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A FOREST WORKING PLAN

FOR THE FORT RILEY MILITARY RESERVATION.

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GUY E. YERKES.

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1906.

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MILITARY RESERVATION.
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The Fort Riley Reservation, composing an area of about 32,000 Acres, is located in Central Kansas. The topography of the land makes it peculiarly well adapted for maneuvers of Cavalry and Field Artillery, the School of Application for these branches of the regular Army being located here. To assist in obscuring the movements of troops, it is proposed to establish belts of trees on the open ridges, particularly those on the North part of the Reserve.

Brigadier General E. S. Godfrey, Post Commandant, who is in charge of the work, wishes also to place the woodland of the Reserve under conservative management for the production of fuel, and post and pole timber.

The woodland is mostly on the bottom land, and covers about 850 Acres. This working plan provides for the beginning of forestry on the woodland, and for the formation of about fourteen (14) miles of screen-belts.

The reservation includes two classes of soil formation - river bottom and upland. Approximately, one-third of the South part of the tract is bottom land, along the Kansas river, which forms part of the boundary of the Reserve.

The soil is a fertile sandy loam, formed by alluvial deposits from the river. The sub-soil is coarse sand or gravel. The surface is nearly level, about twelve to sixteen feet above the water table. The greater part of the woodland is on this bottom land. The upland is separated from the river bottom by abrupt rocky slopes, capped with limestone. The surface is rolling or

hilly, and is much broken by rocky ravines and gullies. The soil is a clay loam, varying in depth and fertility. The sub-soil is clay or rock. On the ridges, where screen-belts are wanted, no obstruction such as rocks are offered to plowing, and the soil is suitable for tree growth.

In the ravines and along the small water-courses, some timber is found, notably along Three Mile Creek, in the North-east part of the Reserve. The open land is covered with virgin prairie sod, mostly blue-stem grass. Much of this is cut over for hay. The annual fires, set to improve the grass, restricts the trees to the rocky slopes, and the ravines protected by ledges of limestone.

It is on the open ridges of this upland that screen-belts are desired. Their location is shown on the accompanying map. The following plan for their formation and care is submitted:

PREPARATION OF THE SOIL: Since the land is occupied by virgin sod, it must be broken and brought into cultural condition. The earliest planting possible is in the Spring of 1907.

After locating the strips, the ground should be broken with a 14" breaking plow, during the Summer of 1906. Four rows of trees should be set in each strip, twenty feet intervals between rows. This will require the strips to be plowed four rods wide. In the Fall, 1906, the rows where the trees are to be, should be disked twice with an eight foot disc harrow; then four foot wide strips plowed five inches deep with a stirring plow or disc gang plow.

The next Spring, as soon as the ground is in condition to work, the narrow strips for the rows plowed in the Fall, should be disked once and plowed to a depth of seven inches, then thorough-

ly disked with the harrow. This will leave the ground in suitable condition for planting the trees.

Should it be found impracticable to break all the land at once, strips four feet wide can be broken out where the tree rows are to be, leaving sixteen feet of unbroken sod between each plowed strip. The plowed strips should have the same treatment as recommended for the former plan. When teams and men are available, the sod between the rows can be broken out.

PLANT MATERIAL: The soil is fairly deep and fertile, and rainfall is ample for tree growth. As the belts are located in the most exposed places, hardy trees native to the locality will be best. The adverse conditions are the South winds and occasional drouths during the growing season.

Five divisions of the belts are made, as shown on the map. The species to be used in each are as follows:

Division I: Four and eight-tenths miles.

White Elm, alternating with Russian Mulberry. Planting distance, twenty-four feet between each species, making twelve foot interval between trees. 3500 trees of White Elm and 3500 Mulberry will be required.

Division II: Five and one-tenth miles.

Honey Locusts for the permanent trees, Cottonwoods alternating as fillers. Planting distance, twenty four feet for Locust, requiring 5500 Locust, and an equal number of Cottonwood.

Division III: Two and five-tenths miles.

Hack-berry for the permanent trees, and Cottonwood alternating for fillers. Planting distance, twenty-four feet for Hack-berry; 2200 Hackberry will be required.

Division IV:

Burr Oak and Cottonwood. The Cottonwood should be planted 24 feet apart, and the next Fall, when Acorns are ripe, they should be planted in hills alternating with the Cottonwoods. The Strip is eight ^{-tenths} miles long.

Division V: One and five-tenths miles.

Scotch Pine and Cottonwoods. Planting distance, twelve feet for Pines, Cottonwoods alternating; 2500 Pines will be needed.

If changes in length or location of the strips indicated should be desired, the treatment would be similar, as conditions are similar on all the ridges.

One year old trees of White Elm, Russian Mulberry, Hackberry, Honey Locust and Cottonwood should be used. These can be bought of Kansas and Nebraska Nurserymen, for from \$2.50 to \$3.50 per thousand, except Hackberry, which will cost from \$12.00 to \$14.00 per thousand. Three year old Scotch Pine should be used. They will cost eight to ten dollars per thousand.

Burr Oak acorns can be collected on the reserve. The strip to be planted to acorns should be set with Cottonwood in Spring of 1907. The acorns should be planted the following Fall. They ripen in September, and should be collected soon after they fall from the trees. Within a few days they should be fumigated to destroy insect larvae, by placing them in an air-tight receptacle, and setting among them a dish containing carbon disulphide. One and a half ounces is sufficient for a ten gallon can. The cover should be fitted on tightly, and left twenty-four hours. They should be planted within two or three weeks.

The Cottonwoods used for fillers can be collected from sand-bars along the Kansas river. Other species recommended for planting are:

- Osage Orange, *Toxylon pomiferum*;
- Hardy Catalpa, *Catalpa speciosa*;
- Soft Maple, *Acer dasycarpum*.

DIRECTIONS FOR PLANTING: The planting season begins about March 15th. For the broadleaf trees a satisfactory method is for two men to work together - one using a spade, his duty being to insert his spade where the tree is to be, and, with a back-and-forth motion, open a slit behind the spade wide enough to admit the tree to a depth of 7 or 8 inches. Number two has no tools, but carries a bucket partly filled with water, and containing a number of seedlings. After Number One opens the hole, Number Two inserts a tree behind his spade, taking care that the roots go down deep enough so the tree stands about two inches lower than it stood in the nursery. Then, Number One removes his spade and goes to the next place, while Number Two tramps the dirt well about the tree.

Two men working in this way can set 600 to 800 small trees per day, if the soil is moist and in good condition.

In planting Pines, better results are secured by digging holes, spreading the roots out in their natural position, and filling in with fine, moist earth. The roots of Pines must not be allowed to become dry. Even a few moments exposure to the air may prove fatal to them. They should be carried in water.

CULTIVATION: After the trees are planted, the disc harrow can be run on each side of the row. During May and June, at least three cultivations should be given. A good tool for this purpose is a

1579

two-horse corn cultivator. After the second year, the trees will be too large for this cultivator to pass over, and the one-horse cultivator and disc harrow should be used.

FIRE PROTECTION: A necessary part of this plan is providing fire-guards around the strips. The guards should be at least thirty (30) feet, and join the belts on each side. They can be made by plowing strips 3 furrows wide at the thirty foot interval. As soon as the grass is dry enough to burn in the Fall, the intervening space can be burned out. A favorable time should be chosen for the burning, when the wind is light.

THE WOODLAND: Two types of Woodland are found on the Reserve - the river-bottom type and the Creek-bottom type. The former is in the valley of the Kansas River, and includes about three-fourths of the wooded area, and nearly all the large timber. The latter is found along the small water-courses and in the large ravines. It is scattered over a considerable area.

A third type also is found on some of the steep slopes, but it is unimportant, except to prevent washing on the slopes, and is of small extent on account of recurring fires. The treatment most needed on these slopes is fire protection.

THE RIVER-BOTTOM TYPE: About 600 Acres are included, located on both sides of the Kansas river. Few of the large, mature trees are sound, and the most important part of the stand is made up of poles of all sizes, up to twelve inches in diameter, breast-high.

Though numbers of large trees are present, they are nearly all unsound. Several species are represented, and no one is predominant over any considerable area. The large trees are mostly White

Elm and Cottonwood, with some scattering Sycamores and Box Elder, and more rarely Walnut and Hackberry. The most important of the sound growing trees, and the most valuable part of the stand, are White Elm, Hackberry, Green Ash, Walnut, Burr Oak, Chinquapin Oak, and Red Elm.

In the past, the best trees have been cut for poles and posts, and at present the woods are not in good silvicultural condition. By taking out too many seed trees of the best kinds, their reproduction has been checked, and the leaving of the less desirable large Elms and Cottonwoods, which seed up the openings, is causing the land to gradually become stocked with the less valuable trees.

Where protected, reproduction is good for nearly all species, but the varying conditions of soil cover, underbrush, openings, over-wood, and degree of fire protection, makes the appearance of seedlings very irregular.

No attempt was made to measure the volume or estimate the annual yield, because the improvement cutting proposed will materially affect the rate of growth, and the appearance of seedlings, and such estimate made on the basis of the past production would be misleading. When the woods is brought into better condition, a plan to secure a sustained yield can be formed. For the present, the management should be to protect from fire, improve conditions for reproduction, and encourage the better species. An improvement cutting should be made during the coming Winter, if practicable.

The principal uses for the timber at Fort Riley are for fuel, and for posts and poles. The kinds best suited for these purposes should be left as much as possible when the improvement cutting is made. In general, the classes of wood to be cut should be:

I: All unsound trees, except the large Walnut, Hackberry, Ash, and other kinds it may be desired to favor. These excepted trees are valuable for seed trees, and as their present value is mainly for fuel, they should be left.

II: All dead trees.

III: Young trees where the stand is too thick. Thinning should be done where the smaller sized trees are too thick, to favor the better kinds and well-formed individuals. No definite rules can be given for the trees to be cut, and much depends on the skill of the man who does the marking. The best species should be left, and the crowns should stand close enough that the ground will be shaded at least within a year or two. If it is found impracticable to make use of the large, unsound Elms, they can be girdled and left standing.

It is to be borne in mind that an unbroken canopy or forest cover is very desirable, and then the thinning is not apt to be too heavy.

THE CREEK-BOTTOM TYPE: This type includes some 250 Acres scattered along the small streams and in the bottoms of the large ravines. The predominant species is Pignut Hickory, which forms from fifty to ninety per cent of the stand, according to locality. Cinquapin Oak is the next important, followed by Burr Oak. The reproduction is mostly by sprouts. Few large trees are found, but the stand is well-filled with straight, vigorous poles, where protected from fire. Improvement cutting is needed to remove the fire-charred, hollow and other unsound trees. When this woodland is brought into good condition and protected, it can be managed under a coppice system. The material taken out will more than pay

the cost of the improvement cutting.

CUTTING THE TIMBER: The trees to be taken out should be marked by an experienced man who understands the objects sought. The following should be borne in mind in taking out the timber:

- (a): Only marked trees should be cut, and all marked trees should be cut.
- (b): Stumps should be low, in no case higher than the diameter of the tree, except for special reasons.
- (c): Felling should be done with care, to avoid unnecessary damage to young trees.
- (d): In skidding out logs and hauling wood, care must be exercised to avoid damage to trees.

All the material suitable for posts and poles should be so used, and should be stacked in straight piles, the different sizes being placed together. This stacking yard ought to be conveniently located. The fuel wood should be yarded as conveniently as possible for the saw that converts it into firewood.

FIRE PROTECTION: This is an important and necessary measure. The chief causes of fire in the woodland are: burning the hay-land, locomotives, hunters and others who are careless with fire in the woods. Protection from fire is the most difficult task in the management of the woodland. The most practicable plan will probably be to maintain fire lanes around the edges of the woodland, especially that on the river bottom. If properly laid out and maintained they will prevent encroaching fires, which cause most of the damage. The scattered timber along the creeks and in the ravines is the hardest to protect.

The location of the fire lanes is shown on the accompanying map. For most of them the plow can be used. The method is to plow three furrows on each side of a strip about 40 ft. wide, and then burn out the intervening space, when conditions are suitable after the grass dries in the fall.

The hay-land should be burned systematically, by a force of men detailed for the purpose. The small bodies of timber should be burned around first, and the fire put out on the side next the trees by men using a heavy wet cloth. Ordinary "gunny sacks" are very useful for this purpose. An active, skillful man can put out a line of fire rapidly by this means, if it is not driven by wind.

These measures prevent only encroaching fires. It will be necessary to keep a look-out during the dangerous seasons, and a force of men sent out promptly to fight any fires reported.

Hunters and others should be cautioned, by notices posted conspicuously, to exercise great care with their fires and never leave them, even for a short time, without carefully extinguishing them.

Preventive measures are the most effective in dealing with the fire problem.

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LIST OF THE NATIVE TREES ON THE FT. RILEY RESERVE.

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| Green Ash, | Fraxinus lanceolata; |
| White Elm, | Ulmus americana; |
| Red Elm, | Ulmus pubescens; |
| Burr Oak, | Quercus macrocarpa; |
| Chinquapin Oak, | " acuminata; |
| Cottonwood, | Populus deltoides; |
| Walnut, | Juglans nigra; |

1582

Box Elder,	Acer negundo;
Hackberry,	Celtis occidentalis;
Red Cedar,	Juniperus virginiana;
Bass Wood,	Tilia americana;
Buckeye,	Aesculus glabra;
Black Willow,	Salix nigra;
Red Bud,	Cercis canadensis;
Coffee Bean,	Gymnocladus canadensis;
Mulberry,	Morus alba;
Sycamore,	Platanus occidentalis;
Honey Locust,	Gleditsia triacanthos;
Pignut Hickory,	Hicoria glabra.

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