CURRENT TREE IMPROVEMENT RESEARCH IN IOWA

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Species adaptation studies have been conducted in southeastern, northeastern and western Iowa for several decades. Each area presents different problems because of a wide variation in soil series and types. The Fayette series, a loess-derived, medial gray-brown podzolic found in northeastern Iowa, is a fertile soil on which tree growth is good. However, the shrub and weed competition resulting from the relatively high fertility makes tree establishment exceedingly difficult.

The Ida series, a loess-derived regosol found in western Iowa, is a coarse-textured calcareous soil which supports a limited number of species. The Monona series, a loess-derived, minimal brunizen produces fair tree growth, but presents the problems of limited moisture and shallow depths to a calcareous loess.

The Weller series, a loess-derived, maximal gray-brown podzolic of southeastern Iowa is extremely susceptible to erosion, as is the Lindley series, a Kansan till-derived gray-brown podzolic. Excessive erosion and low fertility limit the number of species which can be established successfully.

Additionally, the preponderance of forest land dominated by inferior tree and shrub species and by inferior stems of desirable species is a problem common to all three areas. More than 18 percent (472 thousand acres) of the commercial forest area in Iowa is in nonstocked stands containing a high density of undesirable shrubs and noncommercial tree species.

Stand conversion studies and the aforementioned species adaptation studies have aided appreciably in the selection of species adapted to the environments indigenous to each area. Because of the markedly greater production per acre of introduced conifers as opposed to native hardwoods and the failure of hardwoods on eroded sites, most emphasis has been placed in the selection of superior coniferous species. However, it has been apparent from these studies that species adaptation is not a panacea for all tree establishment and growth problems. Variation in response within each species has indicated a need for intensive seed source investigations. Of times variation within species has exceeded that between species.

Approximately 10 years ago, the Forestry Section of the Iowa Agricultural Experiment Station initiated a tree improvement program which eventually let to the present provenance studies now being conducted in all three problem areas. A list of species, seed sources and their disposition in Iowa is shown in Table 1. Moreover, a list of the limited number of hybrid pines and hybrid poplars being studied, is included. Methods used to evaluate the various seed sources are determined primarily by the specific problems indigenous to each of the three areas. Because of the severe shrub and weed competition encountered in northeastern Iowa and in stand conversion programs in all areas, considerable emphasis has been placed on the response of these provenances to competition for light, soil moisture and nutrients. Controlled greenhouse

and plant growth chamber tests related to compensation point, maximum photosynthesis and growth responses to photoperiod are now being conducted as adjuncts to the field measurements normally made.

An evaluation of the adaptability of the various provenances to drought and to calcareous soils is now being made in western Iowa. A study of the interrelationships between lime-induced chlorosis, mycorrhizal populations and calcareous soils, limited previously to an evaluation of species differences, is being expanded to include an evaluation of seed source differences.

The marked superiority in establishment and growth of several species of conifers over native hardwoods on eroded soils of southeastern Iowa was studied intensively in the early 1950's. Seed sources of some of the coniferous species are now being evaluated in comparable areas. Additionally, provenance studies are being conducted in conjunction with stand conversion investigations.

Disease and insect problems, inherent in any program which emphasizes the planting of exotics, are included in all seed source evaluation studies. Resistance to diseases and insects, within the length of the proposed rotations, is being considered in the selection of seed sources for all areas.

Studies concerned with the rooting responses of stem cuttings of the Shimek and Sherrill clones of hybrid poplar were completed this year. The effects of stem length, stem diameter, auxin concentration and soil moisture level on rooting response were investigated. Stand growth studies are being made on all of the naturally occurring hybrid poplar clones.

Table 1. A resume of the tree improvement research conducted by the Forestry Department at Iowa State University

Provenance Studies

Species	Town	Country	Section	Latitude[1]	Elevation	Disposition in Iowa
European Black Pine						
Pinus nigra austriaca	Titouo Uzice	Yugoslavia	Northern	44°N	600-1100 m.	State Forest Nursery
P. nigra cebannensis	Pyrenees Mts.	France	Southern	48°N		" " "
P. nigra pallassiana	Kizileahaman	Turkey	Central	40°N	1300 m.	" " "
"	Alacam	Turkey	Central	39°N	800-1000 m.	" " "
"	Kizileahaman	Turkey	Central	40°N	1300 m.	" " "
"	Yilanli	Turkey	Southern	37°N	950-1100 m.	" " "
P. nigra poiretiana	Corsica	Corsica	-	42°N	-	" " "
European Larch						
Larix europaea	Central Alps	Austria	-	48°N	1000-2000 m.	NE, W, SE
"	Wiener Neustadt	Austria	Central	45°N	600-1000 m.	NE, W, SE
"	Alsuce	France	Southern	45°N	800-1400 m.	NE, W
"	Wroclaw	Poland	-	approx. 51°N	-	NE, W
"	Wroclaw	Poland	Southern	52°N	400-700 m.	NE, W, SE
Larix olgensis	Kwangneung	Korea	Central	38°N	-	
" sibirica	Askiski District	Siberia	-	approx. 60°N	750 m.	
" X eurolepis	Boller District	Jutland				
(A cross between L. europaea (European Larch) and L. leptolepis (Japanese Larch)						
Norway Spruce						
Picea abies	-	Austria	Southern	47°N	-	State Forest Nursery
"	-	Bulgaria	-	43°N	1000-2000 m.	" " "
"	Wisla	Poland	Southern	51°N	500-800 m.	" " "
" excelsa	Ardennebelge	Belgium	Central	50°N	390 m.	" " "
"	Ardennebelge	Belgium	Central	50°N	400 m.	" " "
"	Ardennebelge	Belgium	Central	50°N	500 m.	" " "
"	Ardennebelge	Belgium	Central	50°N	330-525 m.	" " "
"	Ardennebelge	Belgium	Central	50°N	405 m.	" " "
Scotch Pine						
Pinus sylvestris	Gutenstein	Austria	Southern	47°N	600-700 m.	NE, W, SE
"	Nieder Oesterreich	Austrian	Central	48°N	-	NE, SE
"	Wiener Neustadt	Austria	Central	48°N	300-600 m.	NE, W, SE
"	Ardennebelge	Belgium	Central	51°N	315-355 m.	
"	Vastra Nyland	Finland	Southern	60°N	0-50 m.	NE, W, SE
"	Bamberg	Germany	Central	50°N	-	NE, W, SE
"	Hanau	Germany	Central	50°N	-	NE, W, SE
"	Mecklenburg	Germany	Northern	54°N	-	NE, W, SE
"	Smolnickaltuta	Slovakia	Southern	49°N	-	NE
"	-------	Yugoslavia	Southern	43°N	-	
"	Madrid	Spain	Central	41°N	-	NE, W, SE
"	Catacik	Turkey	Northern	40°N	1300-1500 M	
"	Kizilcahaman	Turkey	Northern	40°N	1500 m.	
"	Oster Goetland	Sweden	Central	62°N	100 m.	NE

1/Latitude of Iowa ranges from 41° to 43°N.
Longitude of Iowa ranges from 90° to 98°W.

Table 1 (Cont.)

Hybrid Pine Studies

Species	Common Name	From	Disposition in Iowa
Hybrid Pines			
Pinus contorta s sp. murrayana (Sierra Nevada group)	Lodgepole	Inst. of Forest Genetics	NE
P. contorta s sp. murrayana x banksiana	Lodgepine & Jack pine	Inst. of Forest Genetics	State Forest Nursery
P. echinata x taeda	Shortleaf & loblolly pine		SE
P. echinata x taeda	Shortleaf & loblolly pine	Inst. of Forest Genetics	State Forest Nursery
P. monticola x strobus	Eastern & western white pine	Inst. of Forest Genetics	NE
P. strobus x griffithii	Eastern & himalayan pine	Inst. of Forest Genetics	NE

Hybrid Poplar Studies

Species	State	Section	Latitude	Elevation	Disposition in Iowa
Crandon P. alba x grandidentata Lee County	Iowa	Southeast	41°N	1000-2000 ft.	State Forest Nursery Cutting Orchard
Hansen P. alba x grandidentata Lee County	Iowa	Southeast	41°N	1000-2000 ft.	NE, W, SE
Sherril P. alba x grandidentata Van Buren Co.	Iowa	Southeast	41°N	1000-2000 ft.	"
Shimek P. alba x grandidentata Lee County	Iowa	Southeast	41°N	1000-2000 ft.	"