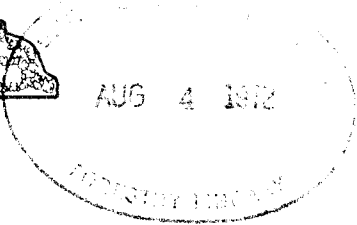


# Minnesota Forestry Research Notes



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## GROWTH AND SURVIVAL OF EXOTIC AND NATIVE SPECIES AT CLOQUET, MINNESOTA

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A series of plantings of exotic and native trees and shrubs was made in 1922, 1925, 1928, 1929, 1930 and 1933 at the Cloquet Forestry Center in northeastern Minnesota. The objective of the plantings was to test the hardiness and growth characteristics of a number of exotics so that recommendations could be made as to suitability for use in northern Minnesota.

The Cloquet Forestry Center is located at latitude 46°31', longitude 92°30' with an altitude of 1265 feet. The plantings have undergone a rather severe test. They are planted on a well-drained, sandy loam soil (Omega series) which is especially poor for growing hardwoods. The area has a typical continental climate modified by Lake Superior, about 20 miles to the east. The plantings have been exposed to temperatures ranging from 40° F. below zero to 105° F. above. The mean annual temperature is 38.6° F. based on the period 1912-1951.<sup>2/</sup> The growing season normally begins about May 1 and ends about September 30. The weather records show that frost has occurred in every month of the year. The normal annual precipitation is 28.5 inches including a normal snowfall of 58.1 inches. Occasional damage has resulted from winds accompanied by freezing rain or snow.

The plantings were evaluated in 1948 and recommendations as to suitability for use were made.<sup>3/</sup> In 1969, survival, height and d.b.h. (diameter breast high, 4.5 feet above ground) measurements were again taken. This report summarizes the 1969 observations. The plantings were divided into three general groupings by native range, as shown in Tables 1-3. The basis for survival percentages is 48 trees unless parentheses indicate otherwise.

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<sup>2/</sup>Weather data taken from Schantz-Hansen, T. and R. A. Jensen. 1956. 40-years of weather at the Cloquet experimental forest. University of Minnesota Ag. Exp. Sta. Bul. No. 436. 19 pp.

<sup>3/</sup>Schantz-Hansen, T. and O. F. Hall. 1952. Results of exotic trees and shrubs for hardiness in northern Minnesota. Minn. For. Note No. 5. 2 pp.

It would be extremely difficult to make recommendations as to suitability for planting based on the observations made in this report. Some of the species listed might well have had better survival and better growth on a different site and under different conditions. No special care has been given to the plantings as would be the case for trees and shrubs placed in a landscaped setting or planted for some particular purpose. Seed source records are available for most of the species and are kept on file at the Cloquet Forestry Center.

Table 1. Species Native to Minnesota

Scientific Name <sup>1/</sup>	Common Name	Date Planted	% Survival		Avg. Ht.(ft.)		Avg. Dbh.(in.)	
			1948	1969	1948	1969	1948	1969
<i>Abies balsamea</i>	balsam fir	1928	96	3	18	40	2.6	5.1
<i>Acer negundo</i>	boxelder	1922	46	7	8	15	3.1	3.8
<i>Acer saccharinum</i>	silver maple	1922	60	0	10	32	3.1	6.4
<i>Aesculus glabra</i> <sup>2/</sup>	Ohio buckeye	1925	88	4	6	6	*	1.6
<i>Catalpa speciosa</i> <sup>2/</sup>	northern catalpa	1933	0(3)	0	--	--	--	--
<i>Crataegus chrysoarpa</i>	fireberry hawthorn	1925	38	sprouts	6	--	1.7	--
<i>Fraxinus pennsylvanica var. lanceolata</i>	green ash	1922	100	1	12	25	2.2	3.1
<i>Juniperus virginiana</i>	eastern red cedar	1928	94	0	12	18	1.9	3.3
<i>Larix laricina</i>	tamarack	1922	73	4	25	53	4.6	6.6
<i>Ostrya virginiana</i>	ironwood	1925	83	7	12	23	1.6	2.6
<i>Picea glauca</i>	white spruce	1922	94	8	18	45	3.6	6.6
<i>Picea mariana</i>	black spruce	1928	98	4	22	47	4.3	6.9
<i>Pinus banksiana</i>	jack pine	1922	92	8	24	61	5.8	7.8
<i>Pinus resinosa</i>	Norway pine	1922	98	6	27	61	5.4	7.9
<i>Pinus strobus</i>	white pine	1922	88	8	19	53	5.4	9.1
<i>Prunus americana</i>	wild plum	1928	75	0	6	--	2.2	--
<i>Salix alba</i> var. <i>vitellina</i> <sup>2/</sup>	golden willow	1925	67	4	29	31	5.0	10.7
<i>Shepherdia argentea</i>	silver buffaloberry	1922	6	0	5	--	*	--
<i>Thuja occidentalis</i>	No. white cedar	1922	96	2	10	22	1.8	3.5
<i>Ulmus americana</i>	American elm	1922	98	0	14	23	3.2	4.4

<sup>1/</sup>Scientific names taken from Little, E. L. Jr. 1953. Check List of Native and Naturalized Trees of the United States. U. S. Forest Serv. Agr. Handbook No. 41. 472 pp.

<sup>2/</sup>Not native to Minnesota.

\* No measurement recorded.

Table 2. Species native to Europe and Asia.

Scientific Name <sup>1/</sup>	Common Name	Date Planted	% Survival		Avg. Ht.(ft.)		Avg. Dbh.(in.)	
			1948	1969	1948	1969	1948	1969
<i>Abies holophylla</i>	needle fir	1930	17	10	3	24	*	4.9
<i>Abies sachalinensis</i>	Saghalin fir	1930	10	2	2	10	*	1.8
<i>Acer tataricum</i>								
var. <i>rubrum</i>	Tatarian maple	1928	92	83	9	14	1.6	*
<i>Betula pendula</i>	European birch	1925	79	25	25	39	3.8	5.2
<i>Caragana arborescens</i>	Siberian pea tree	1922	100	100	many sprouts and multiple stems			
<i>Elaeagnus angustifolia</i>	Russian olive	1922	0	0	--	--	--	--
<i>Euonymus europaea</i>	European Spindle tree	1933	92(36)72		too small to measure			
<i>Forsythia viridissima</i>								
var. <i>koreana</i>	Forsythia	1933	33(24)	1 alive	4	4	*	*
<i>Fraxinus excelsior</i>	European ash	1933	30(36)	0	*	--	*	--
<i>Fraxinus mandshurica</i>	Manchurian ash	1930	25(20)	25	13	25	2.4	4.2
<i>Larix Gmelini</i>	Dahurian larch	1928	96	92	23	44	4.2	5.5
<i>Larix Gmelini</i>								
var. <i>japonica</i>	Kurile larch	1930	60(10)	0	--	--	--	--
<i>Larix Gmelini</i>								
var. <i>olgensis</i>	Korean larch	1930	67	50	26	42	4.8	7.0
<i>Larix leptolepis</i>	Japanese larch	1929	73	52	25	44	5.0	8.0
<i>Larix sibirica</i>	Siberian larch	1930	81	81	27	52	4.5	6.3
<i>Malus baccata</i>	Siberian crab	1930	92	90	10	20	1.7	3.5
var. <i>cea abies</i>	Norway spruce	1922	98	96	25	58	4.0	7.4
<i>Picea jazoensis</i>								
var. <i>hondoensis</i>	Hondo spruce	1930	15	12	2	16	*	2.6
<i>Picea Koyamai</i>	Korean spruce	1933	69	56	8	36	1.7	7.6
<i>Pinus densiflora</i>	Japanese red pine	1929	21	6	12	27	3.9	6.5
<i>Pinus koraiensis</i>	Korean pine	1930	85	85	10	30	2.5	5.5
<i>Pinus mugo</i>	mountain pine	1930	60	40	7	15	*	*
<i>Pinus peuce</i>	Macedonian pine	1933	62	46	6	20	1.6	4.5
<i>Pinus sylvestris</i>	Scotch pine	1922	67(42)	52	17	52	4.6	8.8
<i>Pinus tabulaeformis</i>	Chinese pine	1933	27	0	--	--	--	--
<i>Pinus Thunbergii</i>	Japanese black pine	1933	0	0	--	--	--	--
<i>Populus Petrowskyana</i>	Russian poplar	1922	10(42)	0	18	--	4.8	--
<i>Salix alba</i>	white willow	1922	64(42)	10 sprouts	20	19	3.6	5.8
<i>Salix pentandra</i>	laurel leaf willow	1922	37(30)	0	10	--	2.8	--
<i>Syringa oblata</i>								
var. <i>dilatata</i>	Chinese lilac	1930	73	33	4	4	*	*
<i>Thuja orientalis</i>	Chinese arbor-vitae	1933	0	0	--	--	--	--
<i>Ulmus pumila</i>	Siberian elm	1928	(1 tree)(1 tree)		*	16	*	2.4

<sup>1/</sup>Scientific names taken from Rehder, Alfred. 1956. Manual of Cultivated Trees and Shrubs. 2nd Ed. The Macmillan Company. N.Y. 996 pp.

\* No measurement recorded.

Table 3. Conifers native to western United States.

Scientific Name <sup>1/</sup>	Common Name	Date Planted	% Survival		Avg. Ht. (ft.)		Avg. Dbh. (in.)	
			1948	1969	1948	1969	1948	1969
<i>Abies concolor</i>	white fir	1928	98	97	5	14	*	3.1
<i>Abies lasiocarpa</i> var. <i>arizonica</i>	corkbark fir	1933	48	27	3	16	*	4.0
<i>Picea engelmanni</i>	Engelmann spruce	1933	56	33	*	13	*	2.9
<i>Picea glauca</i> var. <i>albertiana</i>	Black Hills spruce	1922	92	75	16	54	4.4	7.3
<i>Picea pungens</i>	Colorado blue spruce	1922	92	64	20	38	3.8	6.0
<i>Pinus contorta</i>	lodgepole pine	1933	25(24)	0	8	--	2.5	--
<i>Pinus flexilis</i>	limber pine	1933	25	0	8	--	1.8	--
<i>Pinus monticola</i>	western white pine	1930	56	0	3	--	*	--
<i>Pinus ponderosa</i>	western yellow pine	1922	29	4	22	27	5.6	5.5
<i>Pseudotsuga</i> <i>menziesii</i>	Douglas-fir	1928	90	83	8	30	2.2	5.4

<sup>1/</sup>Scientific names taken from Little, E. L. Jr. 1953. Check List of Native and Naturalized Trees of the United States. U. S. Forest Serv. Agr. Handbook No. 41. 472 pp.

\* No measurement recorded.