

# Kansas State Agricultural College

EXPERIMENT STATION.—Circular No. 20 1911

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DEPARTMENT OF FORESTRY

CHAS. A. SCOTT, State Forester

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## The Hardy Catalpa.

(*Catalpa speciosa*—Warder.)

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### INTRODUCTION.

Probably there has been no other tree so generally recommended for planting throughout the State as the hardy catalpa. Many of the plantations that are fifteen years of age or older have made good financial returns, but a large number have scarcely paid for the cost of their establishment and maintenance; still others have been complete failures. The failures have been due to one or more of several factors. However, these failures are usually accounted for by concluding that the wrong kind of catalpas were planted and that the agent from whom the trees were bought was not a reliable man. Such conclusions are very often true, but unfavorable climatic conditions and lack of cultivation account for many more failures.

The proper species is the first factor to be considered in planting. The *Catalpa speciosa* is the only catalpa that is worth planting. It is not an easy matter to be really sure that the seedlings purchased for planting are true to name. This is because the seedlings of all catalpas are so much alike that it is impossible to tell the plants of one species from those of another. This being the case, it is necessary that the selection of planting-stock be made when the different species can be identified with certainty. Fortunately, the characteristics of the seed is one of the best means of identifying the species. The only means by which a planter can be absolutely sure that he is planting the species that he wants, is knowing the seed from which the planting-stock was grown.

Seed that will produce plants true to type can be secured if due

care is exercised in selecting the seed-trees. The trees from which seed is to be gathered should be individuals of good form that have made a satisfactory growth and that bear the characteristic markings of the *Catalpa speciosa*.

In the United States there are two native species, the *Catalpa speciosa* (Warder), commonly known as the "hardy catalpa" because of its supposed ability to endure without injury a greater degree of cold than the other species, and the *Catalpa catalpa* (Karst), usually spoken of as the "common catalpa." Both of these species are found attaining to tree size and form in Kansas. The following characteristics will serve to identify these species:

POINTS OF IDENTIFICATION.

*Catalpa speciosa.*

Seed-pods from seven to twenty inches in length. The walls of the seed-pods are thick and strong, growing singly, in pairs, or occasionally three in a cluster, rarely more than three in a cluster.

Seeds one-third as broad as long. Broad brush of hairs at either end with fringe of hairs extending well along the ventral side.

Bark on old stems deeply furrowed, but never peeling off in scales.

Trunk of trees comparatively straight, seldom dividing into two or more branches of about equal size.

*Catalpa catalpa.*

Seed-pods from six to eighteen inches in length, walls of seed-pods not thick and strong. Pods quite numerous, from five to fifteen in a cluster.

Seeds fully as long as the seed of the *Catalpa speciosa*, but much narrower, the hairs at either end of the seed forming a narrow brush or pencil, but never extending along the ventral side of the seed.

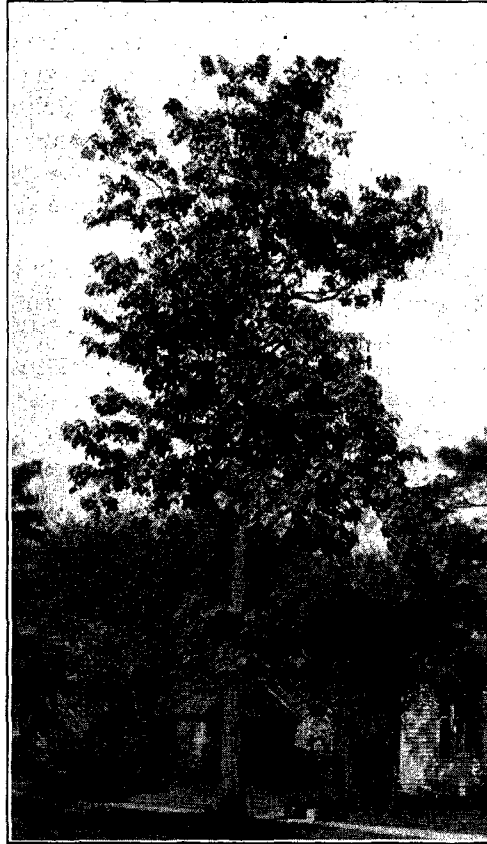
Bark even on the older stems thin and light, falling off in light scales, never deeply furrowed.

Trunks usually divided into two or more branches of about equal size.

The characteristic markings of the seed are the best means of identification. Only very wide seeds with a broad brush of hairs at either end and a fringe of hairs along the ventral edge should be accepted as pure, hardy catalpa seed.

The hardy catalpa hybridizes readily with the other species and consequently there is danger of getting inferior seed even from

the best of trees, if any of the other species are growing in the immediate vicinity. Bees and other insects are the means of cross-pollinating the catalpa. The range within which bees and insects work probably does not exceed two miles. If there are no inferior specimens of catalpa growing within two miles of the



trees from which the seed is to be gathered, the seed may be considered perfectly true to type.

The seed-pods ripen in October. They may be gathered as soon as they are ripe or allowed to hang on the trees until January or February. When the seed-pods are gathered, they should be sacked, and stored in a dry room. Within a few weeks the pods will split open upon the slightest disturbance and discharge the seed. The seeds keep for several months without loss of vitality when stored in a cool, dry place. Trees having a full crown and

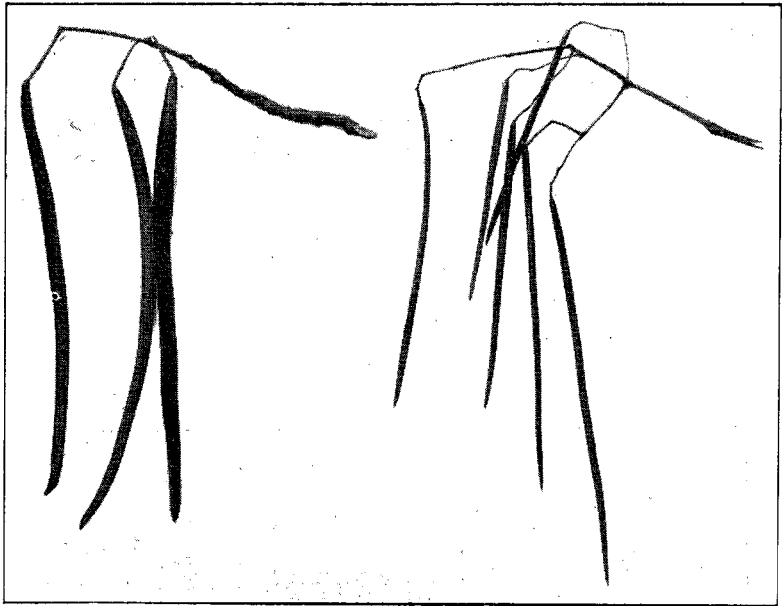
growing in the open usually produce a large quantity of seeds of high vitality.

#### METHODS OF PROPAGATION.

The catalpa reproduces readily from the seed and also by sprouts from the stumps of thrifty trees that have been cut. The seeds grow with great vigor when planted under favorable conditions and properly cultivated. The soil in the seed-bed should be made as fine as possible before the seed is sown. The physical condition of the seed-bed soil practically determines the success of the planting. The seed should be sown in broad drills three or four inches in width and one-half inch deep, at the rate of thirty-five to forty seeds per linear foot. The drills should be wide enough apart to allow cultivation by horsepower, three and one-half feet being a very satisfactory distance.

On account of the shape of the seeds and their light weight, it is impossible to sow them with a machine. In practically all nurseries the seed is sown by hand. Covering the seed is an operation that deserves special attention. The customary practice is to cover the seed with about two inches of soil. This is to insure the seed against drying out before it germinates. This amount of covering makes a mound over the drill-row. Under favorable conditions the seeds will germinate in from five to eight days. As soon as the germ has broken through the seed-coat, the mound of earth should then be raked off the drill-row until the soil immediately above the seeds is not over one-half inch deep. Mounding the drill-rows in this way has a three-fold advantage. The first is, that it keeps the catalpa seeds from drying out or perishing before they germinate. The second is, that all of the weed-seed contained in the soil covering the catalpa seed has an opportunity to germinate as quickly as the catalpa seed, and, in leveling the mound above the catalpa seed, the weeds are all killed and the catalpa seedlings come up in a clean, fresh soil. The third advantage is, that if the soil has a tendency to bake and form a crust, raking the mound down also breaks up the crust which may have formed up to the time when the catalpas are practically ready to come through the surface. But under no conditions should the catalpa be expected to grow through more than a half inch of soil. The seeds are small and the germs have not the strength to grow through a greater depth of soil than this.

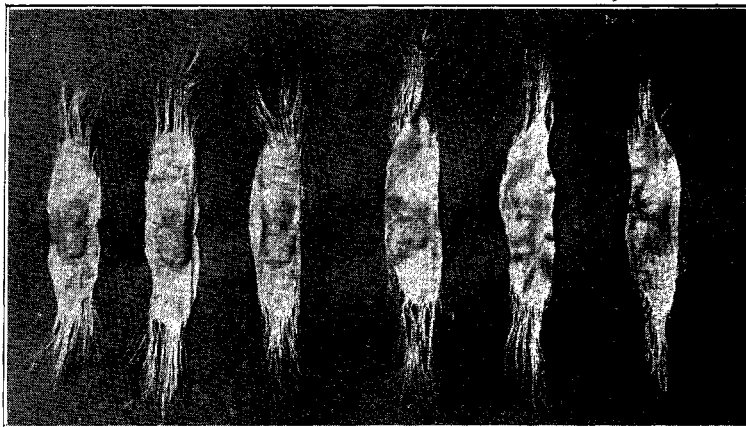
The seed should not be sown until the ground is thoroughly warm and danger of frost is entirely past. Nothing is gained by early seeding, and often the seeds perish in the ground when a period of cool weather comes immediately after planting. The



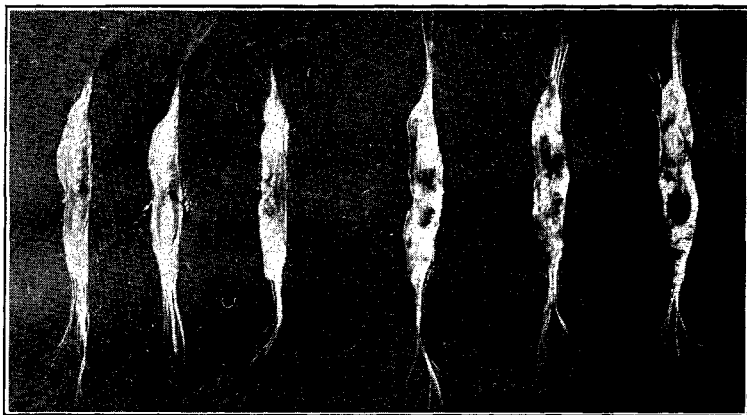
No. 1.

No. 2.

No. 1. Characteristic seed pods of the *Catalpa speciosa*.  
No. 2. Characteristic seed pods of the *Catalpa catalpa*.



Seed of the hardy catalpa, *Catalpa speciosa*, showing their characteristic form and markings.



Seed of the common catalpa, *Catalpa catalpa*, showing their characteristic form and markings.

plants grow slowly during May and June, and they require extensive cultivation during these months. As the heat of summer comes on, their rate of growth increases, and they reach a height of from fifteen to thirty inches by the end of the growing season.

#### PLANTING-STOCK.

One-year-old seedlings are the most satisfactory for extensive plantings. At this age the seedlings are strong enough to establish themselves readily in their new location, and to make a good growth the first season. They can also be planted at a much less expense at this age than they can be at the age of two years. The catalpa is very readily transplanted, and with proper care a full stand is easily secured.

In buying or grading seedlings, it is a safe policy to accept only the best. By the best are meant the largest and strongest plants of whatever age is under consideration. In nursery practice the one-year-old seedlings are sorted into three grades according to their size. Grade No. 1 includes the plants ranging in height from eighteen to thirty inches and upwards. Grade No. 2 includes the plants that are from twelve to eighteen inches in height. Grade No. 3 includes all plants under twelve inches in height. The difference in price between the different grades is from one dollar to three dollars per thousand. The No. 1 grade of trees is by far the most desirable and the most satisfactory. Grade No. 2 is quite satisfactory and altogether acceptable for extensive plantings. Grade No. 3 is the culls of the entire lot and should never be accepted in a purchase. In grading home-grown stock they should be rejected, also.

Many of the failures in attempts to grow catalpa trees are due to the planting of cull seedlings. A large per cent of the small-sized seedlings die the first year they are out. The small-sized trees also require more cultivation and care than do the larger plants.

#### PLANTING-SITE.

The hardy catalpa is exacting in its demands upon the soil. It grows naturally in deep, rich soil along creeks and rivers. Consequently, it reaches its best development in rich, well-drained bottom soils.

It is an entirely safe proposition to plant catalpa trees in any soil that will produce a good corn crop. Catalpa will not make a satisfactory growth in gumbo, poorly drained, or high, dry soils. In selecting a site, all such soils should be carefully avoided.

The catalpa is well adapted for planting on creek and river-valley

lands that are subject to inundation. Occasional floodings do not injure the trees unless their tops are submerged. The only time that this condition might occur would be during the first or second year after the trees are planted. The injury would not then be serious unless the trees remained under water for several days at a time.

A general impression regarding the catalpa is that it requires a sandy soil to attain its best development. This is entirely erroneous. The catalpa makes a good growth on sandy loam or on a sandy soil with a loam or clay subsoil, but sandy soils with coarse sand or gravel subsoil is not at all suitable for growing catalpas. In a few instances throughout the State, catalpas have been seen growing successfully on soils entirely too sandy to be used for the growing of agricultural crops. On such land the catalpas attain a height of from eighteen to twenty-four feet, but they seldom afford two lengths of posts. The returns from catalpas on such soils is probably as satisfactory as the returns from any other cultivated crop. However, they are not a profitable, or money-making, crop on such land.

#### PREPARATION OF PLANTING-SITE.

The first step in setting out a plantation is the preparation of the ground for planting. The catalpa is not a tree that can succeed under adverse conditions, and therefore should be planted only on land that has been under cultivation long enough to have completely killed all grass-sod or bush-growth. To insure a full stand of living trees and a good growth the first year, the ground in which the trees are planted must be in the best possible physical condition. When planted in good mellow soil and given good cultivation, the trees will make a growth of from three to six feet the first summer.

#### TIME OF PLANTING.

The proper time to set out catalpa trees is at any favorable time between April 1 and May 15. The exact time will vary somewhat with the season. They may be set out as soon as the ground is in good working condition in the spring. It is a serious mistake to delay planting until the buds begin to develop. Growth is in active operation in the development of the leaves and the trees should be planted before growth begins.

Fall planting may be satisfactory in the eastern part of the State, but farther west there is always a risk of losing the trees by winterkilling. Fall planting requires one year more of protection from rabbits.



SPACING.

The distance that catalpa trees should be spaced is a point on which few planters agree. The character of the soil, the annual rainfall, and the care and cultivation that the trees will receive, are factors that must determine the distance of spacing. Six by six feet is the spacing generally recommended. This spacing is quite satisfactory when all of the trees in the plantation are to grow until they are sixteen or eighteen years old. However, if some of the trees are to be cut for posts or other purposes as soon as they are large enough, and these cut promiscuously throughout the plantation, the stand is left so open that grass and weeds soon gain a footing and the trees around the opening develop heavy limbs instead of tall, straight trunks.

The sprouts growing from the stumps of cut-off trees in a plantation seldom grow into satisfactory trees because the shade from the surrounding trees prevents their development. There is, therefore, little hope that a sprout from the stump will grow up to take the place of the tree that was cut.

Too wide spacing allows heavy limbs to develop near the ground and the best form for post or pole production is not thus secured.

Where intensive methods are to be practiced, the trees may be spaced three and one-half by seven feet. By the time the trees are eight or ten years old they will be crowding each other badly, and one-half of them should then be cut out. When the plantation is thinned, the remaining trees are left seven by seven feet, which is sufficient room to permit them to reach full development. Crowding during their early period of growth is entirely beneficial, as it causes the trees to develop clean, straight stems free from heavy limbs. The stems in such dense stands are long and slender, but after the thinning the crowns of the remaining trees develop rapidly, and this is followed by an increased diameter-growth of the stem.

The trees that are cut out at eight or ten years of age are large enough to make one post each and considerable stove wood. The value of the posts and of the fuel will much more than pay for the cost of their production. The three distinct advantages gained by close spacing, three and one-half by seven feet, are:

1. The crowding of the young trees develops the best possible form.
2. The dense shade keeps out grass and weeds and reduces the amount of required cultivation.
3. The litter falling from the trees provides a mulch that protects the soil and retains the moisture.

### CULTIVATION AND CARE OF PLANTATION.

Whatever spacing distance is decided upon, it should be such as to allow clean cultivation with the implements used in cultivating the other crops grown on the farm. It is quite a common practice to grow a row of corn between the rows of trees the first year. The corn usually more than pays for the cost of cultivating the trees and thus reduces the cost of producing the crop of timber.

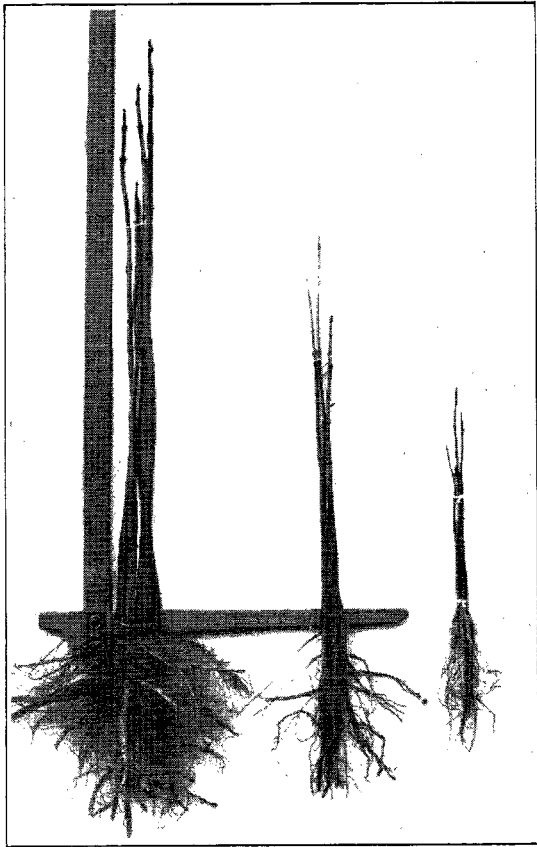
Thorough cultivation is very necessary in a newly established catalpa plantation. Like any other tree that has been transplanted, the catalpa is set in its new location with less than one-fourth of its root system to gather moisture and to nourish it until new roots can be grown. Under these conditions, the young trees require the best of treatment if they are to succeed. Trees respond to good cultivation as readily as any other cultivated crop, and the start they get the first season is distinctly noticeable for several years. The catalpa is a tree that comes into leaf very late in the spring and it is one of the very first to lose its leaves in the fall.

Cultivation is, therefore, very necessary to keep grass and weeds from gaining a foothold. A sod of grass is as injurious as a growth of weeds, or even worse. The cultivation must be continued until the trees reach sufficient growth to shade the ground completely. This growth will probably be attained during the third year.

The only care that the trees will require after cultivation ceases is protection against injury by fire or live stock. The danger of injury by fire is not great unless there is a growth of grass or weeds on the ground; the litter from the trees does not accumulate in sufficient abundance to carry destructive fires. Live stock of any kind is harmful to trees if the stock is given freedom to range in the plantation. Cattle, horses, and sheep are especially harmful on account of trampling and packing the soil about the trees. Trees demand a loose, friable soil and any treatment that compacts the soil is detrimental to their growth and development.

### PROTECTION AGAINST RABBITS.

The rabbits are the most destructive enemies that young catalpa trees have. They are particularly fond of the bark of the one- and two-year-old trees. There are several methods of protecting the young catalpas against rabbits. In small plantations where there are but a few hundred trees to be protected, a simple and

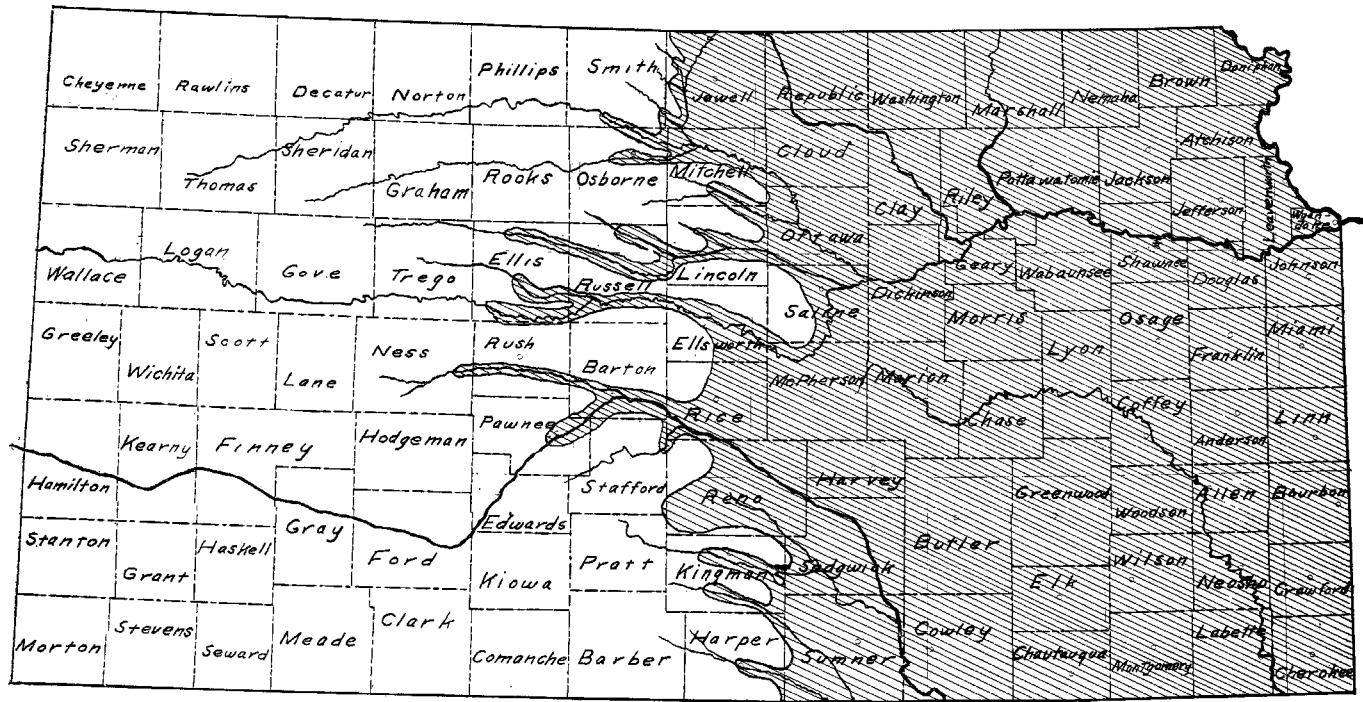


No. 1.

No. 2.

No. 3.

Grades of catalpa seedlings. Grade No. 1 consists of plants exceeding 18 inches in height. Grade No. 2 consists of plants between 12 and 18 inches in height. Grade No. 3 consists of plants under 12 inches in height.



Shaded portion shows region in which catalpas can be grown successfully in Kansas.

effective method is to wrap the stems with a tree shield, which is a strip of wood veneer fitting closely around the stem and held in place with a wire tie. Building-paper cut into strips, wrapped around the stems, and tied in the same manner gives perfect protection.

Another method of protection that has proved successful where tried is that of inclosing the young plantation with a woven-wire, rabbit-tight fence. Rabbits will seldom go over a thirty-inch woven-wire fence, but they will crawl under if the wire is not in close contact with the ground.

Poisoning has in some instances proved a very efficient method of protecting trees against injuries by rabbits. There are two general methods used; the first is to place poisoned water in the rabbit runs, especially during periods of dry weather. The second method is that of placing poisoned food where the rabbits can get it. Rabbits are fond of practically all kinds of vegetables and some fruits; any of these may be used for this purpose. The Ohio Experiment Station has had good results in destroying rabbits by dipping twigs of trees in a solution of one part of sulphate of strychnine, one part of borax, one part of white syrup, and ten parts of water. This mixture should be well shaken before the twigs are dipped in it. They are then scattered where the rabbits will find them.

Washes of various sorts have frequently been recommended for the protection of orchard trees against rabbits. The same can be used with equally good results on the catalpas. The following is recommended by the Oklahoma Agricultural Station and has been found very satisfactory: One gallon of water, two pounds of soap, two to four ounces of carbolic acid. Some prefer to add enough vermilion to make the mixture a pinkish color. This wash is painted on trees in the fall with a brush or a swab of rags tied to a stick. Another wash which is used by the same station, and which has proved very satisfactory, is made by slacking a peck of fresh lime with soapsuds, after thinning to the consistency of whitewash and adding half a gallon of crude carbolic acid, four pounds of sulphur, and one gallon of soft soap. Paint the trunks of the trees in the autumn in the manner heretofore prescribed. The United States Department of Agriculture recommends the lime-sulphur wash as having given thoroughly satisfactory results. This wash consists of twenty pounds of unslacked lime, fifteen pounds of flowers of sulphur, fifty gallons of water. The lime, the sulphur, and one-third of the water are boiled together for one

hour, and then the rest of the water is added. If salt is added the wash will stick better.

Various methods of trapping have proved satisfactory. A trap made of a half barrel sunk into the ground with a balanced swinging lid slightly smaller than the top of the barrel on which bait has been placed is quite satisfactory. When the rabbit steps on the lid, it tips and allows the rabbit to drop into the barrel. Another ingenious trap is made of a small, rectangular box with a door in one end held open by a trigger. The rabbit readily enters the box and, in moving around, releases the trigger and closes the door. The objectionable feature about this trap is that but one rabbit can be caught at a time.

One of the most effective methods of protection against injury by rabbits is clean cultivation. If food is available elsewhere, rabbits seldom frequent places where they cannot find cover. In one plantation observed for three years, in which plantation the trees were given clean cultivation, and in which there was not a weed or vegetation of any character to afford cover, not a single tree was injured by the rabbits. In another plantation not half a mile from the one mentioned above, in which there was abundance of cover, the rabbits were numerous. After four years' work in attempting to get a stand of trees, the plantation was abandoned because of the injury done by the rabbits; at the end of the four years' trial, not over fifteen per cent. of the trees showed more than a one-year-old stem. The conditions in the two plantations were very similar except for the amount of cover for the rabbits.

The best method of protecting plantations against rabbits will depend entirely on local conditions, including the area of the plantation and the amount of injury that rabbits will probably do. However, it is unsafe to set out a plantation of catalpas without preparing to protect them, in some way, against rabbits.

### CUTTING BACK.

Some catalpa growers practice and advise cutting the trees back to stumps level with the ground two years after the trees are set out. This is to secure a perfectly straight growth to the height to which the sprout will grow the first season after it is cut back. When cut back in this way, the stumps sprout freely, and, if they are properly cared for, trees of very satisfactory growth and form can be developed. However, cutting back necessitates a great deal of work that farmers seldom have time to do, and any advantage that may be gained hardly pays for the extra cost of such treatment.

If cutting back is to be practiced, the trees should be cut after they have grown two years in the permanent plantation. The stumps will send out three or four sprouts, all of which must be cut off except the strongest. Under favorable conditions this one sprout will attain a height of from six to ten feet the first season, and by the end of the second season will be as tall as the five-year-old trees that were not cut back. If one trimming of the stump-growth would answer all needs, the care of the sprout-growth would be a simple matter, but the stumps persist in sprouting, and the plantation must usually be gone over two or three times to keep the stumps free of undesirable sprouts.

On account of the excessive growth and the heavy foliage, the one-year-old sprouts are subject to considerable injury from wind-felling. The strain caused by a heavy wind splits the sprouts from the stump. Danger from such injury is entirely overcome during the second season's growth.

#### FORM AND SIZE.

In Kansas the hardy catalpa is a medium-sized tree which, when planted in groves, reaches its best financial development in from eighteen to twenty years. Trees in single rows, as in street and roadside planting, require a much longer time to reach their full development.

When closely planted in groves, the trees develop a tall, slender trunk with very few large side branches. Trees from eighteen to twenty years old vary from thirty to forty feet in height and from eight to ten inches in diameter at one foot from the ground, depending upon the strength of the soil in which they grow. The stems are reasonably straight and entirely satisfactory for fence-post purposes. The trees hold their diameter well and will usually cut three lengths of six and one-half foot posts. The catalpa is preeminently a fence-post tree; in its seedling stage it continues to grow throughout the season until checked by frost; consequently, from six inches to a foot of tender, immature wood at the end of the season's growth winterkills. The following season's growth starts from a bud somewhere on the stem below the injured portion. This causes a slight crookedness in the stem that is objectionable where a perfectly straight stick is desired. Pole size is not reached until the trees are twenty-five years of age or older, and it is only under the very best of care that they can be grown to this size without becoming infected with fungi.

## FUNGUS DISEASE.

The catalpas throughout the State are susceptible to the attacks of a fungus disease, *Polystictus versicolor*,<sup>1</sup> which very generally attacks the trees in groves after they are past twenty years of age. In some plantations the trees are attacked at an earlier age; the fungus gains entrance through wounds in those lower limbs which are killed by the shade from the upper part of the tree. The disease spreads from the point of entrance, going both up and down the trunk. Within a very few years after the disease gains entrance, the wood of the entire trunk is affected and the tree dies. The presence of this fungus is easily detected by the occurrence of brackets or punks, often spoken of as "toadstools," that appear on the surface of the infected parts, and also by the occurrence of broken limbs. In an advanced stage of the disease, the trunks of the trees are usually covered with a growth of brackets which are the fruiting organs of the fungus. The infected trees are often broken off by the wind at heights varying from two to ten feet from the ground.

The fungus destroys the strength of the wood and makes it worthless for any purpose. The only possible way of preventing injury by this trouble in a grove of catalpas is to cut the trees before the disease has developed to the point of seriously affecting the strength of the wood.

## LENGTH OF ROTATION FOR THE CATALPA.

A careful study of catalpa plantations indicates that the catalpa must be handled on a sixteen- or eighteen year rotation. At this age the trees are large enough to cut three lengths of posts that are large enough for general fencing purposes. The trees do not reach their full growth or development at this age, but the risk of losing the crop by an attack of the fungus heretofore mentioned is very great, and the increased value of larger material does not balance the risk.

## SECOND CROP.

If the trees are cut while they are in a good, thrifty condition, the sprouts from the stumps will yield a second crop of posts in from fourteen to sixteen years. This second crop of posts will nearly equal the first cutting in number and value. They will be straighter and freer from limbs than the posts of the first cutting, and quite as durable.

The care of the plantation during the production of the second

<sup>1</sup> Described in Bulletin 37 of the Forest Service, U. S. Dept. of Agri.





A twenty-seven year old hardy catalpa plantation on Mr. Geo. Newcomb's farm near Morrowville, Washington county, Kansas. The measuring board is 20 feet in length.



A catalpa tree infested with the fungus disease *Polystictus versicolor*. The sporophores or fruiting bodies appear on the surface of the bark.

crop is more simple than that of the first. To secure a good growth of sprouts the frees should be cut in March or early in April. The stumps should be cut smooth, with the slant all in one direction. In May each living stump will develop from ten to twenty sprouts that will grow very vigorously and that by the middle of June will begin to be thrown by the wind. Later in the season many of the sprouts become top-heavy and fall of their own weight, breaking at the point of union with the parent stump. In plantations where the sprout-growth is rank, the loss due to the sprouts falling of their own weight or being felled by the wind is very heavy in the first summer. During the second season's growth the union of the sprout with the stump develops sufficiently to withstand all ordinary strain.

There are two methods that have proved entirely satisfactory in handling the sprouts. The first method is to allow all the sprouts to grow untouched until the summer of the second year's growth. At this time all but one or two of the largest sprouts are cut off close to the stump. This method has been practiced extensively with good results.

The second method of handling the sprout-growth is to go over the plantation as soon as the sprouts reach a height of two or three feet, select three or four of the largest arising from each stump, and tie these together loosely with a band of binding twine. The tops of all the other sprouts are then broken off to retard their height growth. When the sprouts selected are bound together, each helps support the other and reduces the loss from wind-felling to a minimum. By midsummer, it is necessary to go over the plantation a second time to bind the sprouts again and break off the tops of the undesirable ones. The second band should be placed as near the tops of the sprouts as possible, in order to hold the stems from falling apart of their own weight. During the summer of the second year, all the sprouts are cut off close to the stump, except those that are selected for the future trees.

There are three advantages in the practice of allowing all the sprouts to grow until the second year before cutting them off. First, the full growth shades the ground and prevents a growth of weeds that would practically smother the sprouts. In every plantation that has been studied, a rank growth of sunflowers and horseweeds has grown up during the summer following the cutting. In several plantations the growth of weeds exceeded the growth of the catalpa sprouts. Wherever this occurred, the catalpas were seriously injured. In attempting to reach up into the light, they grew too slender, and were unable to support the weight of their own leaves.

Second, a full growth of sprouts greatly lessens the loss from attacks of rabbits. The protection of the sprouts against the rabbits is a very important item in caring for a grove. When all the sprouts are allowed to stand over the first winter, the rabbits feed on the smaller stems, and the larger stems often go through the entire winter untouched.

Third, when a full growth of sprouts is permitted the first season, the cost of sprouting the stumps is reduced to a minimum. One cutting of the sprouts during the second season's growth is all that is required. The second growth of sprouts that appears after this cutting gradually fails on account of lack of light. The dead stems are unsightly for a year or two, but they in no way interfere with the growth of the second crop of trees.

The method of selecting the future tree early in the first season and cutting off all the other sprouts — which method has been frequently advised—is not practical. The loss by wind-felling of the sprouts thus selected is excessive. Success in growing catalpas is determined largely by the cost of the labor expended upon them. The very least amount of labor that will produce the desired growth is the watchword that must be constantly kept in mind. Successive sprouting is a waste of time as well as an unwarranted expense that must be charged against the cost of growing the crop.

Whenever cultivation is possible, the ground between the rows of trees should be cultivated during the summer immediately following the cutting. A disk harrow is the most satisfactory implement for such cultivation. The cultivation at this time is very necessary to keep down the weeds that would otherwise take possession of the ground. Cultivation that keeps the surface soil in good physical condition greatly increases the rate of tree-growth. On the other hand, a lack of cultivation results in a heavy growth of weeds, which, after they ripen, afford the greatest kind of cover and protection for rabbits, which in turn live on catalpa bark throughout the winter, girdling and injuring many valuable trees. The presence of the dry weeds also increases the danger of the destruction of the trees by fire. If a fire should once get started in such a mass of dry vegetation, it would be impossible to stop its progress until it burned itself out. The cultivation prescribed would cut and injure some of the surface roots, but this injury is not worthy of mention in comparison with the injury that would result from a fire running through the trees.

If the trees of the original planting are allowed to grow until they become infected with fungus, their ability to reproduce by

stump sprouts is seriously impaired, and a second crop is very uncertain.

### CUTTING.

A second crop of posts from the stumps must always be considered in connection with the cutting. To secure the best second growth, the trees should be cut late in the winter or early spring; March is a very desirable month. The stumps should be cut low so as to insure a sprout-growth from as near the surface of the ground as possible. A smooth stump with the slope all in one direction is desirable to avoid pockets that will hold rain or snow water and will thereby induce fungus attacks.

### SEASONING.

The value of thoroughly seasoning the catalpa posts before setting them cannot be overestimated. To air-dry posts and poles thoroughly will require from six to nine months' time, depending upon the season and also upon the size of the posts.

The seasoning can be most quickly and satisfactorily accomplished by piling the posts in an open pile in alternating tiers of three and seven posts each. This order of piling admits of abundance of light and free circulation of air. The bark of the catalpa is very thin and does not seriously interfere with the seasoning of the posts. It clings tightly to the seasoned wood and is not detrimental or objectionable on the post.

The value of thoroughly seasoning posts or poles before setting them is that drying the wood increases its durability. Bacteria and fungi that cause decay can exist and develop only in a moist medium. Therefore, if the wood is dried before it is set in the ground, it greatly lessens the opportunity for fungi to attack it.

### DURABILITY AND CHARACTER OF CATALPA WOOD.

The catalpa wood, wherever known, is recognized as one of the very durable woods, second only to the Osage orange and the red cedar. In spite of its reputation for durability, some complaints have been received to the effect that the posts are short-lived and not satisfactory. An investigation of several such unfavorable criticisms regarding the value of the posts has led to the following conclusions:

First, the posts were set before they had been seasoned; or

Second, the trees were infected with fungi and the strength and durability of the wood were seriously impaired before the trees were cut.

When the trees are cut while they are in a perfectly healthy condition, whatever their age, and the posts thoroughly seasoned before they are set, the wood is very durable and satisfactory for fence-post purposes. The wood is light, but strong enough to resist the required strain of the fence, and it holds staples very satisfactorily. The posts are clean, smooth, pleasing in appearance, and easily handled.

In general repair work on the farm, the catalpa is a very serviceable wood. It has been used with entire satisfaction for sweeps on horsepowers, for tongues of all sorts of implements and vehicles, and for doubletrees, singletrees, and neckyokes.

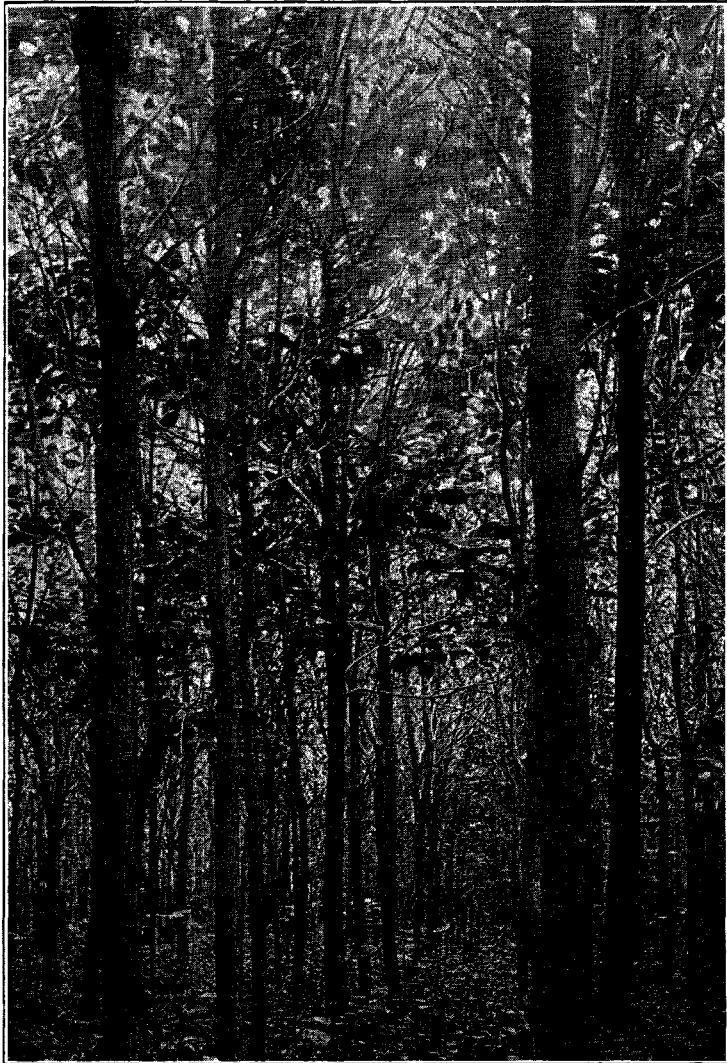
#### RANGE OF SUCCESSFUL GROWTH.

The hardy catalpa is an introduced tree in this State, its natural range being throughout southern Ohio, Indiana, Illinois, eastern Missouri, and southward. The range for growing the catalpa on a commercial scale in Kansas is confined to the eastern half of the State. To draw a line defining the western limit of successful groves of catalpa, the line between Jewell and Smith counties projected south to the southern boundary of the State is a safe division. West of this line the catalpa can be grown successfully only in favored sites on low ground along the water courses. Under no consideration should the catalpa be planted on the high prairie land of western Kansas. It cannot endure the dry summers and prevailing wind of that section of the State.

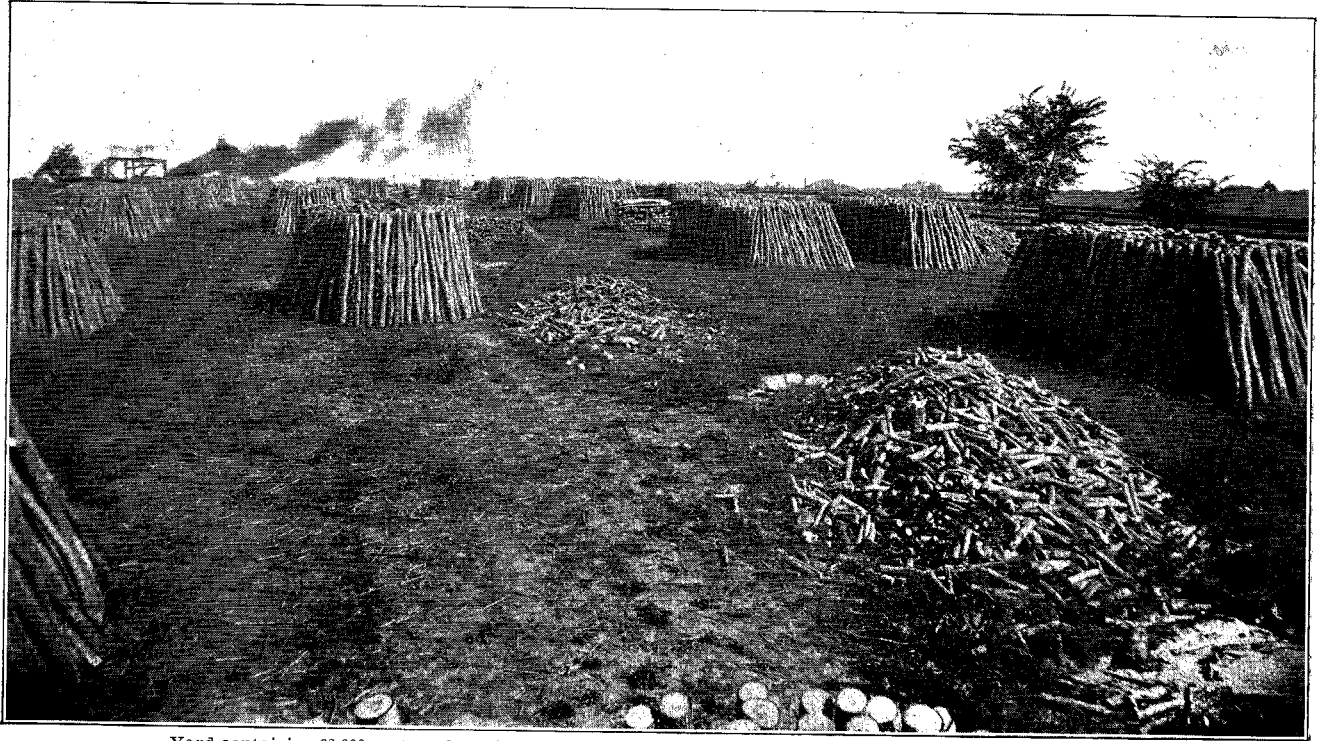
#### CATALPA GROWING AS A COMMERCIAL ENTERPRISE.

The possibility of growing catalpas on a commercial scale is receiving considerable attention throughout the State, especially in the southern part. The plantations within the State that have received proper treatment have without exception proved good financial investments, and without exception the owner of the plantations are enthusiastic catalpa men.

The commercial product of a catalpa plantation is posts and poles. The market for the products is good and will continue to be good, as the demand for posts and poles is increasing and the supply of natural timber suitable for such uses is diminishing. As the supply from the natural sources decreases, the demands on the artificial plantations will increase. In this State the catalpa is practically without a competitor. As a tree, it is easily handled and grows into commercial size in a comparatively short time. When cut, it makes the most desirable post on the market. Geographically, Kansas is ideally situated to make the growing of



Eight-year-old second-growth hardy catalpas from 21-year-old stumps in the Farlington Plantation, Crawford county, Kansas.



Yard containing 60,000 posts and 650 ricks of stove wood cut from 20 acres of 16-year-old hardy catalpa trees.



catalpa posts and poles an important industry. The demand for the posts comes largely from the plains region lying farther south and west. The Kansas plantations are nearer the field of consumption than is any other source of supply. This shortens the distance that the products must be hauled, and saves immensely in cost of transportation. The lightness of the wood is another factor favoring the catalpa. The air-dried wood weighs only about half as much as the same volume of Osage orange, its closest competitor. The uniform size and smoothness of the catalpa posts allow them to pack closely in the car. In the range country the posts are frequently hauled long distances, again the lightness of the posts and the compactness of the load are a big factor. On average country roads a team can easily haul from 250 to 300 posts at a single load.

In considering the possibilities of growing the catalpas on a commercial scale, the first point to get absolutely clear is that the land selected is suitable for their thrifty growth and within reasonable distance from a shipping point. If the land is on or near a main line of road, so much the better.

In selecting the planting-stock, great care must be exercised to be sure of getting the *Catalpa speciosa*. The common catalpa is not worth planting and will be a source of endless grief. The distinction between the two species is most clearly seen in the mature trees; indeed, it is only from the characteristics of the mature trees or of the seeds that the species can be definitely determined. The desirable trees should be marked for their seed crop. The seedlings are easily and cheaply grown; if the planter requires several thousand, he can well afford to grow them himself. In case he buys his seedlings, he should buy only from reliable nurserymen who make a specialty of catalpas and who sell them at a figure that will allow the planter an opportunity to grow them at a profit.

Before setting out to plant and grow catalpas on a commercial scale, the prospective grower should clearly understand that the investment is a long-time one, that it will be ten years before there are any returns from the planting and at least fourteen or sixteen years before the entire crop can be cut and marketed. In view of this fact, the original cost of the establishment of the plantation will practically determine the financial success or failure of the undertaking. The rule of compound interest must be applied in such investments. Five per cent. compound interest is a very reasonable rate to require of such an investment. On this basis, if \$1 is put out at five per cent. compound interest, it will in sixteen years amount to \$2.18. To determine the future worth of

the investment multiply the cost per acre by 2.18. The result will be the value of the investment at the end of sixteen years at five per cent. compound interest. Take a concrete example. If the trees are planted at three and one-half by seven feet, 1777 will be required to the acre. At \$5 a thousand, the cost will be \$8.88 an acre. Preparing the ground, planting, and cultivating the trees for two years will cost at least \$12 an acre. At five per cent. compound interest, this will, at the end of sixteen years, amount to \$45.52. To this must be added the cost of harvesting and rent on the land. This cost will vary, depending upon the amount of material to be cut and the cost of labor; however, it is a safe estimate to say that it will cost \$70 an acre to cut and market the crop. Suppose the land on which the trees are to be grown will rent for \$5 an acre per year; in sixteen years this will amount to \$80. This makes the total cost of the crop of timber \$195.52 an acre. In other words, under the conditions, assumed above, a plantation must produce a yield worth \$195.52 an acre or you cannot afford to grow the trees.

The cost of preparing the ground, planting and cultivating the trees, the rent of the land, and the cost of harvesting and marketing the crop are items that will remain the same regardless of the cost of the planting-stock. In the foregoing estimate, this cost is \$167.16 an acre. But inasmuch as the cost of the trees is often the determining factor in the establishment of a plantation, let us consider the difference in the final results. In lots of 10,000 and more, the catalpa seedlings can be grown at home for \$2.50 a thousand. Nursery-grown trees can be bought in lots of 10,000 and more for \$5 a thousand and upwards, while certain nurseries are flooding the State with agents selling catalpa seedlings at \$25 a thousand. The following table shows the difference that a few dollars in the initial cost makes in the final cost:

Table showing future value of cost of catalpa planting-stock for one acre, on basis of 1777 trees to the acre, and estimate of total cost per acre.

COST OF TREES PER M.	Present Worth per Acre.....	Value of Investment in 16 Years.....	Estimated Cost of Preparing Ground, Planting, Cultivating, Rent on Land, Harvesting, and Marketing the Crop.	Total Cost of Crop per Acre.....
\$ 2 50.....	\$ 4 44	\$ 9 67	\$ 176 16	\$186 83
5 00.....	8 88	19 35	176 16	195 51
10 00.....	17 77	38 73	176 16	214 84
25 00.....	44 42	96 83	176 16	272 99

The foregoing figures tell their own story, which is simply this: At a reasonable price for the planting-stock, catalpas can be grown at a profit; but if the price exceeds \$10 a thousand, it is very doubtful if they can be grown profitably.