, fuel, and lumber, and if these can be grown on unused land it is not only a convenient but profitable arrangement.

Perhaps the primary object of farm forestry in Nebraska is wind protection for crops, livestock, and farm buildings. It is rather difficult to realize what a change in conditions would be brought about by a thrifty twelve or fifteen year old windbreak or woodlot on every farm. However, eastern Nebraska is an example of what tree planting can accomplish. Sixty years ago this section of the state was more barren of trees than a lot of western Nebraska is today. Trees will not stop wind but they will act as a check or diverter, and windbreaks, shelterbelts, and woodlots now scattered over a good portion of the state have done a great deal toward breaking up that direct sweep of wind which not only blows the soil but uproots and breaks off a great deal of grain.

A shelterbelt of one or two rows of trees along the windward side of a field that is subject to blowing will soon pay for itself in protecting crops. A shelterbelt is effective for about twenty times height, that is, a belt of trees thirty-five feet tall will protect a 700 foot strip of field.[1] An increased yield of ten per cent in the area influenced by this thirty-five foot shelterbelt will compensate for a total loss on a two-rod strip next to the trees.

THE GROWTH OF A TREE

A tree is a plant not unlike other plants with which man is more familiar. It will respond to cultivation just as readily as corn.

A tree consists of an upright branching stem, roots, leaves, flowers, and fruit. The stem has the function of transporting raw materials from the roots to the leaves, and that of supporting the crown.

If leaves stay on a tree over winter it is called an evergreen; if the leaves fall during autumn it is called deciduous.

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[1] Bates, Windbreaks — Their Influence and Value — Forest Service Bul. 86.

Pines, spruces, and cedars (needle-like leaves) are in the evergreen class, while oaks, elms, maples, etc., are in the deciduous class. Evergreens gradually shed their leaves but never all at one time. A tree by returning its old leaves to the soil is furnishing a very good fertilizer and adding humus. The function of the leaf is to manufacture plant food from raw materials taken from the air and the soil. There is a constant evaporation of moisture thru the leaves which has a cooling effect on the air immediately surrounding a tree.

The roots serve as anchors for the tree and absorb moisture from the soil and with it small quantities of plant food. There are two types of root systems, one a tap root common to oaks, hickory, and walnut (some pines), and lateral root common to spruce, while most of our common shade trees of the west have a combination of both lateral and tap root systems and are capable of adjusting their root system to suit local conditions.

WHAT CAN REASONABLY BE EXPECTED OF FARM FORESTRY?

Protection of farm buildings from winter winds and driving snows is important. This should include the feedlot where cattle will fatten on less grain than in an exposed lot. Hot winds in summer have a drying effect on orchards, gardens, and flowers, and a sweeping spring wind, common to Nebraska, causes mechanical injury to all small plants.

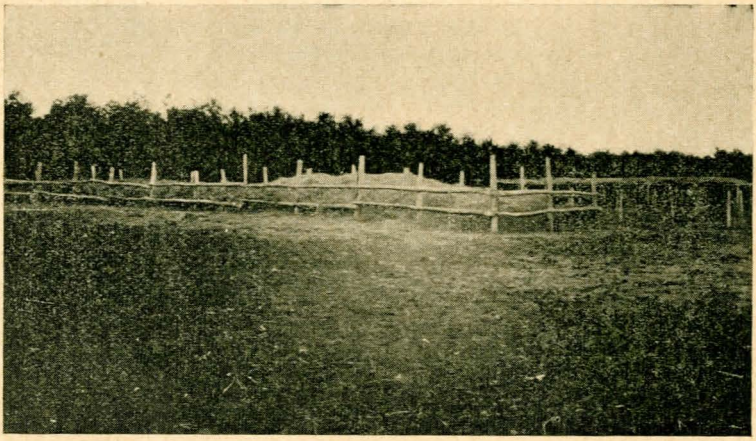

FIG. 1.—A shelterbelt gives much protection to a feed lot

Besides the factor of protection, trees add beauty to any home. By increasing the beauty of a place its value is in-

creased. Trees, shrubs, and flowers growing around the home add interest and can be enjoyed by all members of the family.

Posts, poles, fuel, and lumber are some of the forest products that will eventually come from the farm woods. Some of the post material will require creosote treatment but this is not a difficult nor expensive process.

One or two rows of rapid growing seedlings planted along an exposed side of a field will be of some value as a windbreak and snowfence within three or four years. While these are growing, a row of pines or other species of a more permanent nature, with a more penetrating root system, can be started. When the rapid growing variety reaches post size, which ordinarily would be ten or twelve years, they may be taken out leaving the evergreens as a permanent crop windbreak. Snow held on a field by any obstruction is an important factor in moisture conservation, evidenced by the rapid early growth of fall planted crops behind a highway snowfence.

PREPARATION OF SOIL

Where it is possible the ground to be planted should be plowed [1] in the fall and allowed to lie over winter in a rough loosened condition. In the spring as soon as the frost is out and the soil dries out so it can be worked the ground can be worked down to a compact seed bed. Then when ready to plant a furrow can be opened for the trees with a plow or lister. Dirt can then be worked down around the tree from the sides of the furrow and the whole seedling root system will be in loose soil.

In western Nebraska where moisture is a limiting factor it is advisable to have the ground ridged between the rows; that is, have the ground sloping from the center between the rows down to the furrow where the trees are planted. This will tend to drain both winter and summer moisture into the tree row.

In sandy soil where it is not abvisable to break up the entire surface, open a furrow with a plow or lister and plant the trees in the bottom of the furrow. The sides of this furrow will offer some wind protection to the seedlings until they are established, and they will not be competing, for the first year or two at least, with surface vegetation. This, of course, applies where it is impractical to cultivate.

In all cases be sure the roots are carefully spread out when planting the trees.

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[1] This does not apply to sandy soil where there is danger of blowing.

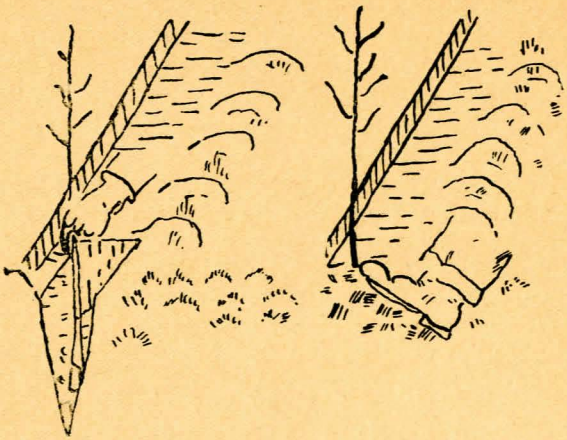

FIG. 2.— Furrow Planting

HANDLING AND PLANTING TREE SEEDLINGS

Trees should be planted as early in the spring as they can be dug from the nursery beds and shipped. Spring planting in Nebraska has proven more successful than fall planting because the seedling then has a growing season to establish itself before it is subjected to severe winter weather.

The purchaser of nursery stock should be prepared to get the shipment from the station as soon as it arrives, and if it is some distance to the farm a little water should be poured over the packing material around the roots to insure keeping them moist. It is not advisable to wet the tops, but a wet sack can be thrown over them to check evaporation while in transit. As soon as the place of planting is reached unwrap the bundle and dip the roots in a bucket of thin mud.[1] If planting can be done at once carry the trees to the field in this mud and plant directly from the bucket. By this method each foot is surrounded with saturated soil when planted.

If it is impossible to plant at once, dip the roots in thin mud as described and place them in a heel-in bed.

When seedlings are to be planted take them from the bed and again place the roots in a bucket of mud from which they will be planted directly in the furrow.

Never leave the roots exposed to direct sun or wind.

[1] By thin mud is meant a mixture of rich soil and water that will completely cover and adhere to even the smallest root hairs.

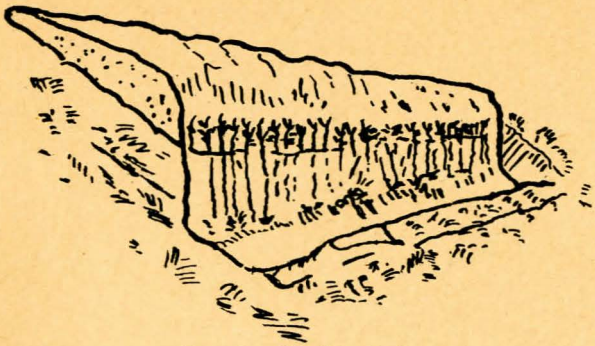

FIG. 3.— Heel-in bed

Dig trench in moist earth deep enough to bury roots and part of the stems, allowing roots to hang down full length. Be sure that when roots are covered there are no spaces left around stems for air to circulate. Have the heel-in bed in the shade if possible.

The best time to handle seedling stock is on a rainy or cloudy day.

When the seedling is taken from the bucket carefully spread the roots in all directions in the bottom of the hole or furrow then gradually work loose soil down around them keeping the roots, as nearly as possible, in the same position they would be if growing there naturally. Plant the seedling a little deeper than it stood in the nursery row.

A little extra care in planting will mean a lot toward a successful stand.

As the dirt is being worked down around the roots it should be pressed down firmly with the hand or foot being sure that no air spaces are left. (Never use sod to pack around the roots.) Continue this process until the hole is filled to within an inch or two from the ground level, then unless the soil is thoroly moist pour in about a gallon of water. Allow this is soak away and then fill the hole to ground level with a layer of loose soil. A successful tree-planter always keeps this top two inches of soil loose either by cultivation or hoeing. This method keeps down the weeds, does not allow soil to bake and crack, and has a beneficial effect on moisture conservation.

Regular and thoro cultivation of young trees is more important than artificial watering.

CUTTING BACK HARDWOOD (BROADLEAF) SEEDLINGS

In transplanting trees it is almost impossible to save all roots and for this reason it is necessary to cut back the top

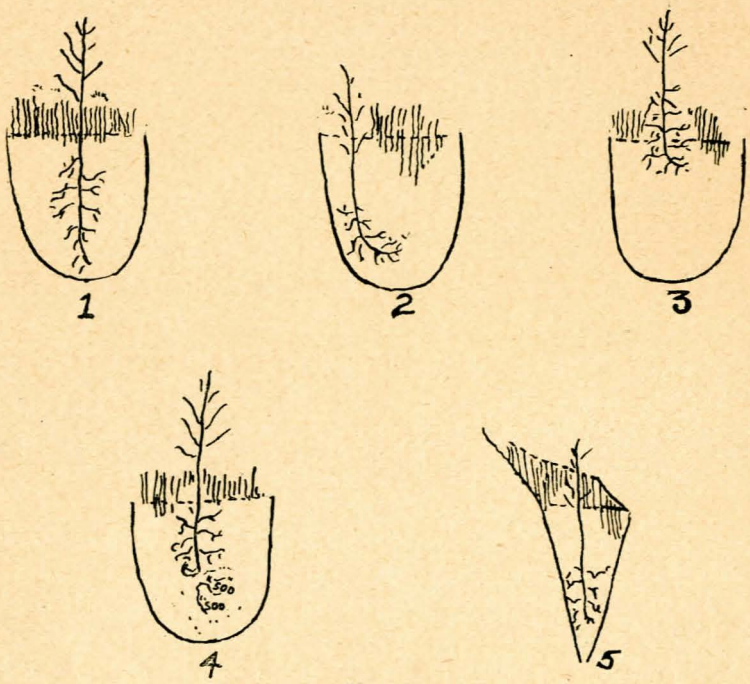

FIG. 4

No. 1.—Tree properly planted, roots spread out and soil firmed around them.
No. 2.—Careless planting, tree set too deep and roots crowded.
No. 3.—Careless planting—tree has no chance to live.
No. 4.—Sod used around roots which will leave air spaces and roots will dry out.
No. 5.—Tree set too deep in the hole.

according to the amount of root system lost in transplanting. However this is not necessary with one year nursery grown stock unless they have reached abnormal size. It is not considered essential to cut back stock under 18 inches in size but in most cases it is desirable since it will give the root system a chance to establish itself before the top gets large enough to evaporate much moisture. Seedlings with an excessive amount of top as compared with their roots can be cut back before shipping. This lowers the cost of transportation and does not interfere with the growth, in fact, oftentimes, growth is stimulated. When tops are cut back a sharp knife should be used in order to avoid bruising the bark.

Evergreen seedlings should not be cut back. The construction of their leaves (needles) is such that there is much less evaporation than in the case of broadleaf trees.

CULTIVATION

A planting of forest tree seedlings should be considered an agricultural crop and cultivated regularly until the trees are too large to get over with a cultivator at which time the crowns will shade the ground thus holding moisture and keeping out weeds. Cultivation will keep the soil from drying out or cracking. After the first year shallow cultivating close to the trees is advisable in order to avoid cutting newly developed roots. Experience has shown that regular cultivation thruout the growing season, and especially after each rain, is more important than artificial watering.

Cultivation should be discontinued August 1 in order that the trees have time to harden up somewhat before cold weather.

Transplanted tree seedlings cannot compete with native weeds that are well established.

STRAW OR HAY MULCH FOR TREES

It is generally considered that a permanent mulch for growing trees is not advisable. However, some plantings have been successful by using this method and it is probable that there are cases where this procedure would prove best. A heavy mulch will hold the moisture near the surface of the ground which encourages surface rooting of trees. Such a root system cannot withstand a severe dry spell nearly so well as one that has penetrated more deeply into the soil. A tree with a surface root system is often windthrown by an ordinary straight wind. A mulch provides a harbor for rodents and insects that are often injurious to young trees. A mulch of bright colored straw will reflect heat from the sun and scald the tender stems.

If a mulch seems advisable for winter protection use old discolored hay, sawdust, or partially rotted chaff from a straw pile. This should be applied about the time the ground starts to freeze in the fall and removed when the frost is leaving the ground in the spring.

PRUNING

Trees planted for the purpose of wind protection should never be pruned. The growth of the lower limbs is just as important as those nearer the top of the tree. Further it has been found that trees severely pruned cannot stand extreme climatic changes so well as those that were never pruned. This is especially true on the more exposed sites in the western plains section.

In pruning an ornamental tree or removing a dead or diseased limb from any tree cut close to and parallel with the trunk of the tree. This enables the wound to heal more quickly. Never leave a stub because this makes it impossible for the wound to heal. Where it is necessary to remove a large limb the first cut should be made about 18 inches from the trunk. First cut thru the bark and into the wood an inch or two on the lower side of the limb, then on the upper side and about two inches farther from the trunk cut thru until the limb falls. This method leaves only a short stub to be taken off in the final cut and eliminates the danger of tearing off a long strip of bark, which is not only unsightly but is a serious injury to the tree.

The wound left from removing a limb of any size should be painted immediately with a coat of tar roof paint, or any good white lead paint. An evergreen tree should never be pruned except to take out dead or diseased limbs.

SPACING TREES IN WINDBREAK AND WOODLOT

In spacing trees in a windbreak two factors should be considered: amount of available moisture, and the possibility of cultivation. Trees should be spaced so that they will not compete with one another for moisture during the first few years, and in cultivating there must be room for a team to get around in the planting for at least three years. A general recommendation is 8 by 8 feet offsetting the trees in every other row. However, in some sections of the state where moisture is a determining factor 10 by 10 feet should be used in order that moisture competition would not result during the first few years. The low growing hedge type species used for an outside row should be planted 4 feet apart in the row in order to get a snowbreak and a little wind protection established as soon as possible.

The general tendency is to plant trees too close together with the idea of getting wind protection more quickly, but oftentimes this results in early competition and height growth is stunted.

PLAN OF MANAGEMENT OF FARM WOODS

The farm forest should be handled in such a way as to bring in the best possible returns and at the same time be maintained as a permanent crop. This can be accomplished only by planting new trees each year as older ones are removed. An ideal farm woodlot is one with all age classes represented. The method of management depends on the purpose of the planting and the varieties of trees used.

For Shelterbelt Planting Along Fields.— Plant the cottonwood 6 feet apart far enough from the fence row so

they can be cultivated, then plant a second row of evergreens, or a more permanent broadleaf tree, a few feet to one side of the first row. These can be started more easily under the protection of the first planting and will serve as a permanent shelterbelt when the cottonwood are removed.

Improvement Cutting in the Woodlot.— In removing material from the woodlot the idea should be to favor the most promising looking trees. That is, the first thinning should remove all diseased and crooked trees. The next thinning should remove trees that are seriously crowding others and those with small crowns. All material that is being taken out can be used for posts, poles, and fuel, and trees that are growing tall and straight are being favored. As soon as the stand is opened enough for light and moisture to reach the ground interplant with young stock.

Improvement work in the woodlot can be done in winter when other work is slack.

Transplanting Trees.— When there are stands of native timber there are often dense stands of natural reproduction. In this state this applies mainly to the broadleaf trees. In such cases these seedlings should be used for planting windbreaks and shelterbelts. Where an extensive planting is to be made it is best to select seedlings 12 to 24 inches tall. These are more easily handled and their growth will not be checked as much as in the case of larger trees. Dig the trees carefully getting as much of the root system as possible. This can best be done with a spade. Pack the roots in wet straw or saw dust while they are being transported for planting. When the seedlings are taken out of this packing to be planted put the roots in a bucket of thin mud and plant them directly from this bucket. After the seedling is carefully planted take a sharp knife and cut the branches back to within about two inches of the main stem. This is necessary with native seedlings which usually have a more spreading root system than nursery grown stock. In transplanting a broadleaf tree the top must be cut back to correspond with the loss of roots.

In transplanting a large tree it is advisable to root prune it in the fall or spring one year before it is to be moved. This is done by digging a trench three or four feet deep (depending on the size of the tree) around the tree leaving a section of undisturbed earth as many feet across as the tree is inches in diameter (with a minimum of 30 inches for trees less than three inches in diameter). That is, a three-inch tree would be left in a section of earth three feet across. When this trench is dug all spreading roots will be pruned and the following year a mass of fibrous roots will be sent out around

these (cut ends) which will help feed the tree and assist in holding the dirt on the roots when it is moved. The trench should be packed full of leaves or straw to protect the new roots from frost injury.

The hole where the tree is to be set should be dug in the fall before the ground freezes then the tree can be moved before the frost is entirely out of the ground in the spring.

In lifting the tree for moving, a sloping trench can be dug up to one side of the trench made for root pruning and the tree pried over with a pole. It will be necessary now to cut any large roots that go down thru the bottom of the ball of earth. After the tree with the ball of frozen earth is securely tamped in the new hole take a sharp knife and cut all branches off halfway between their tips and the main stem.

Trees for Windbreak — Woodlot, and Shelterbelt Planting

Following is a list of forest trees recommended for farm planting in Nebraska together with a brief description of their habits of growth and requirements. These recommendations are general and do not take into consideration strictly local conditions which might increase or decrease the range of certain species to some extent. Further the list does not include all species that can be successfully planted for these purposes but includes those which will serve very well and can be secured at reasonable prices.

American Elm.— This elm is native to Nebraska and an excellent shade tree, is long lived and hardy anywhere in the state. It prefers moist rich soil but can adapt itself to a variety of sites, and can be found growing in every county in Nebraska. Its large spreading crown gives it a place in a mixed windbreak planting.

Chinese Elm.— This rapid growing tree is not native to America but has proven to be hardy. It will thrive under a variety of soil conditions but is particularly adapted to dry land planting in western Nebraska. Its ability to recover quickly after transplanting and to make unusually rapid growth makes it a desirable species for windbreak planting if the stock can be obtained at a reasonable price.

Cottonwood.— This native tree has done more for Nebraska than any other one tree species, and because of its rapid growth should be used in starting a windbreak or shelterbelt planting. It is not exacting in soil requirements and is hardy anywhere in the state. This tree should not be used as a permanent tree in a windbreak or shelterbelt but due to its quick recovery after transplanting, and rapid early growth it should be used as a nurse tree for some of the slower growing permanent species. The wood is tough and

durable when used as dimension material for buildings and if treated with a preservative makes a very durable post. Small areas of waste land along streams could well be planted to cottonwood for lumber production.

Carolina Poplar.— This tree is one of the most rapid growing species listed and is capable of making an efficient windbreak at the end of three or four years. It recovers and starts growing very quickly after transplanting. It should not be used as a permanent planting because it is subject to attacks by the poplar borer and the poplar canker either of which will in most cases prove fatal. However, the rapid growing qualities of this tree give it a place in windbreak plantings where early protection of the more slow growing varieties is important.

Box Elder.— Box Elder is a native of Nebraska and while it is not a particularly beautiful tree it has withstood some severe seasons where other varieties have failed. It is easily transplanted and makes rapid growth which makes it a desirable species in a mixed windbreak planting especially on unfavorable sites. When a satisfactory stand of more desirable trees is obtained the box elder can be taken out for fuel.

Green Ash.— Green ash attains its best development on low moist ground but is capable of adapting itself to upland or even dry situations. It was used extensively for timber claim planting and many of these plantings are still standing tho the growth has been very slow. This tree is hardy anywhere in the state and is recommended for mixed windbreak plantings in western Nebraska. It is subject to injury by borers but this is not serious enough to warrant leaving it off of the very limited list of Nebraska trees.

Honey Locust.— Honey Locust is a very hardy species, can be grown anywhere in the state, and is not exacting in its moisture or soil requirements. These qualities make it especially desirable for western Nebraska planting. It is not bothered by the locust borer which is a disastrous enemy of black locust. The wood is hard, close grained, and is comparatively durable in contact with the soil.

Hackberry.— Hackberry is not a commercially important species but is extremely hardy and native to Nebraska. It has a fibrous branching root system and for that reason is easily transplanted. This tree is used extensively for ornamental plantings because of its symmetrical spreading crown. It is also an excellent species for windbreak planting on dry sites altho it will thrive on a variety of soils.

Catalpa (Hardy).— Catalpa is a rapid growing tree, and since it does not have a compact crown is not especially adapted for windbreak planting, altho it is often used. This is an ideal woodlot tree for post production since it makes rapid growth and the wood is very durable in contact with the soil. It is subject to winter injury and is recommended for use only in the eastern part of the state, that is, east of the 99th meridian.[1] Catalpa prefers rich moist soil and is capable of making small areas of rich waste land pay dividends. A single grove of catalpa, growing on land of the finest quality in Nebraska, at the age of 18 years had a value in posts of $289.30 per acre.[2]

Cottonwood for Crop Protection.— Native cottonwood is one of the most hardy trees in this state and has done a great deal for Nebraska in the way of producing posts, poles, fuel, and lumber. Because of its rapid growth and ability to adapt itself quickly it is one of the very best species for first planting in a windbreak or shelterbelt. It will be of some value as windbreak and snowfence the third season after planting. In planting cottonwood for a shelterbelt along a field or as part of a farmyard windbreak it should be used for a short cycle. That is, take them out for fuel or posts [3] at the end of 12 or 15 years. They will have served their purpose as protection for the more permanent species and will not have the root spread at that age which will seriously interfere with adjoining ground.

Russian Mulberry.— Mulberry is a comparatively rapid growing tree, easily transplanted, but is subject to some winter injury on exposed sites in western Nebraska; however this tree is growing in all parts of the state. This tree when left untrimmed is especially good for the outside row of a windbreak, and when planted four feet apart in the row will make a quick snow-fence and the much needed early wind protection for inside rows of small evergreens. Mulberry can also be used for a single row shelterbelt planting along fields, since it has a very dense spreading crown when left untrimmed.

Russian Olive.— Russian Olive is a very hardy large shrub or small tree and can be grown anywhere in the state. It is especially recommended for an outside row in a windbreak or a single row shelterbelt in western Nebraska because of its ability to thrive on dry or exposed sites.

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[1] A line running (approximately) thru the western edge of Holt, Valley, and Franklin counties.

[2] Bates, Windbreaks — Their Influence and Value — Forest Service Bul. 86.

[3] Good for posts only after seasoning and treating with a preservative.

Caragana (Siberian Pea Tree).— Caragana is an extremely hardy shrub and can be grown anywhere in Nebraska. It is very similar to Russian olive in its soil and moisture requirements and is a good substitute for that species in farm planting. It is easily transplanted and will recover and start growing very quickly.

Black Walnut.— Black Walnut is a commercially important tree in Nebraska and is recommended for use in establishing foodlots on small areas of rich waste land. This tree will grow on the more favorable sites in all sections of the state. A few hundred of these trees growing on an unused corner of a farm will increase its sale value besides furnishing an annual crop of nuts after the trees are from eight to twelve years old. Farmers Bulletin 1392 " Black Walnut for Timber and Nuts " gives some interesting information on black walnut culture.

Western Yellow (Bull) Pine.— Yellow pine is an evergreen native to western Nebraska, and hardy anywhere in the state. This tree, like all evergreens, is slow growing as compard to most broadleaf trees, but its dense foilage and compact crown makes it an ideal windbreak species. It is not exacting in soil or moisture requirements and once established will thrive on exposed dry sites or sandy soil. It should be planted with some broadleaf species which will make more rapid early growth.

Austrian Pine.— Austrian pine is an evergreen very similar to western yellow pine in its growth habits, and while it is not a native tree has proven very hardy under the variety of soil and climatic conditions found in Nebraska. It is recommended for use with broadleaf species in a mixed windbreak planting or where it can be started without the protection of more rapid growing trees it makes a very effective single row windbreak around an orchard or along a field.

Scotch Pine.— Scotch pine is an evergreen introduced into the United States from Europe. This tree does not have the compact crown that is produced by Austrian or yellow pine but is more rapid growing than either. It is particularly well adapted to planting on sandy land but will do very well on heavy land in eastern Nebraska. Scotch pine seedlings are more easily started when planted where they will get a little protection, the first year or two, from some rapid growing broadleaf species.

Jack Pine.— Jack Pine is an evergreen naturally adapted to sandy soil and while it can be grown on heavy land it is not as desirable there as some of the other pines.

This tree has a definite place in Nebraska farm forestry especially in the sandy section of the state where it can be expected to make at least a foot in height growth per year. It has the quality of establishing itself in very sandy soil where there is little other vegetation.

Eastern White Pine.— White pine is one of the leading lumber species of the United States, and while it has been planted in Nebraska only to a limited extent the growth made in some eastern Nebraska plantings make it a very promising species for that section. There are many acres of rough land in eastern Nebraska that are unsuited to agriculture or grazing that could be producing a valuable crop of white pine timber. This tree is one of the five-needle pines and therefore can not be shipped from one state to another because of the Blister Rust quarantine. The seedling stock must be raised from seed in local nurseries.

Red Cedar.— This tree is not recommended for general farm planting in Nebraska because of its connection with the rust fungus (cedar apple) which is very injurious to apple orchards. The disease is serious enough to prohibit planting of cedar for any purpose in a section of the state where apples are important. Cedar is native to Nebraska, is very hardy and long lived, can be transplanted easily when young, and will thrive on extremely dry or exposed sites. The compact evergreen crown makes it a desirable windbreak species, but its interference with fruit crops should be carefully considered.

Catalpa for Post Production.— On rich soil these can be planted 6 x 6 feet or 1,200 trees per acre. As soon as these trees reach one post size, which should be from 10 to 14 years, take out every other tree. This will open up the stand for more rapid growth in the remainder of the stand and yield 600 posts per acre. In midsummer the year following this first cutting the stumps will send up several suckers, save the straightest, most likely looking one, cut all others away close to the stump, and this sucker will make a post much more quickly than the original tree. The next cut would be made when the trees in the balance of the original stand have reached two or possibly three post size. On a favorable site this cycle should be completed within a period of 25 years. There are many idle acres in eastern Nebraska that could well be producing posts and fuel. Catalpa does well in eastern Nebraska but is not recommended for planting in other parts of the state.

Distributed in furtherance of cooperative agricultural extension work. Acts of May 8, 1914, and June 30, 1914. Extension Service of The University of Nebraska Agricultural College and U. S. Department of Agriculture cooperating. W. H. Brokaw, Director of Agricultural Extension Service. [11-27-10M]