Bulletin No. 163 - Results with Tree Planting at the Sheridan Field Station

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RESULTS WITH TREE PLANTING AT THE SHERIDAN FIELD STATION

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Results with Tree Planting at the Sheridan Field Station

R. S. TOWLE

This circular gives the history of the shelterbelt plantings at the Sheridan Field Station from the time of the first planting in 1917 to 1928. The general plan of the plantings and the average growth of the trees in each planting are shown. The relative hardiness of the different trees under the conditions existing at the station to the fall of 1928 is indicated also.

The station is located on a non-irrigated tract of land about 8 miles northeast of Sheridan. The most of the land used for shelterbelt plantings is on a northeast slope, the soil consisting of a dark, heavy clay loam with a small amount of gumbo. In one of the later plantings, however, the one designated as block No. 5, there is a slight rise to the north and the soil is somewhat sandy.

The rainfall, as recorded at the station shows wide fluctuations both in the amount and also in its distribution during the season, a condition which is characteristic generally of the Great Plains. The average annual rainfall for the 10 year period from 1917 to 1926 was 15.10 inches with a range from 8.56 inches in 1919 to 25.18 inches in 1923. Temperatures as high as 100° F. in summer or as low as —30° F. in winter occur, but seldom during any season and in many years not at all. Periods of warm weather, with day temperatures above freezing, are quite frequent during the winter. The wind velocity is relatively low compared with other sections of the Great Plains. Strong drying winds are relatively infrequent, but do sometimes occur.

All shelterbelt plantings were made in cooperation with the Northern Great Plains Field Station of the U. S. Department of Agriculture, Mandan, North Dakota. Seedling trees were supplied by that station and the plantings were made according to plans furnished by it. All plantings were made on land which was in

*Division of State Farms Bulletin No. 13.

State Farms—Cheyenne, Laramie County; Eden, Sweetwater County; Gillette, Campbell County; Grover, Lincoln County; Lander, Fremont County; Lyman, Uinta County; Sheridan, Sheridan County; Torrington, Goshen County; Worland, Washakie County. (Cheyenne and Sheridan Farms cooperating with U. S. D. A.)

†This study was made at the Sheridan Experiment Farm, Sheridan, Wyoming, by the Division of State Experiment Farms, in cooperation with the Office of Dry-Land Agriculture, Bureau of Plant Industry, United States Department of Agriculture.
summer fallow the year before planting, and in some cases for a longer period. Clean cultivation has been practiced since the shelterbelts were planted.

MONTHLY, SEASONAL, AND ANNUAL PRECIPITATION AT THE SHERIDAN FIELD STATION FOR THE 12-YEAR PERIOD FROM 1917 TO 1928, INCLUSIVE.

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<td>0.18</td>
<td>10.21</td>
<td>17.27</td>
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</table>

*Ave. *

*Average 1917 to 1928.
Figure 1 shows the general outline of all plantings of the shelterbelt. This shows the position of the plantings in relation to the station buildings, the small fruit plantings and the road leading to the public highway. A separate diagram is shown of each planting also, along with the description of that planting. In these diagrams, x indicates trees still standing and making a healthy growth in 1928, and o indicates points where trees have killed out or have killed back badly and have been taken out. In the drainage course in block 2, however, the most of those marked as being out were taken out to clear the entire row or to thin the stand.
Blocks 1 and 2 were planted in 1917. A strip of ground 80 feet wide and 1,000 feet long on the west side of the station grounds and immediately west of the buildings was planted in two equal blocks. The north block, No. 1, was planted with trees 4 feet apart each way and the south block, No. 2, with trees 4 feet apart in the rows and the rows 8 feet apart. The trees in each block were planted from west to east as follows:

Block 1, 4x4 golden willows, golden willows, boxelders, green willows, poplars, boxelders, American elms, boxelders, green ash, poplars, boxelders, poplar cuttings, Chinese elms, green ash, poplar cuttings, green ash, boxelders, green ash, golden willows.
March, 1929  Results With Tree Planting

Block 2, 4x8—golden willows, boxelders, poplars, American elms, green ash, boxelders, Chinese elms, poplar cuttings, boxelders, golden willows.

A drainage course or shallow ravine, about 7 feet deep, with gently sloping sides, crosses these blocks near the center.

This ravine drains only a small area of land and there is water in it generally only during periods of heavy run-off from melting snow in the winter and spring. A clean cultivated strip about 30 feet wide was left next to the willows on the east side, but on the west side the native grass came within 4 feet of the outside row.

Where poplars were planted in 1917, Norway poplars were used. Many of these died each year, very few of the cuttings surviving the first year. All missing poplars were replacted by cuttings in 1920, but very few of the cuttings lived. Those poplars remaining made a rapid growth, but nearly all, except some in the drainage course, died in the spring of 1921. Those in the drainage course were taken out in 1925 in order to clear out the entire row. In all later plantings Northwest poplars were used where poplars were planted.

The row of poplar cuttings between the east row of boxelders and the Chinese elms in the 4 by 8 block was replaced in 1918 by Chinese elms. These were dug out again in 1919 to make way for poplar cuttings in 1920. None of the cuttings planted in 1920 lived and this left a space 16 feet wide between the boxelders and the remaining row of Chinese elms. Chinese elm sprouts continued to come at intervals where the trees had been dug out in this row, and all station plantings of Chinese elms after 1920 were made from sprouts secured from this source.

Practically all of the willows killed back and many of them died each year until 1920. All missing willows were replaced by cuttings in 1920, but few of the cuttings lived. Those willows remaining on the east side in 1920 have since made a good growth with only a little killing out. Practically all of those remaining on the west side, except in the drainage course, died in 1921 and 1922 and were pulled out in the fall of 1922. Those left in the drainage course on the west side made only a scrubby growth and were later removed.
Boxelders, except in the row farthest east, killed back badly in the winter and spring of 1921 and 1922, probably from drying winds and lack of moisture in the spring. Growth in the 4 by 4 block was shorter and the trees killed back slightly less than in the 4 by 8 block. Very little killing back was evident in the boxelder row with the 16-foot space between it and the next row. The boxelders seemed to recover fairly well during the next two years, but in 1925 a large number in both blocks killed back again, except in the east row. The row immediately west of the Chinese elms in the 4 by 8 block was removed that summer, except in the drainage course. By the spring of 1927 a large part of the boxelders had killed to the ground again, even a few in the east row killing back some. Consequently, in the summer of 1927 all of the boxelders were taken out except the east row, those in the drainage course, and a portion of the west row, which had not killed back to any extent. The stand was thinned to 8 feet in the row in the drainage course, and in a small section of the east row in order to secure a comparison with the 4-foot spacing in the remainder of the row.

No killing back of green ash has been apparent. The stand is thin in the west row of the 4 by 4 block, but here the ash were crowded by the rows on both sides, and no cultivation was possible from about 1922 until the boxelders and dead poplars were removed in 1927. The ash has grown slowly, however.

American elms have killed but little more than green ash and the growth has been about equal to that of the boxelders still living.

Chinese elms have made the fastest growth of any of the trees in this planting, and killed back but little until the spring of 1927. That spring many of the largest trees were found to be dead to the ground and many of the largest limbs on the remainder were dead. This condition was true of the Chinese elms in all plantings. More killing back occurred in the spring of 1928, but it was not as bad as in the previous year. The stand and general growth of these trees in the shelterbelt still remains good, however.

Evergreens of different species were planted each year in the space immediately east of these blocks, but until the planting of 1922 only a few lived through the summer. In the spring of 1922 Black Hills spruce were planted in a row 24 feet east of the wil-
lows. They were shaded by setting up shingles at a slight angle on the south side of each plant in order to protect them from the sun during the hottest part of the day. A good stand was secured from that planting, and there has been practically no killing out since.

The trees in block 3 were planted in rows from the west to east as follows:

Block 3, 8x6 and 8x8—Norwest poplars, boxelders, and green ash, Chinese elms, boxelders and green ash, Chinese elms, caraganas. Rows were planted 8 feet apart, with trees 6 feet apart in the row in the north one-half of the block, and 8 feet apart in the south one-half.

The Chinese elms and boxelders were planted in 1921. The season was unfavorable and about 65 per cent of the boxelders died, while practically all of the Chinese elms survived. Northwest poplars and caraganas were planted in 1922 and the missing boxelders were replaced by green ash. Another row west of the poplars was originally planned, but was not planted. This leaves a cultivated strip about 25 feet wide between the poplars and the sod, while on the east there is a similar strip about 18 feet wide.

A large part of the caraganas died the first year and were not replaced, until in 1927, extra evergreens were planted in a part of the row. There has been little loss of any other stock and all trees in this block have made a good growth. No difference can be noted in the trees planted 6 feet apart in the row and those 8 feet apart, but the wider spacing has been found more convenient for cultivation.
Blocks 4 and 5 also were planted in 1922. These blocks were planted in rows in order from west to east and with spacing as follows:

Block 4, 12 x 12 — buffaloberries, green ash, northwest poplars, green ash, northwest poplars, caraganas.

The caraganas were planted 8 feet from the sod and 4 feet apart in the rows. The other stock was planted 12 feet apart each way, the east row of poplars 14 feet from the caraganas to allow for turning in cultivation crosswise of the 12x12 plantings. The row of buffaloberries came within 8 feet of the sod on the west.

Block 5, 12x8—Russian olives, green ash, northwest poplars, green ash, boxelders, caraganas.

The caraganas here also were planted 8 feet from the fence and 4 feet apart in the row. The remainder of the block was planted in rows 12 feet apart and 8 feet apart in the row, except the boxelders, there being only enough of these supplied to plant 16 feet apart in the row. The boxelders also were planted 16 feet from the caraganas, to allow for cross cultivation of the 12x8 planting.
March, 1929 Results With Tree Planting

Very few of the caraganas in blocks 4 and 5 survived the first year. This probably was due to the fact that it was planted on the extreme edge of the ground previously prepared, the ground outside the row being broken up from sod just before planting. There has been little loss of any of the other stock in either block.

Block 6 was planted in 1927. The rows in this block were planted as follows, from north to south for those running east and west, and from west to east for those running north and south.

Block 6, 10x6 and 12x6—caraganas, caraganas, Schotch pine, Norway pine, Black Hills spruce, Black Hills spruce, Colorado blue spruce. The rows running north and south were planted 12 feet apart, with exception of one space which was made 16 feet to fit the rows still standing in block 1. Rows running east and west were planted 10 feet apart. Caraganas on the outside were planted 2 feet apart in the row, the second row 3 feet apart in the row and all the evergreens 6 feet apart. A good stand resulted with all of this planting.

The evergreens were shaded with shingles the same as those planted in 1922. Wet, cloudy weather prevailed for some time after planting and probably as good a stand would have resulted with no shading.
### GROWTH OF SHELTERBELT PLANTING, SHERIDAN FIELD STATION, SHERIDAN, WYOMING

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<td></td>
</tr>
<tr>
<td>Poplar Cuttings</td>
<td>out</td>
<td>out</td>
<td>out</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green Ash</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>7</td>
<td>7</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Boxelder</td>
<td>7</td>
<td>10</td>
<td>13</td>
<td>12</td>
<td>16</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td>Green Ash</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>7</td>
<td>9</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Golden Willow</td>
<td>6</td>
<td>8</td>
<td>10</td>
<td>12</td>
<td>16</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

Evergreens—Few from older plantings, probably 1920 and 1921, both blocks... 5-6 feet. 1922 planting... both blocks... 4 feet.

Note: *Killed back badly between 1920 and 1925.
†Only a few left in row.

### BLOCKS 3, 4, AND 5. PLANTED IN 1922°.

<table>
<thead>
<tr>
<th></th>
<th>FALL, 1924</th>
<th>FALL, 1928</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Height in Feet</td>
<td>Height in Feet</td>
</tr>
<tr>
<td></td>
<td>Distance apart, feet</td>
<td>Distance apart, feet</td>
</tr>
<tr>
<td></td>
<td>8X6</td>
<td>12X12</td>
</tr>
<tr>
<td>Northwest Poplar</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Buffaloberry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Russian Olive</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Boxelder</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Green Ash</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>Chinese Elm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northwest Poplar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boxelder</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Green Ash</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Chinese Elm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northwest Poplar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boxelder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caragana—Seedling 6 inch</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: °Chinese elms and boxelders in block 3 planted in 1924.
†Few.
A number of trees secured from commercial nurseries were planted in clumps with other stock on the station building grounds in 1923. The spacing in these clumps was irregular, varying from 6 to 12 feet. A hedge also was planted to caragana seedlings in 1922 from the same stock that was used for the shelterbelt plantings that year. A good stand was secured with the caraganas and with all the trees planted in clumps. Practically no killing back has taken place. The following table shows the kind of trees planted together with the size of the stock used, according to the catalog list, and the height in feet in 1928.

Growth of caragana hedge planted 1922 and of trees planted in clumps, 1923. Sheridan Field Station.

<table>
<thead>
<tr>
<th>Tree Type</th>
<th>Size of Stock Planted</th>
<th>Height Fall 1928</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northwest poplar</td>
<td>3-4 feet</td>
<td>18 feet</td>
</tr>
<tr>
<td>Green ash</td>
<td>5-6 feet</td>
<td>12 feet</td>
</tr>
<tr>
<td>Silverleaf poplar</td>
<td>4-6 feet</td>
<td>14 feet</td>
</tr>
<tr>
<td>Hackberry</td>
<td>5-6 feet</td>
<td>14 feet</td>
</tr>
<tr>
<td>Honey locust</td>
<td>5-6 feet</td>
<td>13 feet</td>
</tr>
<tr>
<td>Caragana</td>
<td>6-in. seedlings</td>
<td>6 feet</td>
</tr>
</tbody>
</table>
SUMMARY

Green ash and American elms survived the best of any of the trees planted in 1917. Over 85 per cent of both species lived and neither has killed back noticeably in any year. Green ash grew very slowly in the 1917 planting, but grew much faster in the later plantings where more space was allowed between the trees. American elms made about the same growth as boxelders, where the latter did not kill back.

Boxelders survived nearly as well as the green ash on low ground and in the row on the east side, but outside of the low ground it killed back badly on the west side.

Chinese elms made the fastest growth of any sort planted in 1917. As many of the Chinese elms lived as of the ash and American elms, but the Chinese elms killed back badly in 1927 and 1928, some of the best trees killing out completely in those years.

Only 35 per cent of the golden willows on the east side of the shelterbelt lived. Those made a good growth after 1920. None of the golden willows on the west side lived, except in the ravine, and those made only a scrubby growth.

In the later plantings, northwest poplars made a faster growth than Chinese elms and nearly all trees planted lived. Russian olives and buffaloberries made a good growth with no noticeable killing back.

Caraganas planted in a row by themselves in 1922, and in the shelterbelt in 1927, made a fast growth. Between 95 and 100 per cent of these lived and there has been no killing back.
March, 1929  Results With Tree Planting

The following publications of the Wyoming Experiment Station may be had upon request. (Revised list, January, 1929.)

ANNUAL REPORTS—
1909-10 to 1919-1920; 1921-1922; 1923-1924 to date.

No.  CIRCULARS—
  17. Feeding Yearling Steers.

No.  BULLETINS—
Index Bulletin D, July, 1907, Indexing Bulletins 54 to 75.*
  110. Sweet Clover.
  111. Alfalfa in Wyoming.
  113. The Effect of Alkali upon Portland Cement.
  116. Winter Grains.
  117. Cattle Feeding:
       Oat and Pea Silage for Beef Cows.
       Oat and Pea Silage for Growing Cattle.
  118. Oats in Wyoming.
  119. Spring Wheats in Wyoming.
  120. The Chemical Examination of Three Species of Larkspurs.
  121. Swamp Fever in Horses.
  123. Chemical and Pharmacological Examination of the Woody Aster.
  129. Sunflowers, their Culture and Use.
  130. Native Feeds for Fattening Lambs.
  131. Effects of Alkali and Weathering upon the Wool of Range Sheep.
  134. Wintering Range Calves.
  135. Garbage for Fattening Pigs.
  136. Avian Type of Tuberculosis in Cattle: Injection and Testing.
  137. Wyoming Forage Plants and their Chemical Composition.
  138. Experimental Transmission of Swamp Fever or Infectious Anemia by Means of Secretions.
  139. Climatological Data for Wyoming.
  143. Chemical Examination of Three Delphiniums.
  144. Lupine Studies II—The Silvery Lupine.
  145. Wyoming Hay for Milk Production.
146. Wyoming Forage Plants and Their Chemical Composition—Studies No. 7.
148. Wyoming Corn for Pork.
150. Fallow for Small Grains.
152. A Study of Potato Seed Treatment for Rhizoctonia Control.
153. Type in Beef Cattle.
155. Type in Two-Year Old Beef Steers.
157. Wyoming Forage Plants and Their Chemical Composition—Studies No. 8.
158. Use of Calcium Cyanide in the Apiary.
159. Surface Tension of Disinfecting Solutions for American Foulbrood.
160. Lessons from the University Dairy Herd.
162. Making Bread from Wyoming Flour.

Address requests: Bulletin Department, Experiment Station, Laramie, Wyoming.

*Very limited number.*