

A FOREST PLANTING PLAN
FOR THE WASTE LAND OF A KANSAS FARM.

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In going over our upland Kansas farms, one is invariably struck with the amount of more or less waste land upon them. Stony hillsides, washed gullies, sloughs, small, frequently flooded creek bottoms, and hillside fields which are washed and gullied until they are mere clay banks, are some of the places of this sort. The object of this investigation is to find out to what extent timber planting will pay on these various kinds of waste land, what trees will do best in each situation, and, specifically, to make a planting plan for an actual farm.

The farm which I have chosen is a quarter-section situated four miles due east of Eskridge, Wabaunsee County, Kansas. The land is first class upland, with good, deep, black, fertile soil, but cut up, as the map shows, by numerous ravines and a small creek. This has many pools which almost always contain water, but runs only in wet weather. The quarter has not been managed as a single farm, but is part of a fifteen hundred acre farm, which is now rented to several persons. However, in this plan it will be considered as a single farm. There is a small cheap house in the southwest corner, which is occupied by the tenants who farm the quarter south of this one, but the site is very poor, and in this plan, lot 11, which has

been planned as a building site by the owner, is considered as the farmstead. There is no natural timber on the place. For further description see explanation of map and detailed planting plan.

Planting Plan.

Lot 1. This consists on the east side of flat, low bottom cut up with old creek channels. There is a gully at the west leading to the creek and a level tillable acre in the corner. This will be planted to cottonwood in pure stand, for lumber. On these little bottoms cottonwood will make sawlogs in twenty-five to thirty years, and at the rate lumber is going up, he who has some rough lumber growing on his place twenty-five years from now will be very fortunate. The land is in sod now, and as much of it as possible should be plowed and disced several times the preceding summer, followed by a deeper plowing late in the fall or early in the spring. This should be planted with cuttings or one-year seedlings, spacing 7 X 8. Owing to the danger of flooding and washing cultivation should probably be discontinued after one year, on the east part at least. The unplowable corners, which would not be many, could be planted by cutting individual places and inserting cuttings. After eight to ten years the ground could be returned to the pasture. The cost per acre of establishing this grove would be about as follows:

Trees, 778 at \$2.50 per thousand	\$1.95
Preparation of land	\$5.00
Planting	2.00
Cultivation 1 year	2.00
Total	<u>10.95</u>

A row of cottonwoods along a fence line on the place, upland, in the grass, 19 years old, showed an average diameter of 10.1 inches, while some nine year old cuttings in a slough much like the present planting had splendid straight trunks forty feet high and six to ten inches in diameter. In view of this I believe it is conservative to take the figures of plantation No. 7, page 13, Circular 45 of the Forest Service, in which a twenty-five year old grove with an average diameter of 12.1 yielded 3000 feet B. M. of lumber and forty-one cords of fuel wood per acre. At this rate the returns would be:-

3000 ft. B.M. lumber at \$15.00	\$45.00
41 cords wood at \$2.00	82.00
Total	<u>127.00</u>
Cost	10.95
Total return	<u>\$116.05</u>
Yearly return, or rental paid by the trees,	4.62
Area of grove	6 acres
Total yearly return	\$27.72

This is not a very large return, but is more than the land is worth as pasture, (\$1.50 per acre at present) and it can not be cultivated. The grove will also be worth something as pasture and shelter for stock after it is established. Catalpa would do better than this, except that it does not stand wet soil. To the expenses above should be added in this particular case part of the value, and the cost of putting up and taking down 1600 feet of rough fencing. This would be about \$6.00 per acre more.

Ravine A in Map 1 is a steep, narrow, grassy ravine-- good pasture and poor tree land. It will therefore be left in pasture, as will the creek bottom into which it runs. The latter, although it contains some good tree land, will be left to connect the two upland pieces of pasture. Gully B has sides which are too steep to be cultivated across continuously. Where it is plowed, as shown, it is so washed that a buggy could not drive across it. However, it is good land and can be plowed long enough to start alfalfa upon it. Now alfalfa will give much larger returns than trees, and so I have planned to make alfalfa meadow out of the whole strip shown in Map 2.

Lot 2 has a steep, rocky border on the west, while on the east the field gradually slopes down into it. This should be planted to catalpa, cottonwood and bur oak. The catalpa will have the best land, the cottonwood the slough land near the creek, and the bur oak the side hill. I estimate that there will be 1.5 acres of catalpa, 2 acres of cottonwood and one acre oak and unplanted. The plan and returns for the first two would be as in Lots 1 and 6; total yearly return from 3.5 acres, \$35.50. The oak is simply an experiment, and the returns problematical. The grove would be established by planting acorns three or four feet apart where the trees are wanted to grow. Much of the land is in sod, and this would either have to be scratched with a plow as well as possible on the stony hillside or else individual spaces spaded or hoed. A guess at the cost would be as follows:-

Seed	\$5.00
Preparation of land and planting	<u>10.00</u>
Total	\$15.00

The returns from this grove would certainly be small, though I have no means of calculating them. The slow-growing oak would have to fight the grass for ten to fifteen years before establishing forest cover. The trees would be too crooked for lumber and would have to be used for fuel and fence posts. Since the land is almost worthless for anything else, and any profit is just that much gained, the experiment is worth making, but it would be decidedly unwise to try to establish forest on any large area of stony sod land in this country.

Pot 3 contains at the north a peninsula of good, deep, tillable land, (3-1/3 acres--too small for a field) and at the south and west the rough, cut-up creek bottom, with a steep bank at the extreme south. This bank will be planted to oak and red cedar, and the remarks under Lot 2 about oak apply here also. There is about an acre of this and the planting will cost about \$20.00, the increase over Lot 2 being due to the cedar, which is expensive. This would be established by setting three year old transplants, which would be grown on the farm. An acre of the east part of the peninsula will be planted to catalpa and walnut in accordance with the plan given on page 20, Circular 45, of the Forest Service, as follows:- Walnut is planted 8 X 8 and some field crop grown with it for two years, and then catalpa is planted in the spring of the third year, so as to make a stand 4 X 4, three fourths catalpa and one fourth walnut. The catalpa forces the walnut upward and helps it establish forest cover. The catalpa is gradually thinned out and the poorer walnut trees cut until in thirty-five or forty years a pure stand of walnut is left for lumber. The cost of establishing this will be about

as follows:

Walnuts, 2 bushels	\$.50
Preparation of land and cultivation 2 years, paid for by other crop.	
2040 catalpas at \$1.00 per thousand	2.04
Cultivation 2 years more	3.50
Planting	3.75
Total	<u>\$9.79</u>

The returns from this I have no means of calculating, but the catalpa would certainly pay the cost, rent and interest, and at least \$5.00 per acre besides. The return from the walnut would be considerable, but would come to the second generation.

I intend to make a sort of park, picnic ground and arboretum of the remainder of the peninsula, 2.3 acres, planting two or three specimens of most trees which grow here. As this is not timber planting it will not be further considered. The remainder of the lot, four acres of bottom, will be planted to mixed hardwoods. This will include:- sycamore next the creek, oak, green ash, and pignut hickory for wood and heavy repair work about the farm, shell bark hickory and pecan for nuts, and perhaps chestnut, butternut, hackberry, elm and others. The seeds of the heavy-seeded trees will be planted where they are wanted to grow after plowing as described in Lot 1, while seedlings of the ash and sycamore will be used. The cost of this would be about the same as the oak of Lot 2, \$15.00 per acre. Of course returns can hardly be calculated on such a mixed planting for such various uses, but they would at least equal the value of the land for pasture.

Lot 4. This will be planted in several ways. The

banks a a a in the first map are steep clay banks which the creek is rapidly cutting into. These should be broken down somewhat and planted with large willow cuttings. There are steep, stony banks on the south which will be planted to oak and cedar, rather more easily than the others because most of the surface is free of grass. The oak, cedar and willow will probably cover about two acres. Total cost, \$40.00. Probably half an acre can not be planted at all on account of gravel and ground actually occupied by the creek. About an acre on the east side of the peninsula in the center is covered with buck-bush and other brush. In here I would sow acorns and walnuts three or four feet apart and let them look out for themselves. The brush will make a good nurse crop for them. Total cost, \$8.00. Returns can not be estimated on any of the above plantings.

The remainder of the lot, two acres, can be plowed, and will be planted to osage orange. One year seedlings from a nursery will be used and planted 4 X 6 feet. The cost per acre will be as follows:-

Trees, 1815 at \$3.00 per thousand	\$5.45
Preparing sod land, as in Lot 1,	5.00
Planting	4.00
Cultivation, 2 years,	3.50
Total	<u>\$17.95</u>

A half mile south on this same section line are 1000 osage trees, planted in 1895. They are in three rows nine feet apart, and five to six feet apart in the row. They were not taken care of more than two years after planting. Four years

ago fire killed a large number of trunks. These were not cut out, but have sprouted up from the base, making three to eight splendid, straight, limbless poles per tree. In four or five more years these will all make posts, and there will then be probably 4000 posts in the grove. Three hundred posts have been cut this winter and last from trees which were not fire-killed. From the above facts I think that, allowing for the death of ten per cent of the trees, I could count on one post from each tree at the end of twelve years and 2-1/2 posts per tree each ten years thereafter. This would make the returns in twenty-two years:-

1500 posts at 8 cents in 12 years	\$120.00
3750 " " " " 10 more years	300.00
Total return	<u>\$420.00</u>
Cost	17.95
Net return	<u>\$402.05</u>
Yearly return	18.27
Area of grove, 2 acres	
Total yearly return	\$36.54

This return seems high, but from what I saw of the other grove I believe it is conservative enough. The twenty-two year old Farlington forest reported in Circular 90 of the Forest Service, showed an acreage value of \$525.

Lot 5 is a deep rocky ravine, except at the west end, with prairie and slough grass growing in every corner of the rocks. I doubt the advisability of planting this to trees. Red cedar is the only one which would do anything in such a

place, and it will be very hard to establish and slow of growth. I counted rings on red cedar in a place similar to this, and found that it took ten years to grow one inch in diameter, and I do not believe this will pay interest on the cost of establishing. This ravine would make a good fish pond. There is a good place for a dam at the east side and I think I could get half an acre of water two to ten feet deep. This would pay better in catfish than the land in trees. The upper part of this ravine, which is now plowed, is inclined to be marshy and may need tile draining. Sediment dams should be put in at the lower side of the field.

Lot 6 is a corner of good land cut off by the ravine, which would make very short rows after the two thousand foot stretch of the land south of it. This will be planted to catalpa, 4 X 6, from seedlings to be raised on the farm. The land would be broken and used as part of the field for two years (or until I wanted to plant it). A hedge of Russian mulberry will be planted on the south to protect the catalpa from the south winds. The cost per acre would be as follows:-

Trees, 1815 at \$1.00 per thousand	\$1.81
Plowing	1.50
Planting	4.00
Cultivation 3 years	5.00
Total	<u>\$12.31</u>

1.3 acres of Lot 10 is now in catalpa. This grove was planted in 1895 on land which had been in cultivation for sometime previously. They were spaced about 10 X 6 and other

crops grown with them for two years. Since then the only care they have had has been the cutting out of posts when they were needed. Forest cover has been established for some time over most of the grove. Three hundred posts were cut in the winter of 1901-02, three hundred in 1905-06 and four hundred in 1906-07. At present, therefore, the stand consists of three parts: 1st, the old trees which have not been cut; 2nd, the large sprouts from the 1901-02 cutting; 3rd, small sprouts from the later cuttings. I made a fairly careful analysis of the grove, in which I noted:- first, the diameter and character of the old trees, in which a tree was classed as "bad" if it forked below six feet, or was rotten or excessively crooked; second, the diameter, character and number in a place of the old sprouts; third, the number of good sprouts in the clumps of young sprouts. In the tables following, any given diameter includes every diameter between it and the next lower, e.g., everything between 3 and 3-1/2 inches is included under 3-1/2, and so on. Diameters were taken at about 4-1/2 feet from the ground. The column "0" in the "Distribution of Sprouts" includes those stumps of the later cuttings which have yielded no good sprouts. Probably most of these are not as hopeless as they appear now. The small number of "bad" sprouts is very noticeable.

Diameters	1½	2	2½	3	3½	4	4½	5	5½	6	6½	Totals
Good trees		11	25	49	53	66	65	52	23	11	3	348
Good sprouts	15	29	60	51	32	26	9	1	1			224
Total	15	40	85	100	85	92	74	53	24	11	3	
Bad trees	scrubs											
	6	16	26	30	47	35	21	15	6	4	2	208
Bad sprouts		3	3	4		1	2					13
Total	6	19	29	34	47	36	23	15	6	4	2	
Grand total	21	59	114	134	132	128	97	68	30	15	5	793

Distribution of Sprouts

Number at a place	0	1	2	3	4	Total
Sprouts of 1901-02		67	52	22		141
Sprouts of 1905-6-7	34	50	103	54	11	252

Of the trees 23 divided into two trunks at the base,
making 533 places for 556 trunks

Total living places in grove 926

As 1000 trees were planted, this is a loss of 7½ per cent.

In calculating returns all good trunks (including sprouts) over 2½ inches in diameter up to and including 4½ inches were estimated as giving one ten cent post, those above 4½ inches as giving three ten cent posts. The poor trees of the same diameter were figured as giving one and three five cent posts. This is a conservative estimate. It makes:-

351 + (3 x 91) = 624 10 cent posts	\$62.40
140 + (3 x 27) = 221 5 " "	11.05
Present value of grove	<u>\$73.45</u>

Posts cut in the past, 1000 of all grades, say at 8 cents	\$80.00
Total returns	<u>\$153.45</u>
Actual expense: trees	2.00
planting, two men one day,	2.50
Cultivation paid for by other crops	
Net return	<u>\$148.95</u>
Area of grove 1.3 acre; return per acre	114.58
Return per acre per year	8.81

Plow land rents for \$2.50 to \$3.00 an acre, so this is a pretty fair return. However, the returns from this grove I am planning should be two to three times as much, for the following reasons:

1. At least one third of this grove was on a wind-blown hard pan spot, where the trees have done practically nothing. Most of the "bad" trees were in this part of the grove.
2. The trees were planted at least twice too far apart. They were late in establishing forest cover and have made bushy heads instead of single trunks.
3. The grove is *Catalpa catalpa* and not *Catalpa speciosa*.
4. The grove has not been managed at all, but simply cut when needed.
5. The trees were not cut back when young, which accounts for much poor form.
6. In the reports of Kansas *catalpa* plantations in

Bulletin 37 of the Forest Service, there are many plots yielding over \$25.00 per acre per year, and only on the poorest land did the returns fall as low as those given here. I think I have given sufficient reasons for assigning a return of \$17.50 per acre per year above expenses.

Area of lot	1.8 acres
Yearly return	\$31.50

The mulberry hedge will require one hundred and twenty-five plants, costing \$1.25. It will yield a lot of second class posts.

Lot 7 is a tiny corner of plow land cut off by a rocky slough. It will be planted to cottonwood like Lot 1.

Area	.85 acre
Yearly return	3.93

Lot 8 is a deep, wide ravine with steep, grassy sides, no rock. It will be planted to cottonwood and used for hog pasture in connection with the plow land west of it which it cuts off. There is good water at X which will be used for the hogs.

Area	1.3 acres
Yearly return	\$6.00

Lot 9 is a continuation of the present grove and will be planted to catalpa as far as possible, with some cottonwood in the wettest portions.

Area	1.7 acres
Return, allowing .5 acre cottonwood,	\$23.31

1.3 acre of Lot 10 is the present grove, already described. The rest includes a row of Russian mulberry and a thin stand of cottonwood and osage in the grass. The row of mulberry may be left. The cottonwood should be cut for fuel, and the ground gotten into such shape as possible and planted to catalpa or osage. As this would be rather poor land, I have assigned to the whole area the return now being received from the grove, although I believe the grove can do much better if managed right.

Area	2.5 acre
Yearly return	\$22.00

Lot 11 is the farmstead, enlarged from the present area. It will include the house, garden, orchard, barns, sheds, feed lots, etc.

The remainder of the farm is first class plow land and will be used for regular farm crops, which it is not the purpose of this paper to discuss.

In the above plan, I have not given detailed discussions of the value of the particular trees chosen (or others which were not chosen), nor any but the most general plans of management. For further information, the publications in the bibliography are recommended.

Summary of Plantings

Lot	How planted	Area	Total cost	Yearly return
1	Cottonwood	6	\$65.70	\$27.72
2	Cottonwood	2	21.90	9.24
	Catalpa	1.5	18.46	26.25
	Bur oak	1	15.00	
3	Catalpa and walnut	1	9.79	5.00
	Cedar and oak	1	20.00	
	Mixed hardwoods	4	60.00	
	Picnic ground	2.3		
4	Oak, cedar, willow	2	40.00	
	Walnut, oak	1	8.00	
	Osage orange	2	35.90	36.54
	Vacant	.5		
6	Catalpa	1.8	22.16	31.50
7	Cottonwood	.85	9.15	3.93
8	Cottonwood	1.3	14.23	6.17
9	Cottonwood	.5	5.47	2.33
	Catalpa	1.2	15.00	21.00
10	Catalpa	2.5	30.77	22.00
Total		32.5	\$392.53	\$191.68
Average yearly return per acre				5.90

Besides the cash return there will be from all groves a considerable amount of firewood from thinnings, waste ends of post cutting, etc., and they will also have some value as stock shelters.

The remainder of the farm is divided as follows:-

	Acres
Lot 5, fish pond	1.6
" 11, farmstead	5.7
" 12, alfalfa	19.1
" 13, pasture	25.6
" 14, field	7.4
" 15, plow land, will make several fields	67.1
Total, including tree plantings,	159.

Time of Making Plantings

Of course all these plantings can not be made at once. It would be too great drain on the farm resources of money and labor. I have made out the following schedule of planting, beginning with 1908 for convenience:-

Fall 1908, Prepare Lot 1

Spring 1909, Plant Lot 1

Fall 1909, Prepare Lot 4, plant oak and walnut in
in brush, and make all oak plantings, Lots 2, 3
and 4.

Spring 1910, Plant Lot 4, osage and willow.

Fall 1910, Plow walnut and picnic ground of Lot 3.

Spring 1911, Plant walnut of Lot 3, cedar of 3 and 4.

Fall 1911, Prepare Lots 7, 8, and remainder of 3.

Spring 1912, Plant Lots 7, 8 and remainder of 3.

Fall 1912, Prepare remainder of Lot 2.

Spring 1913, Plant cottonwood and Catalpa in Lot 2,

catalpa in walnut of Lot 3, and Lot 6.

Fall 1914, Prepare Lots 9, 10.

Spring 1914, Plant Lots 9, 10.

Protection

Fire, rabbits, mice and gophers are the enemies which will have to be looked out for in these plantings. Mice and gophers are likely to bother the fall acorn and nut plantings. I know of no way to help this, and as the damage will probably not be great, the vacant places may be replanted. Rabbits eat off seedling trees in this locality badly. In the case of trees that sprout, like catalpa and osage, this does not hurt much the first winter after setting, and if the bunches of sprouts which come up are left unthinned until the following spring, the rabbits will eat the small poor ones for the most part. The other trees, if the rabbits are bad enough to warrant it, can be protected by dopes, or a light fence of two foot chicken wire stretched around the plantation. Fire will not be dangerous except in those groves next the pasture, which is burned every year. There fire guards will have to be maintained. Otherwise I believe the fire danger is not important, though the groves should be watched in dry seasons and at other dangerous times.

Bibliography

All are publications of the Bureau of Forestry.

Bulletin 37. The Hardy Catalpa

" 52. Forest Planting in Western Kansas

" 65. Advice for Forest Planters in Oklahoma and
Adjacent Regions

Circular 45. Forest Planting in Eastern Nebraska

" 56. The Bur Oak

" 73. The Red Cedar

" 82. The Hardy Catalpa

" 77. The Cottonwood

" 88. The Black Walnut

" 90. The Osage Orange

" 99. Forest Planting on the Semi-arid Plains.

Map 1

Road

Road

Orchard

Grove

House

Prairie

Field

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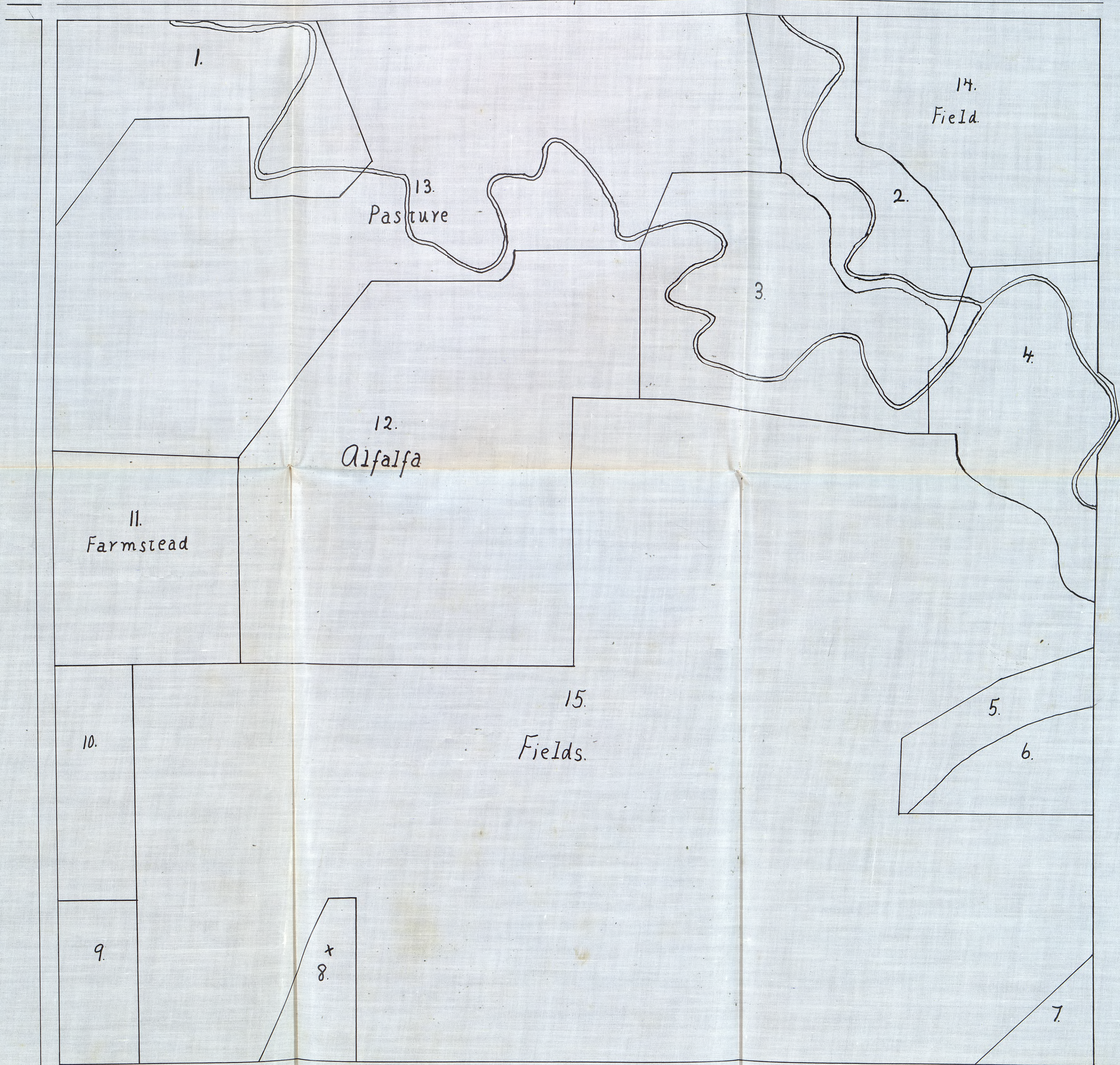
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Map 2



Explanation of Maps

Map No. 1. The farm at present.

Heavy straight lines -- fences

Light " " -- divisions not fenced.

Shaded areas -- untillable land, -ravines and creek.

The banks of the creek are sometimes indicated inside the waste land.

Dotted lines -- tillable swales.

Map No. 2. The divisions of the farm as planned.

Not all the divisions shown would be fenced.

Scale of maps, 1 inch = 160 feet.