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South Dakota State University Agricultural  
Experiment Station

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12-1892

## Forestry

J.C. Whitten

*South Dakota Agricultural College*

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### Recommended Citation

Whitten, J.C., "Forestry" (1892). *Bulletins*. Paper 32.  
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SOUTH DAKOTA  
AGRICULTURAL COLLEGE  
AND  
EXPERIMENT STATION  
BROOKINGS, S. D.

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BULLETIN NO. 32.

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DECEMBER 1892.

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Department of Forestry and Horticulture.

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FORESTRY.

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DUTCHER, BREED & STORGAARD, BROOKINGS.

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All letters and other mail matter for the Station should be addressed to the Experiment Station.

# FORESTRY.

J. C. WHITTEN.

During the season of 1892 no new plantings have been added to the forest plats. The season has, as a whole, been favorable to tree growth, though so wet as to prevent the successful extermination of weeds. During the early part of the growing season, copious rains greatly hindered work with the cultivator, and also kept the ground so cold that weed growth did not begin in earnest until the latter part of June. About this time the soil became dry enough to be worked to better advantage, and a vigorous use of the cultivator was continued until July 7th, when cultivation ceased, in order to allow a thorough ripening of the new wood, as well as to allow the weed growth to cover the soil for holding the snows of the coming winter. Weed growth continued very late, so that clipping with a scythe became necessary, in some plats, where too great a tendency to ripen foul seed was noticed. This has been the only season in the history of the forest tree plantations at this Station, that has afforded opportunity to note the comparative effects upon different varieties of copious rains throughout the entire growing season. This adds features of interest that have not before been noted. Heretofore observations have been made principally with a view to determining what trees will quickly form leaf canopy, and thus prevent weed growth. Some of the plats have already reached that stage and will no longer admit of cultivation.

The accompanying diagram represents the entire forest plantation, with the exception of a seedling plat, and gives the varieties of trees in each plat. Plats 1 to 10 were planted in 1889; plats 11 to 22 in 1890 and plats 23 to 30 in 1891.

SOUTH.  
ROAD — 1 rod wide.

8 Rods.

10 Rods

17A	16	14	12	10	8	6	4	2
Populus certinensis	Silver Maple	Green Ash	Box Elder	Black Cherry Yellow Birch White Birch White Elm White Ash	Soft Maple Cottonwood Scotch Pine White Ash White Birch	Populus certinensis White Elm White Ash	Box Elders Yellow Birch White Pine	Pop. (4 var.) Bl'k Walnut White " " Birch " Elm " Ash Box Elders

ROAD.

17B	15	13	11	9	7	5	3	1
Populus certinensis	White Elm	Green Ash Seed.	Box Elder Seed.	Bl'k Walnut Cherry Box Elder Wh't Walnut P. certinensis White Elm S'lix fragilis White Birch White Ash White Pine	Box Elder White Ash Bl'k Walnut Black Wild Cherry White Elm Populus 2 varieties	White Elm Box Elder White Oak Bl'ck Walnut	European Larch Box Elder	Black Hills Spruce Box Elder Cottonwood Populus certinensis Scotch Pine

ROAD.

26A	25	24	23	22	21	20	19	18
Maple Box Elder Walnut Hickory Elm Ash Cherry	Box Elder Maple Walnut Cherry Elm Ash	Box Elder White Spruce	Box Elder Cherry Ash	Populus certinensis	Green Ash	White Elm	Populus certinensis Soft Maple	Silver Maple Hickory

## ROAD.

26B	27	28	29	30
Maple Box Elder Walnut Hickory Elm Ash Cherry	Maple Box Elder Elm Ash Cherry Bl'ck Walnut Butternut	Box Elder Elm Cherry Butternut Hickory P. certinensis	Elm Ash Cherry Spruce Hickory Butternut Box Elder	Elm Ash Cherry Spruce

## ROAD.

Variety.	Total Growth in Inches.														
	1889.			1890.			1891.			1892.					
	Max.	Min.	Avg.	Max.	Min.	Avg.	Max.	Min.	Avg.	Max.	Min.	Avg.	Max.	Min.	Avg.
Populus pyramidalis .....	23	10	16	40	18	36	43	16	35	.....	.....	.....	.....	.....	.....
Populus nolester .....	80	5	18½	38	18	35	46	20	37½	.....	.....	.....	.....	.....	.....
Black Walnut .....	7½	1½	4¾	9	3	6	20	6	18	40	3	11	.....	.....	.....
White Walnut .....	9¼	.....	6¾	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Yellow Birch .....	10	3	6	30	7	20¾	36	9	21	60	2	39	.....	.....	.....
White Oak .....	5	1	1¾	9	2	5½	13	7	10	22	4	8	.....	.....	.....
White Birch .....	7¾	2½	5¾	20	12	16	40	10	23	48	17	30	.....	.....	.....
White Elm .....	24	3	9½	42	10	22¾	46	15	32	62	19	30	.....	.....	.....
Black Wild Cherry .....	12	4	8	23	6	16	32	20	38¾	40	23	30	.....	.....	.....
Soft Maple .....	12¾	4	8½	35	16	22½	45	26	34¼	40	29	33	.....	.....	.....
Salix fragilis .....	8½	8	15¾	30	18	24	40	22	29¾	54	32	32	.....	.....	.....
Scotch Pine .....	7¾	2¼	4¾	9	2	5	16	2	4	25	6	14	.....	.....	.....
Larch .....	7½	2¾	5	14	8	11½	16	5	11½	37	15	25	.....	.....	.....
Black Hills Spruce .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6	1	3¼	.....	.....	.....
White Pine .....	7½	½	4½	8	1	4½	.....	.....	.....	.....	.....	.....	.....	.....	.....
Populus certinensis .....	39	9	25½	40	14	37	34	10	24¼	46	23	35	.....	.....	.....
Box Elder, 1 year old* .....	32	3¼	10¾	38	10	28¾	39	22	32	31	13	24	.....	.....	.....
Box Elder, 2 years old* .....	34	5½	16	45	20	37½	51	24	38½	62	45	30	.....	.....	.....
Cottonwood, 1 year old* .....	25	4½	15½	66	16	40¼	40	19	29¾	49	23	40	.....	.....	.....
White Ash .....	14	3	9¼	31	8	22¾	31	6	19	48	16	26	.....	.....	.....

\*When transplanted.

The foregoing table affords an opportunity for studying the comparative growths, made by the different varieties, during the past four seasons. By comparing this table of growths with the meteorological table the comparative effect of wet and dry seasons upon the growth of each variety may be ascertained. This, to some extent, will indicate the ability of each sort to continue growth during dry and trying seasons. It must always be borne in mind, however, that each year's growth may be modified by certain conditions, such as the ravages of insect enemies upon some species, and the tendency to accelerated growth, as the tree becomes better established in others:

Month.	Rain fall.			Temperature.			Wind.	
	No. days.	Greatest in one day.	Total.	Highest.	Lowest.	Mean.	Northerly	Southerly.
1889.								
January			.3	41.0	-24.0	15.0		
February			.5	43.0	30.0	19.60	11	
March			.16	55.0	4.0	32.0	15	6
April	11	.27	1.025	83.0	12.0	51.20	10	15
May	9	.62	1.93	91.0	20.0	56.70	15	8
June	11	.54	1.485	93.40	36.10	64.20	15	14
July	9	.89	2.918	98.0	40.0	68.80	11	16
August	3	.53	.72	97.0	41.80	69.50	6	15
September	4	2.22	2.70	89.0	30.0	55.10	9	10
October	1	.005	.005	76.40	33.80	43.70	12	10
November				28.0	-6.0	22.87	15	11
December	5	.475	.975	52.0	-11.0	26.78	13	18
1890.								
January	5	*2.	*6.5	43.90	-28.0	7.56	15	16
February	1	*2.		47.0	-35.0	14.32	15	13
March	3	.31	.56	32.25	-4.0	19.69	13	14
April	4	.51	.787	84.0	10.0	46.71	10	12
May	17	.80	3.33	90.0	33.0	32.197	20	9
June	14	2.	7.91	90.50	39.0	67.75	6	22
July	5	.54	1.535	94.50	41.0	71.06	10	19
August	5	.88	2.07	99.0	35.0	63.8	14	16
September	5	.19	.45	91.0	25.0	57.50	11	16
October	7	.12	.32	74.50	21.0	38.80	6	11
November	1		.03	68.0	0	29.41	22	12
December				58.0	-18.	21.20	8	19
1891.								
January				52.0	-10.0	+	14	16
February	*3	*4.	*10.	48.0	-28.	6.95	11	17
March	*2	*1.	6.	50.	-24.	17.94	13	15
April	9	.93	2.23	88.	11.	43.9	18	9
May	5	.38	.84	92.5	80.	55.54	17	12
June	11	1.34	4.09	89.	40.	62.5	15	14
July	7	.7	2.01	80.	60.	69.5	13	16
August—Frost on 23rd.	7	.44	1.38	96.5	30.5	66.3	15	14
September	5	.27	.48	98.	24.5	65.1	24	6
October	2	.62	1.07	80.	19.5	45.4	15	11
November								
December							1	2
1892.								
January	6	.20	.35	49.0	-34.0	8.330	11	7
February	5	.20	.36	48.0	-19.0	18.78	14	9
March	3	.26	.84	65.0	-7.0	27.100	15	14
April	10	1.12	3.15	65.0	15.0	39.0	19	10
May	14	3.63	7.32	75.0	28.0	47.0	24	7
June	9	1.09	3.82	85.0	38.50	62.80	16	14
July	7	1.43	3.69	97.0	45.0	69.20	12	19
August	11	1.19	3.03	94.50	36.0	67.20	11	20
September	3	.89	1.49	97.0	30.0	60.70	15	15
October	3	.26	.53	92.0	.090	49.20	15	13
November								
December								

\* Snow. † Observations not completed.



Total rain fall during growing season:—

April to November inclusive—1889, 10.783 inches.

“ “ “ 1890, 16.402 “

“ “ “ 1891, 12.10 “

“ “ “ 1892, 22.73 “

## CONDITION AND GROWTH OF THE DIFFERENT VARIETIES.

The following discussion is made on the different varieties in order of their occurrence throughout the plats, beginning with plat No. 7:

### BLACK HILLS SPRUCE.

This variety occurs in plats 1, 24, 29 and 30. This is the first season in which the spruce has made anything like satisfactory growth. In 1891, the trees in plat 1 made an average growth of one inch, only a very few trees showing any tendency to put out a leading branch and to develop tree form. The trees of this variety in the other plats, being set that season, made almost no growth. During 1892 an average growth of three inches has been made by the trees in plat 1. A large part of them are establishing leading branches, the longest new growth being nearly six inches. The fact that these trees have made three times as great a growth as during any previous year is no doubt partly due to the unusually wet season. This indication is emphasized by the fact that, during this season, other spruces in plats of two years planting made greater growth than did these spruces at that stage of planting. Again, the spruces in plat 1 have, during this season, made greater growth than those of any of the later planted plats. This would indicate that, as the trees become longer established their yearly growth increases, and the increased tendency of the oldest trees to put out leading branches, would seem to confirm this probability. With the exception of the Scotch Pine, the Black Hills Spruce is the most promising evergreen now growing at this Station.

### SCOTCH PINE.

This evergreen occurs in plats 1, 8 and 30. Like the Spruce just discussed, it makes slow growth when first transplanted,

but grows more rapidly once it gets established. The trees in plats 1 and 8 were planted the same day. Those in plat 8 have made the best season's growth, Max. 25, Av. 14, and Min. 6 inches. In plat 1, the growth for the year is, Max. 19, Av. 11, and Min. 4 inches. The soil in these two plats is very similar in quality and elevation. Plat 8 has the better leaf canopy, not so much on account of the varieties of trees, as of uniformity of growth. This may account for the better growth of pines in this plat. In plat 30 the pines are the tallest trees, and have as yet no shelter. They have made poorer growth the past season than did those in plats 1 and 8, which had shelter the corresponding season after planting. This is the most promising evergreen growing at the Station, both for forest plats and for lawn planting.

#### BOX ELDER.

This most valuable nurse tree, is making best growth in plats 4 and 5, in which it constitutes three-fourths of the original planting. In plat 4, about one-half the Box Elders were two years old when set, the other half being trees of one year's growth. The two-year olds have made much the better growth from the first, and now average 12 ft. 6 in. in height, with a diameter of 2 to 3 inches one foot from the ground. These trees are past the stage of cultivation, having permitted the germination of actually no foul seed beneath their shade this season. Their growth has been remarkably even and their leaf canopy, during the past summer, was perfect. They have made an average growth this season of about 40 in., directing upward fine, straight boles, so that the plat now assumes the appearance of a fine young forest. Already a tendency to self prune is noticed, the lower branches being very weak and slender, and bearing few leaves, except at their ends, which, in their search for light, reach out and fill every opening thus making the shade more dense.

Though the Box Elder themselves are making fine growth, it must be borne in mind that they are only the temporary trees, to act as nurses to the Birch and White Pines, planted among them. Their shade seems to make very little difference with the growth of the pines, but, already, the Birches are

showing the effects of their dense cover; those in more open places making a much better growth, (plat 10.) The Birch makes a somewhat slow growth, is more low and branching than the Box Elder, consequently the latter makes a poor nurse tree for it. The dense shade of the Box Elder, is in plat 4, all the more deleterious, as the Birches are effected with a fungus growth which seems to flourish best in shade. This fungus, while it has not yet seriously injured the Birches, has, during the past season, somewhat scrolled up their leaves, and contorted twig growth. As a nurse tree for the taller varieties of hard wood, like Elm and Ash, or for any shade enduring sorts, the Box Elder surpasses any other tree in the forest plats. This is illustrated in plats 5 and 7, where the hard woods are making excellent growth. The Ash and Elm keep well up with the Box Elder in height growth, and so hold their ground.

#### THE POPLARS.

Cottonwood, (*Populus monilifera*,) *Populus certinensis*, and *Populus nolesteri*: Much may be said of these trees in common. They have much the same appearance, and are similar, though not identical, in habit of growth, hardiness, and value as nurse trees, so far as tried at this Station.

The Cottonwood makes the most rapid height growth, one, 17 ft. high, and  $3\frac{3}{4}$  in. in diameter being the tallest tree in the plantation. This variety predominates in plat 2. Here many of the largest specimens have already began to die, branch after branch dropping its leaves, and drying out, until on some trees very few branches retained their vigor throughout the past season. This seems to be a very common fault with the cottonwood in many localities throughout the Dakotas. It seems to endure thin planting better than dense, succeeding best, where it is planted in a row, at long distances, along streets and drives. The trees in the plantation have suffered some from the cottonwood leaf beetle (*Lina Scripta*) but not so badly as have the *P. certinensis*. Cottonwoods that have become established along the streets and drives, in this county, have, in many cases attained a very large size, and are still thrifty. So far as I can learn, these large trees are not molested by the leaf beetle. *P. certinensis* is a better nurse tree than

cottonwood. It makes a less rapid height growth, and thus enables Ash and Elm to keep pace with it. While under the cottonwoods in plat 1, the weeds gain a foot-hold, from the trunk of the tree out, under the *P. certinensis* the ground is free from weeds from the trunk well out even with the tips of the lower branches. The last named tree suffers most from the leaf beetle. In 1891, the growing points of the *certinensis* were almost denuded of their leaves by the ravages of this insect. In the fall after the beetle had disappeared, these branches put out a new growth of leaves. As was at the time anticipated, all this new growth died back during the winter. This season, a similar occurrence, though in a less degree, has taken place, and we may expect a corresponding dying back the coming winter. The ravages of this beetle were measurably checked during this season, by spraying the trees with London Purple, one pound to 200 gallons of water.

The tallest *P. certinensis*, planted in 1889 is 11 ft. 8 in. in height and  $2\frac{3}{4}$  in. in diameter, one foot from the ground. The average height is about 9 feet.

#### EUROPEAN LARCH.

Perhaps no other tree in the forest plats has shown greater improvement over previous season's growth than has the Larch. It occurs in plat 3, the nurse trees in this plat being Box Elder. Heretofore, the Larch has shown little or no tendency to establish a leading branch. During the first few years, it merely developed a mass of lateral twigs, which, interlacing, gave the tree much the appearance of a tumble weed. Last season a few trees put out leaders, and began upward growth. During the present season, nearly all have begun developing tree form, making an average growth of 25 in. of new wood. The largest specimen is now about 6 ft. tall, having put out 37 in. of new wood this season. They showed no tendency to die back during the past winter, and this year's growth was for the most part, directed straight upward from the main stem.

#### YELLOW BIRCH.

This tree has made its best development in plat 10 where it has hard woods for all its neighbors. It seems to like bright sunshine, a fungus growth which effects its leaves, doing less

damage in this open plat, than in plat 4, where the Box Elders overshadow it with their shade. None of the trees have died this season, and the tree, thus far, seems to withstand this climate well, once it gets established. The Birch is a dense shade tree, allowing no weeds to grow beneath it. Thus far no deleterious effects from using hard woods entire, in this plat, can be noticed. Whether or not they will continue to thrive as well as they would with soft wood neighbors remains to be seen as growth continues. It will be noted from the table that the annual growth of the Yellow Birch has increased each year. The trees now average about  $9\frac{1}{2}$  ft. in height, the largest being 13 ft. high, with a diameter of  $3\frac{1}{2}$  in., one foot from the ground.

#### WHITE BIRCH.

For the four seasons since the plantation was begun, the growth of the White and Yellow Birch has been nearly parallel, some years the balance of growth being in favor of the one, and again, in favor of the other. This season, the White Birch has made less growth than has the Yellow. The largest White Birch is 12 ft. high, and  $3\frac{1}{2}$  in. in diameter, one foot from the ground. The Birches succeed well, not only in the cultivated plats, but as a lawn tree. The cut leaf, or Weeping Birch, is one of the finest ornamental trees on the College grounds.

#### BURR OAK. (*Quercus macrocarpa*.)

The Burr Oaks in the plantation are yearly becoming more promising. They grow very slowly at first, but during this time they are making strong root growth, so that once established, they withstand the trying features of our climate with impunity. At time of transplanting, care should be taken not to mistake live trees for dead ones, as they nearly always look dried and lifeless, when taken up. During the present season, those trees that have only moderate shade from the Box Elders, have made a little better growth, than those growing in that section of the plat, where the nurse trees are larger, and shading denser. The largest Oaks in the plat are about 4 ft. in height.

#### WHITE ELM.

The Elm is one of the most desirable hard wood trees yet planted at the Station. It has few insect enemies, is a strong, vigorous grower, and, year by year, proves itself more valuable.

Once established, it makes a very rapid height growth, keeping well in pace with the Box Elder as a nurse tree, so that it will endure planting where a dense leaf canopy is to surround it. This season, it has made its best growth in that part of plat 5, where the best stand of Box Elders, as nurse trees was secured, and where the leaf canopy is as nearly perfect, as in any part of the plantation. The second best growth was made in the hard wood plat, 10. In this plat, the leaf canopy is superior to that of most of the soft wood plats, except 4 and 5. The largest Elm in the plats is  $12\frac{1}{2}$  ft. high and has a diameter of  $2\frac{1}{2}$  in.

#### ASH.

As a hard wood the Ash promises to be equal, if not superior to the Elm for this vicinity. It is more hardy, more easily transplanted, seems to endure drought better, especially in its early stages, and makes a more valuable wood than Elm. Here it suffers more from the ravages of the Ash borer, than does the Elm from any insect enemies. In growth it keeps well up with the Elm. The largest tree in the plats is 10 ft. 3 in high and  $1\frac{3}{4}$  in. in diameter, a foot from the ground. Plats 21 and 20 planted to Ash and Elm respectively show a more nearly equal comparative growth than do plats 14 and 15 planted to the same varieties. The two first mentioned plats are very low, and were very wet, during the growing season. The two latter named are on higher and dryer ground. The growth in these four plats, indicates that Elm makes more rapid comparative growth on low wet land than does the Ash.

#### BLACK WALNUTS.

The walnuts were slow growers at first and many died the first few seasons. For the past year none have died. All that once succeeded in establishing themselves are growing well. Those that have most shade, thus far tend to outgrow those in sunshine. The tallest is 6 ft. 3 in. high.

#### SOFT MAPLE.

Heretofore, the records of each season accredited this tree with dying back badly during each winter, and sending up tufts of shoots of nearly equal size, each summer. The past

season seems to have been no general exception to this rule, but in plat 8, where the largest tree has reached a height of 11 ft., there seems to have been very little killing back last winter, and a greater tendency than usual to establish leading branches. In a good many specimens in this plat, an upward growing branch has taken the ascendancy, and promises a good, symmetrical growth. In plats 18 and 19, planted one year later, very few specimens have shown any tendency to develop tree form. The actual height of the trees, is very little above what it was a year ago, there being in most cases only a number of withes at each crown. As this tree is not a strong one, this tendency to form forked branches of equal size, results disastrously to the tree growth, by these branches splitting down, as soon as loaded with leaves. The maples in plats 25, 26 and 27 were planted one year later than those in plats 18 and 19. The trees were ordered from the same nursery, but very few died back. They are making rapid, symmetrical growth, and at present promise well as nurse trees. A greater annual growth was averaged by trees that died back. This unusual growth, may result in leaving the tissues infirm, and unable to withstand the winter; hence the continued tendency, in trees that have once winter-killed.



### TO FARMERS AND STOCKMEN.

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The Veterinarian of the Experiment Station, desiring to secure at all times as much information as possible regarding the diseases of domestic animals in this state, and to assist farmers and stockmen, would be pleased to receive and answer all letters that may be addressed to him concerning any matters in his department. Such letters should be as definite as possible in the statement of symptoms and other attendant facts.

In case of suspected outbreaks of contagious or infectious diseases he will endeavor to visit the locality and give such advice and assistance as may be possible, on condition that his necessary expenses are paid by the owners of stock suppose to be affected, or by the county commissioners. All communications should be addressed to

D. A. CORMACK,  
Brookings, S. D.