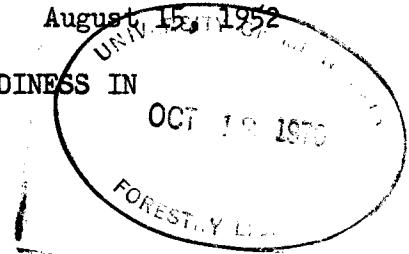


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RESULTS OF TESTING EXOTIC TREES AND SHRUBS FOR HARDINESS IN NORTHERN MINNESOTA

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Foresters planning windbreaks or other forest plantations, nurserymen, horticulturists, and wildlife biologists or sportsmen making game food plantings will be interested in the results of thirty years of experimentation at the Cloquet Experimental Forest with trees and shrubs native to other parts of the United States and to many foreign countries. The plantings were undertaken in order to find exotic trees and shrubs which might meet ornamental and utilitarian purposes not satisfied by native species. Of the many tried up to the present time, twenty-one have shown sufficient hardiness and good growth to be recommended for northern Minnesota planting.

Since 1922 when the tests began, these experimental plantings have been subjected to a wide range of climatic extremes in unprotected field plantings. Temperatures have ranged from -45° F. to 105° F. and there have been seasons of extreme drought, above normal rainfall, sudden freezing, and mid-winter thawing. Before field planting, all trees underwent four years in outdoor nursery beds, a period in which many unsuited species were eliminated. The soil in which the trees have grown is well-drained, light sandy loam. Insect damage has been considerable on some species. These conditions seem to include all hazards that young trees in northern Minnesota may be subjected to, although the dangers of windfall, disease, and insects that may be more damaging to mature trees have not been fully tested. It is possible that some of the trees which were unable to withstand these severe conditions may be sufficiently hardy for the southern part of the state.

The results of the tests up to the present time are set forth in the following table. Some native species have been included in the tabulation for purposes of comparison. Anyone wishing further information about any of these trees and shrubs, or anyone having recommendations of additional species that should be tested is invited to write to the authors.

Trees and Shrubs Recommended for Northern Minnesota Planting

Species	Condition in 1948			Remarks
	Age years	Average height feet	Survival per cent	
<i>Abies balsamea</i> (Balsam fir)	32	18	96	Native
<i>Betula alba</i> (European white birch)	26	25	80	
<i>Craetagus</i> sp. (Hawthorne)	23	6	40	Native wildings
<i>Juniperus virginiana</i> (Eastern red cedar)	24	12	94	

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Species	Age years	Average height feet	Survival per cent	Remarks
<i>Larix dahurica</i> var. P.R. (Prince Ruprecht's larch)	23	25	73	
<i>Larix korainsis</i> (Korean larch)	22	26	70	
<i>Larix kurilensis</i> (Kurile larch)	21	25	60	
<i>Larix laricina</i> (Tamarack)	26	26	73	Native
<i>Larix leptolepis</i> (Japanese larch)	24	23	95	
<i>Larix occidentalis</i> (Western larch)	19	15	75	
<i>Larix siberica</i> (Siberian larch)	22	27	80	
<i>Malus baccata</i> (Korean crabapple)	22	10	88	Fruit relished by grouse and other birds.
<i>Picea abies</i> (Norway spruce)	32	25	98	Must come from northern seed source.
<i>Picea ajanensis</i> (Yezzo spruce)	22	17	80	
<i>Picea glauca</i> (White spruce)	32	18	95	Native
<i>Picea glauca</i> var. <i>albertiana</i> (Black Hill's spruce)	33	16	90	
<i>Picea mariana</i> (Black spruce)	26	22	98	Native
<i>Picea pungens</i> (Colorado blue spruce)	33	20	90	
<i>Pinus banksiana</i> (Jack pine)	30	24	90	Native
<i>Pinus mugo</i> (Mugho pine)	23	7	80	Ornamental use only
<i>Pinus resinosa</i> (Red pine)	31	27	95	Native
<i>Pinus strobus</i> (Eastern white pine)	31	19	90	Native
<i>Pinus sylvestris</i> (Scotch pine)	22	17	58	Must come from northern seed source.
<i>Prunus americana</i> (Wild plum)	26	6	76	Native
<i>Salix alba</i> var. <i>vitellina</i> (Golden willow)	24	29	68	
<i>Thuja occidentalis</i> (White cedar)	32	10	94	Native
<i>Ulmus japonica</i> (Japanese elm)	20		100	Only one specimen planted.

Trees and Shrubs Not Recommended Because They Made Poor Growth or Were Semi-hardy.

<i>Abies concolor</i> (Concolor fir)	<i>Populus petrowskiana</i> (Russian poplar)
<i>Acer tartaricum</i> (Tartarian maple)	<i>Pseudotsuga taxifolia</i> (Douglas fir)
<i>Aesculus glabra</i> (Buckeye)	<i>Salix alba</i> (White willow)
<i>Fraxinus pennsylvanica</i> var. <i>lanceolata</i> (Green ash)	<i>Salix pentandra</i> (Laurel-leaf willow)
<i>Fraxinus manchurica</i> (Manchurian ash)	<i>Ulmus americana</i> (American elm)
<i>Pinus koraiensis</i> (Korean white pine)	<i>Ulmus pumila</i> (Siberian elm)

Trees and Shrubs Not Recommended Because They Were Not Hardy or Were Too Short-lived

<i>Abies grandis</i> (Grand fir)	<i>Pinus densiflora</i> (Japanese red pine)
<i>Abies lasiocarpa</i> (Alpine fir)	<i>Pinus flexilis</i> (Limber pine)
<i>Acer negundo</i> (Box elder)	<i>Pinus leucosperma</i> (Chinese pine)
<i>Acer rubrum</i> (Red maple)	<i>Pinus monticola</i> (Western white pine)
<i>Betula populifolia</i> (Grey birch)	<i>Pinus ponderosa</i> (Ponderosa pine)
<i>Elaeagnus angustifolia</i> (Russian olive)	<i>Populus</i> sp. (Northwest poplar)
<i>Pinus albicaulis</i> (Whitebark pine)	<i>Shepherdia argentea</i> (Buffaloberry)
<i>Pinus contorta</i> (Lodgepole pine)	<i>Tsuga heterophylla</i> (Western hemlock)