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**Minnesota Wood Energy Scale-Up
Project 1994 Establishment Cost Data**

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LOCKHEED MARTIN ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

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ABSTRACT

The Minnesota Wood Energy Scale-up Project began in late 1993 with the first trees planted in the spring of 1994. The purpose of the project is to track and monitor economic costs of planting, maintaining and monitoring larger scale commercial plantings. For 15 years, smaller scale research plantings of hybrid poplar have been used to screen for promising, high-yielding poplar clones. In this project 1000 acres of hybrid poplar trees were planted on Conservation Reserve Program (CRP) land near Alexandria, Minnesota in 1994. The fourteen landowners involved re-contracted with the CRP for five-year extensions of their existing 10-year contracts. These extended contracts will expire in 2001, when the plantings are 7 years old.

The end use for the trees planted in the Minnesota Wood Energy Scale-up Project is undetermined. They will belong to the owner of the land on which they are planted. There are no current contracts in place for the wood these trees are projected to supply. The structure of the wood industry in the Minnesota has changed drastically over the past 5 years. Stumpage values for fiber have risen to more than \$20 per cord in some areas raising the possibility that these trees could be used for fiber rather than energy. Several legislative mandates have forced the State of Minnesota to pursue renewable energy including biomass energy. These mandates, a potential need for an additional 1700 MW of power by 2008 by Northern States Power, and agricultural policies will all affect development of energy markets for wood produced much like agricultural crops.

There has been a tremendous amount of local and international interest in the project. Members of the Minnesota Senate Environment and Natural Resources Committee toured plantations and learned about the project in October 1994. A tour of international researchers coordinated with the International Energy Agency visited in late September 1995. Recent local and national press has highlighted this project [e.g. The Wall Street Journal, TVA Southeastern Regional Biomass Energy Program Newsletter, Agri-News, The Land, Wadena Pioneer Journal, Alexandria Echo Press, Morris Sun and local television stations].

Contractual negotiations between area landowners, the CRP, a local Resource Conservation and Development District, the Minnesota Department of Natural Resources and others are currently underway for additional planting of 1000 acres in spring 1995.



INTRODUCTION

Researchers have projected the cost of supplying wood from short rotation intensive culture methods. With no actual field production cost data, these estimates have been based on the opportunity cost of current land use and various economic assumptions about management practices. Research plots of up to 10 acres have provided valuable information about growth and yield, but provide limited information on costs and yields of larger plantings. The purpose of this project is to track economic costs of planting, maintaining, monitoring and harvesting commercial scale plantings of hybrid poplar.

The purpose of this report is to summarize the first-year results of the project and to describe the projects status. In the first section, a general per-acre average cost structure for establishment of the plantings is provided. The next three sections outline the process whereby landowners recontract through the Conservation Reserve Program (CRP), the land tax structure near Alexandria, Minnesota, and availability and quality of nursery stock. Two sections document the replanting contingency provision and possible end-use alternatives for harvested wood. Finally, two detailed appendices include summaries of site-by-site costs to date with a machinery complement for each of 14 planting sites, and maps of each site showing soil types and hybrid poplar clones selected for each site.

GENERAL COST STRUCTURE

Information in this section describes the general cost structure of converting CRP land to hybrid poplar. CRP land in much of this region is currently planted to a mix of grasses. Table 1 shows the general cost structure per acre to landowners. In the project area landowners are currently paid from \$45 to \$60 per acre per year by the CRP. This applies to at least 6 counties around Alexandria, Minnesota. Landowners in this project paid \$31 of the planting, establishment and maintenance for the first year; landowners net receipt for the first year is \$19 per acre, on average. Landowners were consulted as a group and agreed to this cost structure before any work took place. The second year, two cultivations are expected to be needed at \$10 each; the third year, only one cultivation is expected to be needed. The CRP payments will continue at \$50 per acre per year through the first seven years of the project. During the first year, the total per-acre cost was \$276. The landowner paid \$31 of that and the Farm Services Agency (FSA) paid \$73 on average. The FSA agreed to this cost structure as well after meetings with landowners and the RC&D. The remaining \$172 was paid for by project partners.

The first four costs in Table 1 cover site preparation in the fall of 1993. Fall site preparation was not completed on all sites in 1993, but average costs were nearly 21 percent of the entire establishment costs over all sites which had completed fall site preparation. Fall site preparation was very important because the CRP land used had been in sod for a number of years. The sites were very difficult to work because of extensive sod formation and root growth.

Trees were planted on an 8 foot by 8 foot spacing with approximately 700 trees per acre. The technique of planting was either by hand with a planting mattock (hook), or with a mechanical (tractor drawn machine) planter. Although overall costs of planting by either technique were similar on average, planting accuracy (measured by spacing consistency, depth of stick, and count) was greater with hand planting. Accuracy leads to better chances of survival. Hand planting also affords the ability of cross-cultivation by machinery (cultivation in both directions) reducing weed growth between and within rows.

Plant material cost from the nursery was \$0.07 per cutting FOB the nursery. The Consolidated Farm Service Agency (CFSA) paid \$0.10 per cutting (in addition to the base \$0.07 cost) for shipping and storage. Total plant material cost was \$0.17 per cutting or \$116.00 per acre on average.

CRP RECONTRACTING PROCEDURES

The Minnesota Department of Agriculture and the WesMin RC&D hosted a CRP Informational Meeting in April 1994. Three such meetings were held in Minnesota to solicit input from CRP contract holders on management options and concerns for CRP lands, should the CRP cease to continue. One of the key findings was that farmers considered the prospects of long-term end-use contracts very positively. Many expressed a willingness to accept more up-front costs if product end-use contracts could be struck. In lieu of these long-term contracts, they accepted the costs outlined in the first section.

Farmers had two major reasons for being interested in planting hybrid poplar and recontracting through the CRP. First, hybrid poplar production could provide an alternative source of income. Second, farmers felt that extending their CRP contracts would at least provide them CRP payments for an additional 5 years. The CRP allows tree planting as an option for extending CRP contracts on qualified land.

LAND TAX STRUCTURE BY COUNTY

Tax information as received from tax assessors by county is as follows. Douglas County landowners, who represent the northern part of the project, incur a tax of \$2.50 per acre per year for homesteaded property and \$5 additional per acre per year for non-homesteaded land. In Swift County, (represents the southern part of the project) landowners pay \$3.40 per acre per year for homesteaded land and \$10.20 per acre per year for non-homesteaded land. Pope county landowners pay \$2.71 and \$9 per acre per year for homesteaded and non-homesteaded land, respectively. There is some within-county variation in taxes based on soil productivity. These finer points and details of assessment are not yet understood.

NURSERY STOCK AND PROJECTION OF AVAILABILITY

Planting stock for the project was bare-root stem cuttings. These stem cuttings are 10 inches long and from 3/8 inch to 3/4 inch diameter. Nursery production of hybrid poplar cuttings in Wisconsin, Minnesota and Michigan were barely able to meet demand for this project and other related plantings. It takes about an acre of land to produce enough cuttings for 150 acres of tree planting, depending on field spacing. Several nurseries in Wisconsin, Minnesota and Michigan provided the majority of plant material. Increasing interest in planting will encourage the nursery industry in Wisconsin, Minnesota and Michigan to rethink their production schedules and improve the grade of plant materials.

REPLANTING CONTINGENCY AND COST STRUCTURE

Several factors influenced the success of 1000 acres planted. These factors were cutting grade and quality, soil preparation, weed control practices, and water availability. Several sites are to be partially or completely replanted in 1995. Under an agreement with the FSA, CRP, the WesMin RC&DD, and landowners, replanting is available on CRP acreage if the failure of these plantings cannot be attributed to the landowner. Table 2 shows the cost schedule for replanting under CRP regulation. Table 3 summarizes the approximate replanting schedule of activities for each site. Entire sites were determined to need replanting if more than 40 percent of the plants on a site did not survive. In all cases where entire sites need to be entirely replanted, more than 90 percent of the plants did not survive. The main reason for these failures was due to standing water in fields after planting, combined with inferior diameter cuttings. Late spring site preparation also contributed to failures. -

DISCUSSION OF END-USE ALTERNATIVES

There are no contracts currently in place for the wood harvested from the 1000 planted acres. There is a growing interest from traditional wood market centers and there has been a long standing interest in wood energy crops in Minnesota.

One possibility for contracting for energy end-use involves Whole Tree Energy™ Technology. David Ostlie and Energy Performance Systems, Minneapolis, Minnesota, who patented the process, have expressed a willingness to contract with landowners for wood. Mr. Ostlie feels he could compete with the current wood products markets; he would offer the landowner \$10 per dry ton. If he could receive \$25 from an electric power producer, he feels he could cover his harvesting and transportation cost.

In 1991, the stumpage price (price per dry ton of standing timber paid to landowner by a logger) in the area of Alexandria, Minnesota was between \$4 and \$6 per dry ton. Currently, prices (now determined by auction) range from \$12 to \$15, reflecting a doubling in price. The pulp and paper industry uses timber in this area predominantly for the production of oriented strand board (OSB), an important building product. A logger who may pay a landowner, say, \$12-15 per dry ton may be paid \$35 to \$50 per dry ton at the OSB mill. The logger's net after harvesting and hauling may only be \$12-15. Mr. Ostlie's end-use alternative is for the production of electric power.

Although wood chips are not commercially used for ethanol production, the possibility exists. The fiber industry in the North Central U.S. may provide a viable end-use alternative for hybrid poplar, as has been the case in the Pacific Northwest U.S.

One key to success of the project for renewable energy or fiber is to establish long-term contracts. Under this structure, landowners would contract in such a way as to receive a set annual amount for wood, to be agreed upon by all parties involved.

MACHINERY COMPLEMENT AND SITE SPECIFIC INFORMATION

Tables A1-A14 in the Appendix detail the machinery complement used on each site, whether the trees were hand planted or machine planted, and the dates of crop management. Where available, the name of the herbicide product used and cultivation dates are also listed. For each site, the cost of the trees planted by site and the total cost of the trees are itemized. Better descriptions of individual physical site features and identification of a whole-farm enterprise structure are useful when trying to understand why landowners make CRP contract and crop planting decisions. If landowners, for example, prefer a diversified crop base, and have CRP land that qualifies for tree planting, they may decide to plant trees. If their motives are to retain their land, cover taxes and expenses, and do not look for high profit margins on crops, they may take a chance with a tree crop they had never considered before.

SIGNIFICANCE OF TRACKING SPECIFIC CLONAL PERFORMANCE ON DIFFERENT SOILS

There is no track record of large-scale plant yield and viability of particular varietal selections of hybrid poplar on different soils and soils classes. Valuable information collected from each site will enable researchers to track the growth rate and development of different clones of hybrid poplar on these sites. Table 4 provides a key to the individual site maps displayed in Appendix Figures A1-A14.

Table 1. Year 1 Average Cost per Acre for CRP Extended Land Contracts

OPERATION	1994\$/ACRE	GROUP WHO PAYS	NOTES
offset, disk, plow	15.00	project	
tandem disk	8.00	landowner	
disk/chisel	15.00	landowner	
apply Round-Up	19.00	project	rate = 1.5qt, .25 pt 2,4,D
tand disk cult/harrow	8.00	landowner	
burn down + herb as need	10.00	project	
apply Linuron	34.00	project	
Tree stock/ship/store	73.00	CFSA	formerly ASCS
planting cost 8'X8'	49.00	project	
first cultivation	10.00	project	
second cultivation	10.00	project	
third cultivation	10.00	project	
herbicide application	15.00	project	now, \$10.00 after relabeling of OUST
TOTAL COST PER ACRE	276.00		
FIRST YEAR COST SUMMARY			
total landowner cost*	31.00		
total project cost	172.00		
total ASCS cost	73.00		
TOTAL COST PER ACRE	276.00		

*land owners receive \$45 to \$60 per acre from the CRP, Net receipts to landowners range between \$14 and \$29 per acre.

Table 2. Cost Structure Associated with Replanting

OPERATION	1994\$/ACRE	GROUP WHO PAYS	NOTES
planting stock	70.00	Farm Service Agency	
re-planting	36.00	Farm Service Agency	
re-planting	25.00	MFIP	Minnesota Forestry Improvement Association
TOTAL COST PER ACRE	131.00		

The difference between original plantng cost of \$122.00 and \$131.00 (\$9.00) is paid to the Project for re-disking land for replanting.

Table 3. Success and Replanting

SITE	TOTAL ACRES	SUCCESSFUL (acres)	REPLANT (acres)	COMMENTS
Acorn	73.70	49.70	24.00	
Durst	16.60	144.00	16.60	high pH
Erickson	83.60	21.60	62.00	drought
Eskelson	13.60	13.60	0.00	
Fadden	18.60	18.60	0.00	
Kreyer	120.60	120.60	0.00	
Nelson	130.00	70.00	60.00	flooded areas
Pohlig	16.00	16.00	0.00	
Roguske	40.00	20.00	20.00	
Sheets	104.90	0.00	104.90	drought, planting stock
Strandberg	--	--	--	
Stroot	33.10	23.10	10.00	possible failed areas near main road
Swanson	104.50	64.50	40.00	
Thompson	<u>100.00</u>	<u>0.00</u>	<u>100.00</u>	flooded
TOTAL ACRES	999.20	561.70	437.50	

Table 4. Key for Fig. 1-14; Soil Names and Types

LANDOWNER	SOIL NAME	MAP SYMBOL	LAND CAPABILITY CLASS
Acorn	Blowers	720B	2E
Durst	Hamerly Lindaas	814	2S
	Mackintosh Lindaa	948	2S
Erickson	Wauken	WaC2	3E
	Wauken	WaB	2E
Eskelson	Barnes	BbB2	2E
Fadden	Vallers	VaA	2W
Kreyer	Two Inlets	1196C	4S
	Clontarf	371	3S
	Nitche	705B	3S
	Corliss	721B	4S
Nelson	Maryland Loam	MP	2W
	Marer Loangei	MS	3W
Pohlig	Arvilla Sandy Loam	ASB	3E
Roguske	Biscay	399	3W
	Osakis	413	3S
Sheets	Wauken	WAB	2E
	Barnes	BAB2	2E
	Aastad	AaA	I
Standberg	Vallers	VaA	2W
Stroot	Dorset	DOB	3E
	Osakis Loam	OSA	3E
Swanson	Sinai Clay	SIB	SE
	Waukon Langei	WIC2	3E
	Wauken	WAB	2E
Thompson	Arveson Loam	AV	3E
	Venlo	VE	2W
	Hamar	HA	4W

APPENDIX A

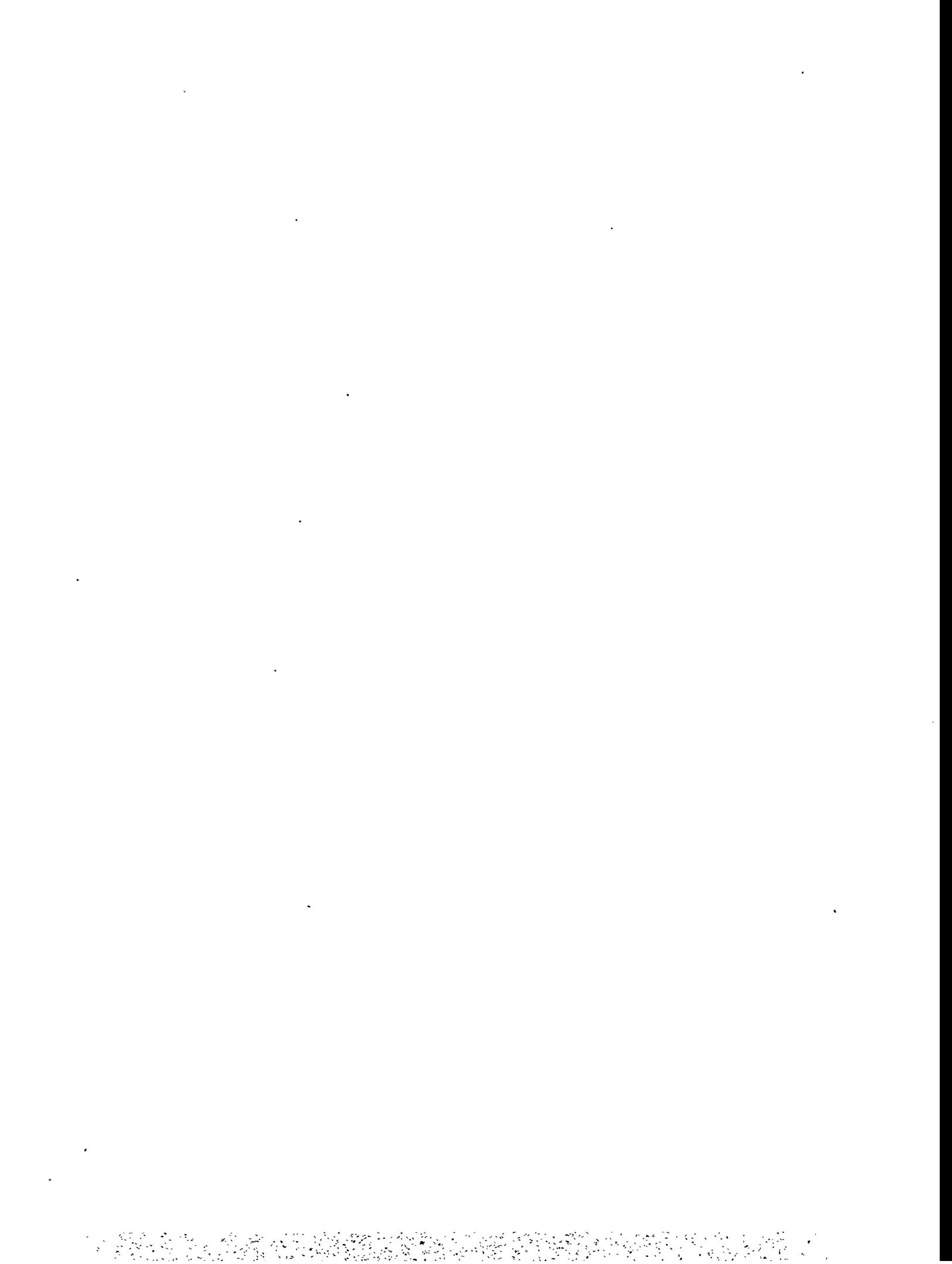


Table A2. Durst - Individual Landowner Project Summary

Name: Durst

Legal Description: 31-125-44
Stevens County

Total Acres: 800

Total Acres in CRP: 480

Acres in Hybrid Poplar: 160.6 PRG. ; CRP EXT

	<u>Practice</u>	<u>Equipment</u>	<u>Completed</u>	<u>Cost/Acre</u>	<u>Total Cost</u>
SITE PREPARATION:					
Burn Off Cover	160.6 AC	--	Nov 93	--	--
Plow	160.6 AC	140 HP TR	Nov 93	\$ 15.00/AC	\$ 2,409.00
Disking	160.6 AC	140 HP TR	May 94	\$ 8.00/AC	\$ 1,284.80
Cultivating	(2X)	140 HP TR	May 94	\$10.00/AC	\$ 1,606.00
PLANTING: 8 X 8 SPACING					
Shipping					\$ 803.00
Cost of Trees					\$ 10,936.80
Hand Planted 110,000 Trees		--	May 94	\$ 47.67/AC	\$ 7,655.76
MAINTENANCE:					
Cultivation	160.6 AC	48 HP TR	July 94	\$ 10.00/AC	\$ 1,440.00
Cultivation	144 AC	48 HP TR	Aug 94	\$ 10.00/AC	\$ 1,280.00
Cultivation	160.6 AC	36 HP TR	Sept 94	\$ 10.00/AC	\$ 1,406.00
Cultivation	160.6 AC	36 HP TR	Oct 94	\$ 10.00/AC	\$ 1,634.00
HERBICIDE:					
<u>Product Name</u>	<u>Rate</u>	<u>How Applied</u>	<u>Completed</u>	<u>Cost/Acre</u>	<u>Total Cost</u>
Round-Up	1 QT/AC	Aerial	May 94	\$ 17.07/AC	\$ 2,731.88
Lorox	3 LBS.	Ground	June 94	\$ 34.89/AC	\$ 5,581.95

ACRES TO BE REPLANTED IN SPRING OF 1995: 16.6 ACRES

Table A4. Eskelson - Individual Landowner Project Summary

Name: Eskelson

Legal Description: 10-124-38 Pope County

Total Acres: 60.5

Total Acres in CRP: 60.5

Acres in Hybrid Poplar: 13.6 PRG. : CRP EXT

	<u>Practice</u>	<u>Equipment</u>	<u>Completed</u>	<u>Cost/Acre</u>	<u>Total Cost</u>
SITE PREPARATION:					
Disking	13.6 AC	45 HP TR	Oct 93	\$ 10.00/AC	\$ 135.00
Plowing	13.6 AC	100 HP TR	Oct 93	\$15.00/AC	\$ 204.00
Chisel Plow/Disc	13.6 AC	250 HP TR	May 94	\$15.00/AC	\$ 204.00
Dragged	13.6 AC	45 HP TR	May 94	\$5.00/AC	\$ 68.00
PLANTING: 8 X 8 SPACING					
Shipping					\$ 68.00
Cost of Trees					\$ 926.10
Hand Planted 9,261 Trees		45 HP TR	June 94	\$ 47.67/AC	\$ 648.31
MAINTENANCE:					
Cultivated	13.6 AC	45 HP TR	June 94	\$10.00/AC	\$ 136.00
Cultivated	13.6 AC	45 HP TR	July 94	\$ 10.00/AC	\$ 136.00
Cultivated	6.8AC	45 HP TR	Aug 94	\$ 10.00/AC	\$ 68.00
HERBICIDE:					
<u>Product Name</u>	<u>Rate</u>	<u>How Applied</u>	<u>Completed</u>	<u>Cost/Acre</u>	<u>Total Cost</u>
Round-Up 13.8 AC	1 QT/AC	Ground	May 94	\$ 17.28/AC	\$ 234.99
Fusilade 13.8 AC	1 QT/AC	Band Sprayed	July 94	\$ 6.66/AC	\$ 90.60

Table A5. Fadden - Individual Landowner Project Summary

Name: Fadden

Legal Description: 34-129-36
Douglas County

Total Acres: 48.5

Total Acres in CRP: 31.2

Acres in Hybrid Poplar: 18.6 PRG. : CRP EXT

	<u>Practice</u>	<u>Equipment</u>	<u>Completed</u>	<u>Cost/Acre</u>	<u>Total Cost</u>
SITE PREPARATION:					
Chopping	18.6 AC	45 HP TR	Oct 93	\$ 10.48/AC	\$ 195.00
Plowing	18.6 AC	110 HP TR	Nov 93	\$ 12.10/AC	\$ 225.00
Disking	18.6 AC	110 HP TR	Nov 93	\$ 4.35/AC	\$ 81.00
Disking	18.6 AC	110 HP TR	Nov 94	\$ 4.35/AC	\$ 81.00
Cultivation	18.6 AC	110 HP TR	May 94	\$ 4.35/AC	\$ 81.00
Cultivation	18.6 AC	110 HP TR	May 94	\$ 4.35/AC	\$ 81.00
Disking	18.6 AC	110 HP TR	May 94	\$ 4.35/AC	\$ 81.00
Cultivation	18.6 AC	110 HP TR	May 94	\$ 4.35/AC	\$ 81.00
PLANTING: 8 X 8 SPACING					
Shipping					\$ 93.00
Cost of Trees					\$ 1,266.60
Hand Planted 12,666 Trees		110 HP TR	June 94	\$ 47.67/AC	\$ 886.29
MAINTENANCE:					
Cultivated	18.6 AC	36 HP TR	June 94	\$ 10.00/AC	\$ 186.00
Cultivated	18.6 AC	36 HP TR	July 94	\$ 10.00/AC	\$ 186.00
Cultivated	18.6 AC	36 HP TR	Aug 94	\$ 10.00/AC	\$ 186.00
HERBICIDE:					
<u>Product Name</u>	<u>Rate</u>	<u>How Applied</u>	<u>Completed</u>	<u>Cost/Acre</u>	<u>Total Cost</u>
Fusilade 18.6 AC	1 PT/AC	Ground	July 94	\$ 7.91/AC	\$ 141.27

Table A6. Kreyer - Individual Landowner Project Summary

Name: Kreyer

Legal Description: 21-133-39
Ottertail County

Total Acres: 182

Total Acres in CRP: 129.8

Acres in Hybrid Poplar: 120.6 PRG. : CRP EXT

	<u>Practice</u>	<u>Equipment</u>	<u>Completed</u>	<u>Cost/Acre</u>	<u>Total Cost</u>
SITE PREPARATION:					
Mowing	120.6 AC	100 HP TR	Oct 93	\$ 5.00/AC	\$600.00
Disc/Plow	120.6 AC	250 HP TR	April 94	\$ 16.00/AC	\$ 1,929.00
Disking	120.6 AC	100 HP TR	April 94	\$ 5.00/AC	\$ 600.00
Disking	120.6 AC	100 HP TR	April 94	\$5.00/AC	\$ 600.00
PLANTING: 8 X 8 SPACING					
Shipping					\$ 603.00
Cost of Trees					\$ 8,212.86
Hand Planted 82,128 Trees		100 HP TR	May 94	\$ 47.67/AC	\$ 5,748.96
MAINTENANCE:					
Cultivated	120.6 AC	100 HP TR	June 94	\$ 10.00/AC	\$ 1,206.00
Cultivated	120.6 AC	100 HP TR	July 94	\$ 10.00/AC	\$ 1,206.00
Cultivated	120.6 AC	100 HP TR	Aug 94	\$ 10.00/AC	\$ 1,206.00
Cultivated	120.6 AC	100 HP TR	Sept 94	\$ 10.00/AC	\$ 1,206.00
HERBICIDE:					
<u>Product Name</u>	<u>Rate</u>	<u>How Applied</u>	<u>Completed</u>	<u>Cost/Acre</u>	<u>Total Cost</u>
Round-Up	1½ QT/AC	Ground	May 94	\$ 19.70/AC	\$ 2,375.90
Lorox	3 LB/AC	Ground	June 94	\$ 37.56/AC	\$ 4,530.00
Fusilade	1 QT/AC	Ground	July 94	\$ 18.65/AC	\$ 2,249.63

Table A7. Nelson - Individual Landowner Project Summary

Name: Nelson

Legal Description: 5-121-40
Snift County

Total Acres: 370

Total Acres in CRP: 370

Acres in Hybrid Poplar: 130 PRG. : CRP EXT

	<u>Practice</u>	<u>Equipment</u>	<u>Completed</u>	<u>Cost/Acre</u>	<u>Total Cost</u>
SITE PREPARATION:					
Chop	130 AC	250 HP TR	Dec 93	\$ 10.00/AC	\$ 1,270.00
Chisel Plow	130 AC	250 HP TR	Dec 93	\$ 10.00/AC	\$ 1,270.00
Disking	130 AC	250 HP TR	June 94	\$ 6.00/AC	\$ 750.00
Disking	130 AC	250 HP TR	June 94	\$ 6.00/AC	\$ 750.00
Cultivating	130 AC	250 HP TR	June 94	\$ 5.00/AC	\$ 750.00
Multiweeding	130 AC	250 HP TR	June 94	\$ 5.00/AC	\$ 625.00
Multiweeding	130 AC	250 HP TR	June 94	\$5.50/AC	\$ 330.00

PLANTING: 8 X 8 SPACING

Shipping					\$ 650.00
Cost of Trees					\$ 8,853.00
Hand Planted 88,530 Trees			June 94	\$ 47.67/AC	\$ 6,197.00

MAINTENANCE:

HERBICIDE:

<u>Product Name</u>	<u>Rate</u>	<u>How Applied</u>	<u>Completed</u>	<u>Cost/Acre</u>	<u>Total Cost</u>
Round-Up	1 1/8 QT/AC	Aerial	May 94	\$ 19.50/AC	\$ 2,535.00
Fusilade	1 PT/AC	Aerial	June 94	\$ 21.00/AC	\$ 2,730.00
Lorox	3 LB/AC	Ground	June 94	\$ 32.00/AC	\$ 4,157.90

ACRES TO BE REPLANTED IN SPRING OF 1995: 60

Table A8. Pohlig - Individual Landowner Project Summary

Name: Pohlig

Legal Description: 36-128-37
Douglas County

Total Acres: 37.5

Total Acres in CRP: 37.5

Acres in Hybrid Poplar: 16 PRG. : CRP EXT

	<u>Practice</u>	<u>Equipment</u>	<u>Completed</u>	<u>Cost/Acre</u>	<u>Total Cost</u>	
SITE PREPARATION:						
Disk and Harrow		70 HP TR	May 94	\$ 14.77/AC	\$ 236.25	
Chisel Plow & Disk		70 HP TR	May 94	\$ 36.33/AC	\$ 581.30	
PLANTING:						
Shipping					\$ 80.00	
Cost of Trees					\$ 1,089.60	
Hand Planted 10,896 Trees		80 HP TR	May 94	\$ 47.67/AC	\$ 762.72	
MAINTENANCE:						
Cultivated	16 AC	70 HP TR	June 94	\$ 7.81/AC	\$ 125.00	
Cultivated/Mowed	16 AC	36 HP TR	Aug 94	\$ 15.00/AC	\$ 240.00	
Cultivated	16 AC	36 HP TR	Sept 94	\$ 10.00/AC	\$ 160.00	
HERBICIDE:						
	<u>Product Name</u>	<u>Rate</u>	<u>How Applied</u>	<u>Completed</u>	<u>Cost/Acre</u>	<u>Total Cost</u>
	Cultivation (In Lieu of Spraying)	1½ QT/AC	70 HP TR	May 94	\$ 10.72/AC	\$ 187.50
	Round-Up		70 HP TR	May 94	\$ 34.45/AC	\$ 551.25

Table A9. Roguske - Individual Landowner Project Summary

Name: Roguske

Legal Description: 9-122-33

Total Acres: 200

Total Acres in CRP: 178

Acres in Hybrid Poplar: 40 PRG. : CRP EXT

	<u>Practice</u>	<u>Equipment</u>	<u>Completed</u>	<u>Cost/Acre</u>	<u>Total Cost</u>
SITE PREPARATION:					
Plow	40 AC	140 HP TR (EST)	Oct 93	\$ 15.63/AC	\$ 625.00
Disking	40 AC	140 HP TR (EST)	May 94	\$ 6.67/AC	\$ 266.66
Disking	40 AC	140 HP TR (EST)	May 94	\$ 6.67/AC	\$ 266.66
Disking	40 AC	140 HP TR (EST)	June 94	\$ 6.67/AC	\$ 266.68
Rototill	40 AC	140 HP TR (EST)	June 94	\$ 12.25/AC	\$ 490.00
PLANTING: 8 X 8 SPACING					
Shipping					\$ 194.00
Cost of Trees					\$ 2,724.00
Machine Planted 13,620 Trees		120 HP TR	June 94	\$ 47.67/AC	\$ 953.40
Hand Planted 13,620 Trees		--	May 94	\$ 47.67/AC	\$ 953.40
MAINTENANCE:					
Cultivated	20 AC	65 HP TR	June 94	\$ 10.00/AC	\$ 200.00
Cultivated	20 AC	65 HP TR	July 94	\$ 10.00/AC	\$ 200.00
Cultivated	20 AC	65 HP TR	Aug 94	\$ 10.00/AC	\$ 200.00
HERBICIDE:					
<u>Product Name</u>	<u>Rate</u>	<u>How Applied</u>	<u>Completed</u>	<u>Cost/Acre</u>	<u>Total Cost</u>
Linex 20 AC	1½ QT/AC	Ground	May 94	\$ 29.00/AC	\$ 580.00
Ranger 20 AC	1½ QT/AC	Ground	May 94	\$ 16.00/AC	\$ 320.00
Linex 20 AC	1½ QT/AC	Ground	June 94	\$ 29.00/AC	\$ 580.00
Ranger 20 AC	1½ QT/AC	Ground	May 94	\$ 19.00/AC	\$ 760.00

ACRES TO BE REPLANTED IN SPRING OF 1995: 20 ACRES

Table A11. Strandberg - Individual Landowner Project Summary

Name: Strandberg

Legal Description: 36-129-37
Douglas County

Total Acres: 63.2

Total Acres in CRP: --

Acres in Hybrid Poplar: 10 PRG. : CRP EXT

	<u>Practice</u>	<u>Equipment</u>	<u>Completed</u>	<u>Cost/Acre</u>	<u>Total Cost</u>
SITE PREPARATION:					
Tandem Disced	10 AC	180 HP TR	June 94	\$ 6.25/AC	\$ 62.50
Tandem Disced	10 AC	180 HP TR	June 94	\$ 6.25/AC	\$ 62.50
Tandem Disced	10 AC	180 HP TR	June 94	\$ 6.25/AC	\$ 62.50
Tandem Disced	10 AC	180 HP TR	June 94	\$ 6.25/AC	\$ 62.50
PLANTING: 8 X 8 SPACING					
Shipping					\$ 50.00
Cost of Trees					\$ 680.00
Hand Planted 6,800 Trees		180 HP TR	June 94	\$ 47.60/AC	\$ 476.00
MAINTENANCE:					
Cultivated		36 HP TR	June 94	\$ 10.00/AC	\$ 100.00
Cultivated		36 HP TR	July 94	\$ 10.00/AC	\$ 100.00
Cultivated		36 HP TR	Aug 94	\$ 10.00/AC	\$ 100.00
HERBICIDE:					
<u>Product Name</u>	<u>Rate</u>	<u>How Applied</u>	<u>Completed</u>	<u>Cost/Acre</u>	<u>Total Cost</u>
Round-Up	1½ QT/AC	Broadcast	May 94	\$ 25.00/AC	\$ 251.45
Fusilade	1 QT/AC	Hand Sprayed	June 94	\$13.94/AC	\$ 139.37

Table A14. Thompson - Individual Landowner Project Summary

Name: Thompson

Legal Description: 5-121-40
Swift County

Total Acres: 428.4

Total Acres in CRP: 428.4

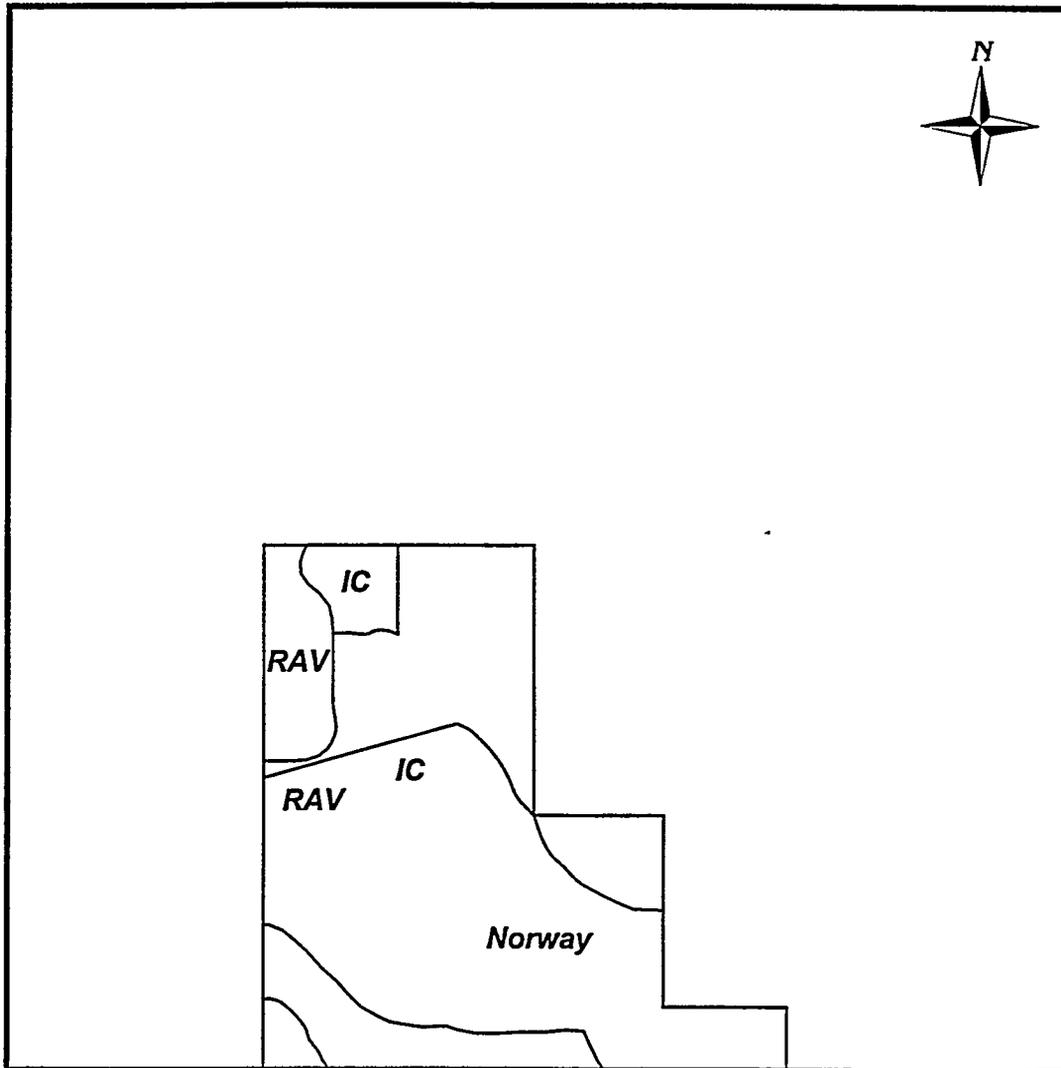
Acres in Hybrid Poplar: 100 PRG. : CRP EXT

	<u>Practice</u>	<u>Equipment</u>	<u>Completed</u>	<u>Cost/Acre</u>	<u>Total Cost</u>
SITE PREPARATION:					
Chisel Plow	100 AC	250 HP TR	June 94	\$ 8.20/AC	\$ 820.00
Disking	100 AC	250 HP TR	June 94	\$ 6.00/AC	\$ 600.00
Disking	100 AC	250 HP TR	June 94	\$ 6.00/AC	\$ 600.00
Cultivating	100 AC	250 HP TR	June 94	\$ 6.00/AC	\$468.00
Multiweeding	100 AC	250 HP TR	June 94	\$ 5.00/AC	\$ 390.00
Dynadrive	100 AC	250 HP TR	June 94	\$ 11.40/AC	\$ 1,140.00
PLANTING: 8 X 8 SPACING					
Shipping					\$ 340.50
Cost of Trees					\$ 6,810.00
Hand Planted 70,000 Trees		--	June 94	\$ 47.67/AC	\$ 4,767.00
MAINTENANCE:					
HERBICIDE:					
<u>Product Name</u>	<u>Rate</u>	<u>How Applied</u>	<u>Completed</u>	<u>Cost/Acre</u>	<u>Total Cost</u>
Round-Up	1 1/3 QT/AC	Aerial	May 94	\$ 19.50/AC	\$ 1,950.00
Lorox	3 LB/AC	Ground	June 94	\$ 31.30/AC	\$ 3,130.00

ACRES TO BE REPLANTED IN SPRING OF 1995: 100 ACRES

APPENDIX B

LANDOWNER: Acorn
LEGAL DESCRIPTION: SECTION TOWNSHIP RANGE
35 130 34



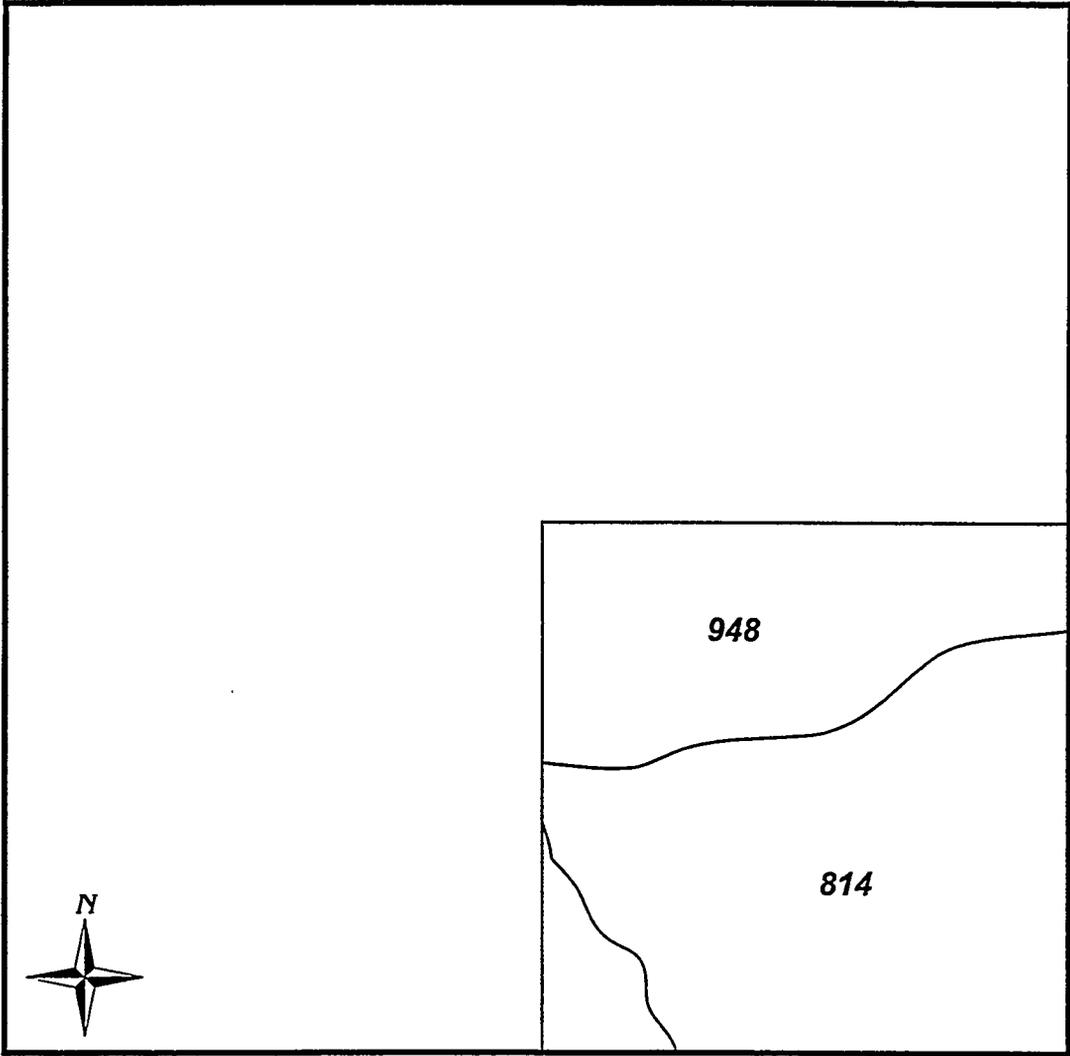
Scale 1" = 1,000'

Note: Planted 50,190 trees.

SPECIES	NUMBER
Norway Poplar — DN-34	29,315
Imperial Carolina — DN-34	8,875
DN-34	12,000

Fig. B1-2. Acorn poplar clone map.

LANDOWNER: **Durst**
LEGAL DESCRIPTION: SECTION TOWNSHIP RANGE
36 125 45

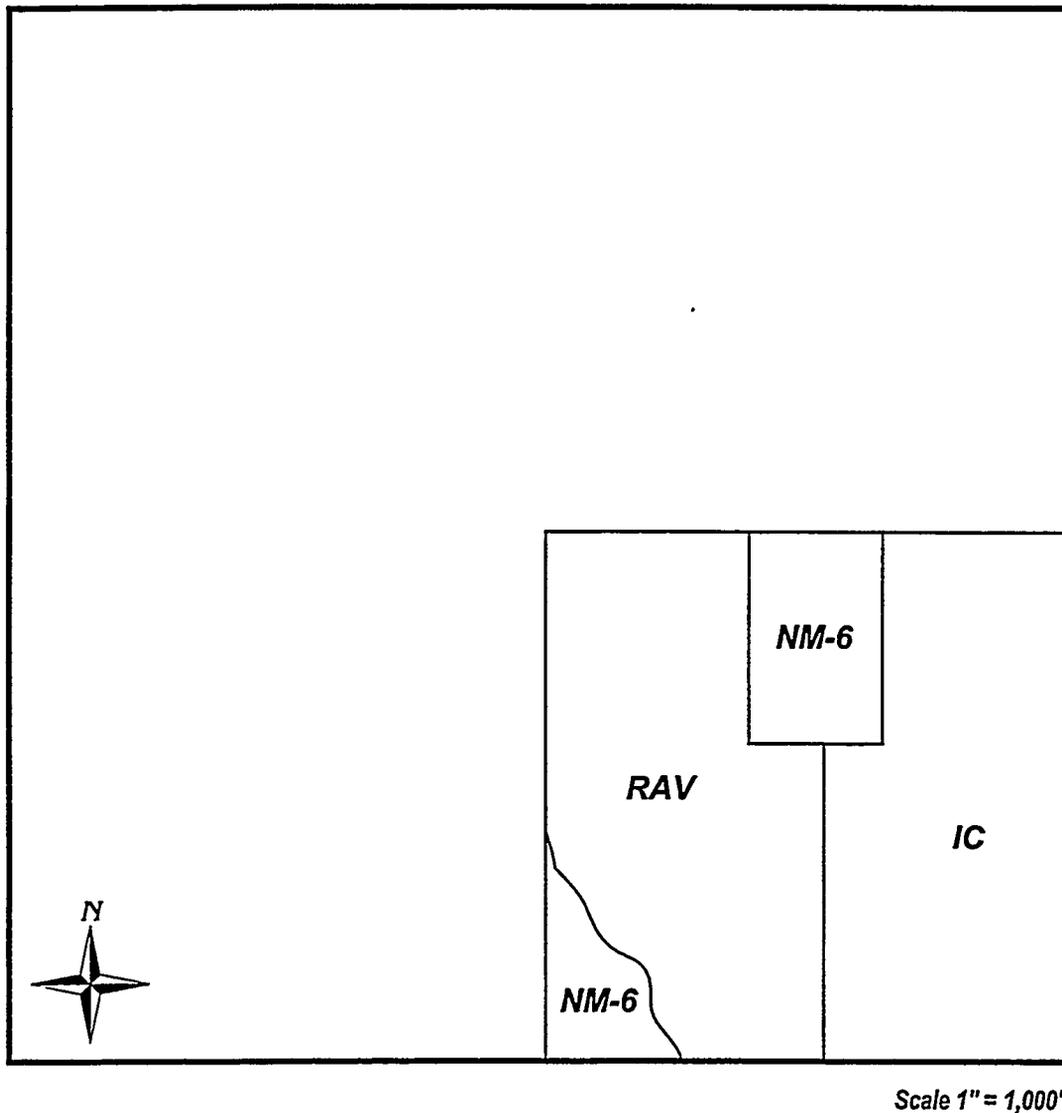


Scale 1" = 1,000'

SOIL NAME	MAP SYMBOL	LAND CAPABILITY
Hamerly	814	IIe
Mackerton	948	IIe

Fig. B2-1. Durst soils map.

LANDOWNER: **Durst**
LEGAL DESCRIPTION: SECTION TOWNSHIP RANGE
36 125 45



Note: Hand planted 108,368 trees.

SPECIES	NUMBER
NM-6	1,000
Raverdeau	3,980
Imperial Carolina — DN-34	103,388

Fig. B2-2. Durst poplar clone map.

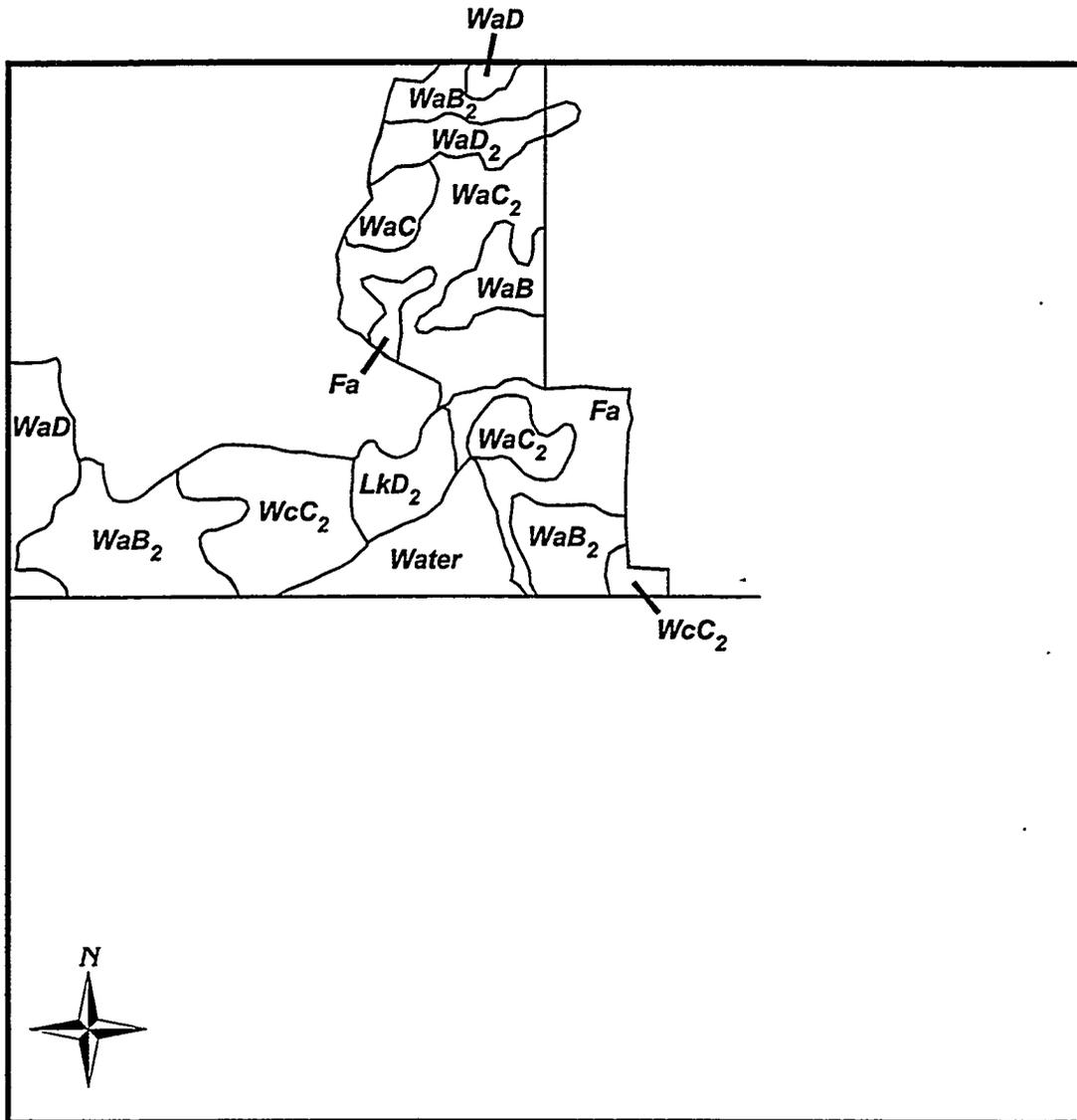
LANDOWNER: Erickson

LEGAL DESCRIPTION: SECTION TOWNSHIP RANGE

7

129

38



Scale 1" = 1,000'

SOIL NAME	MAP SYMBOL	LAND CAPABILITY
Waukon	Wa	IIe
Flom	Fa	IIw
Langhei	Lk	IVe

Fig. B3-1. Erickson soils map.

LANDOWNER: Eskelson
 LEGAL DESCRIPTION: SECTION TOWNSHIP RANGE
 10 124 38

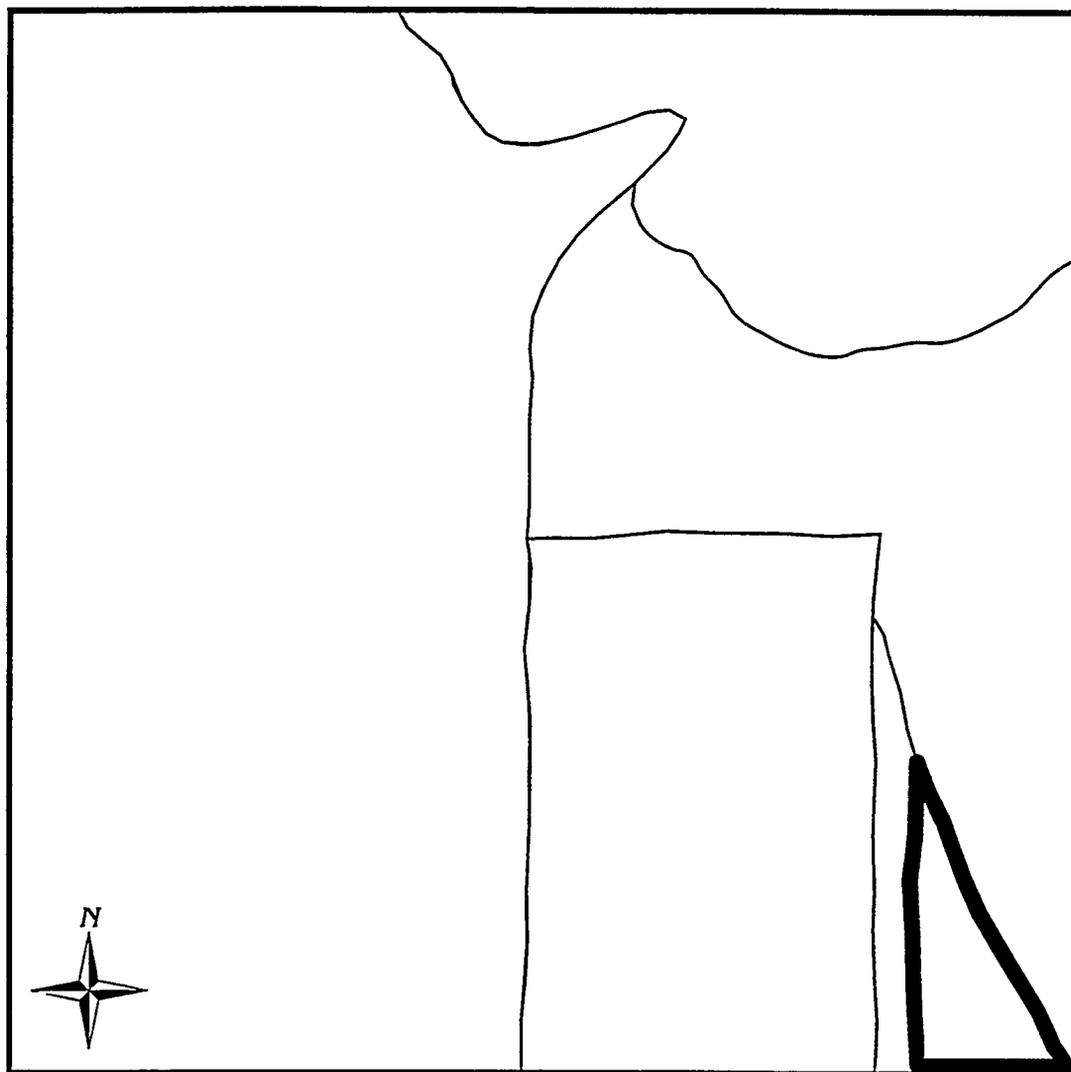


Scale 1" = 1,000'

SOIL NAME	MAP SYMBOL	LAND CAPABILITY
Barnes-Lanshei	Bf	Iie
Parnell & Flom Silty Clay	Pf	IIIw

Fig. B4-1. Eskelson soils map.

LANDOWNER: Eskelson
LEGAL DESCRIPTION: SECTION TOWNSHIP RANGE
10 124 38



Scale 1" = 1,000'

Note: Machine planted 9,261 (Raverdeau) trees.

Fig. B4-2. Eskelson poplar clone map.

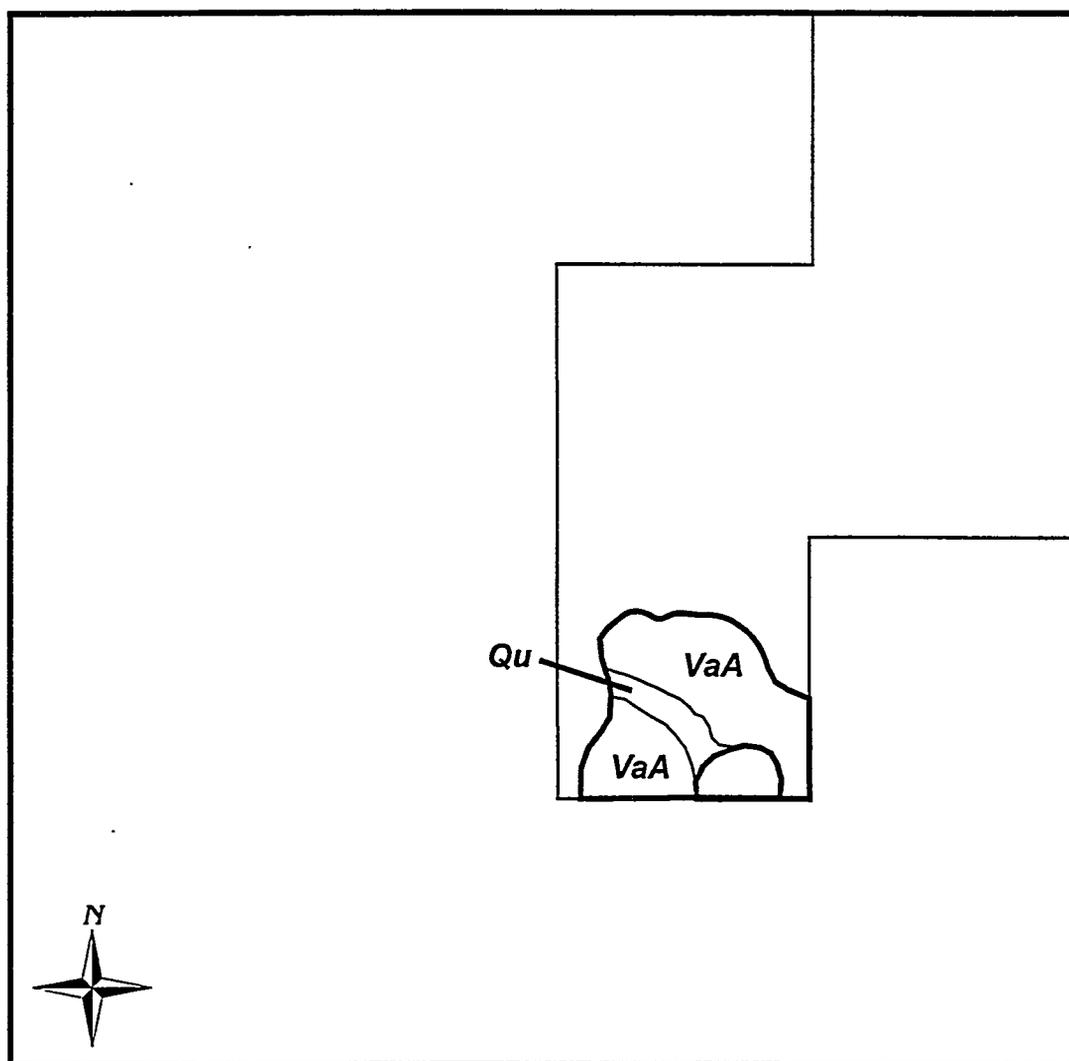
LANDOWNER: Fadden

LEGAL DESCRIPTION: SECTION TOWNSHIP RANGE

34

129

36

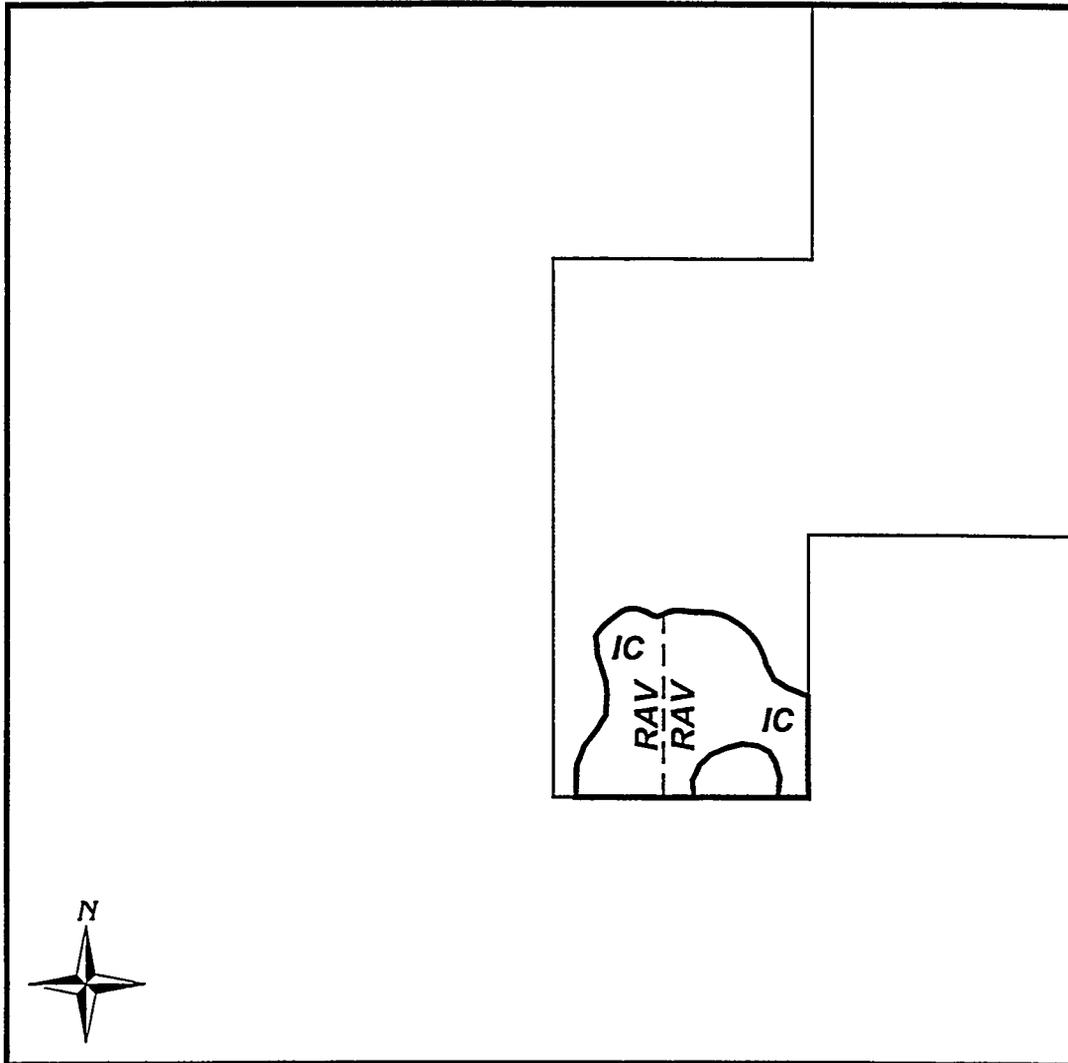


Scale 1" = 1,000'

SOIL NAME	MAP SYMBOL	LAND CAPABILITY
Quam Silty Clay Loam	Qu	IIIw
Vallers Clay Loam	VaA	IIw

Fig. B5-1. Fadden soils map.

LANDOWNER: **Fadden**
LEGAL DESCRIPTION: SECTION TOWNSHIP RANGE
34 129 36



Scale 1" = 1,000'

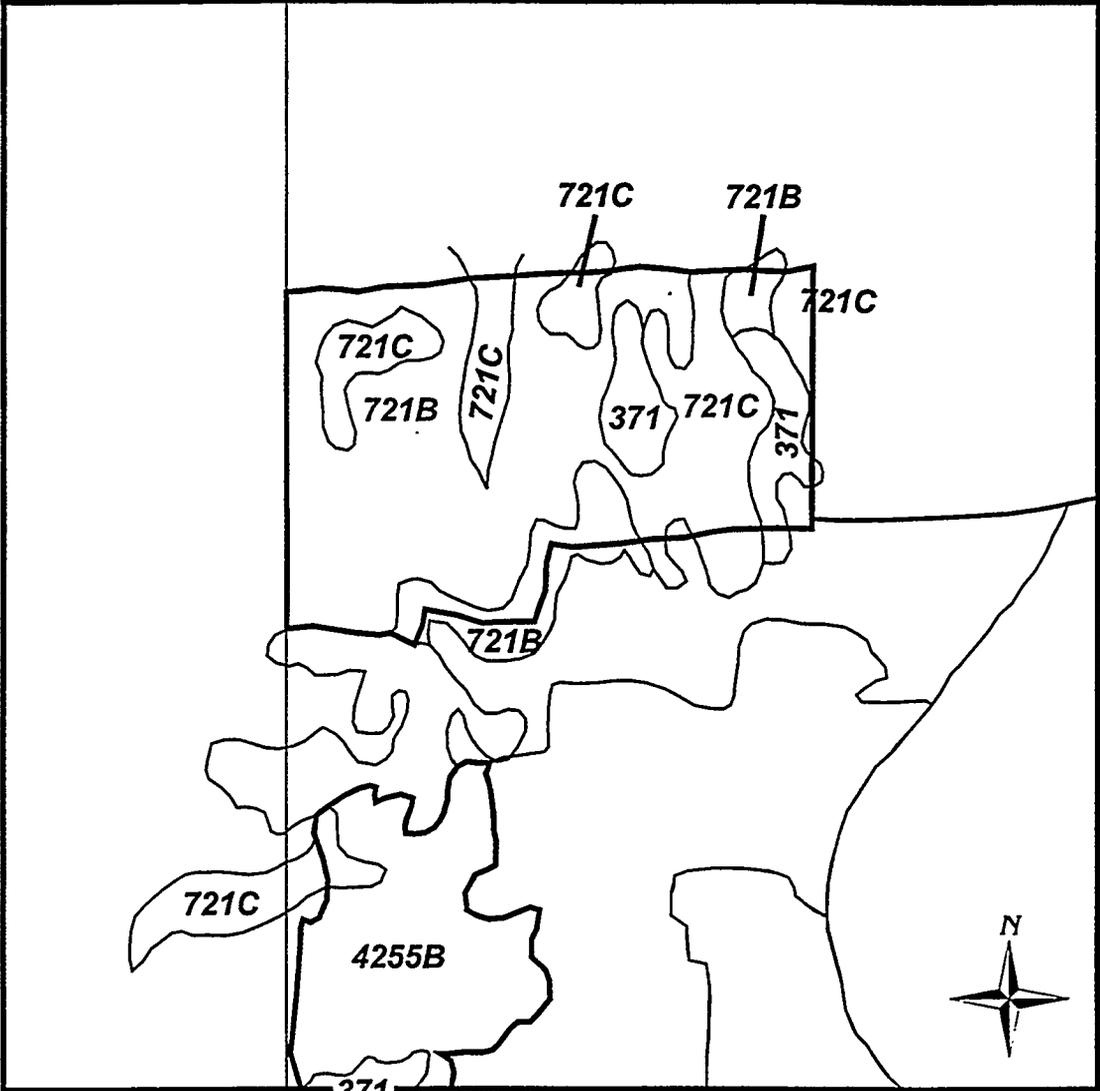
Note: Machine planted 12,666 trees.

SPECIES	NUMBER
Raverdeau	666
Imperial Carolina — DN-34	12,000

Fig. B5-2. Fadden poplar clone map.

LANDOWNER: Kreyer

LEGAL DESCRIPTION: SECTION TOWNSHIP RANGE
21 133 39



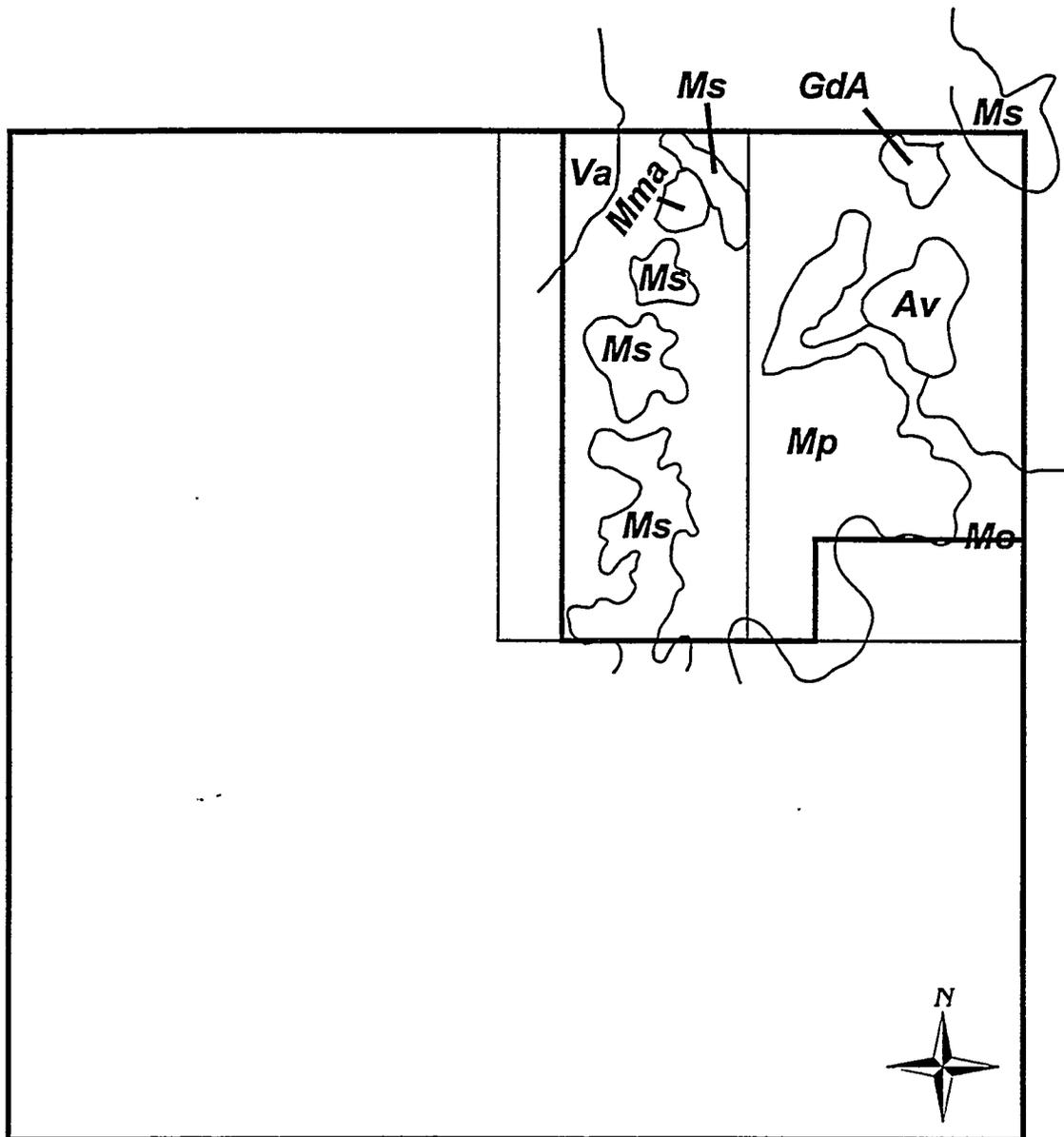
Scale 1" = 1,000'

SOIL NAME	MAP SYMBOL	LAND CAPABILITY
Clontarf	371	IIIs
Corliss	721	IVs
Two Inlets	4255	IVs

Fig. B6-1. Kreyer soils map.

LANDOWNER: Nelson

LEGAL DESCRIPTION: SECTION TOWNSHIP RANGE
 5 121 40

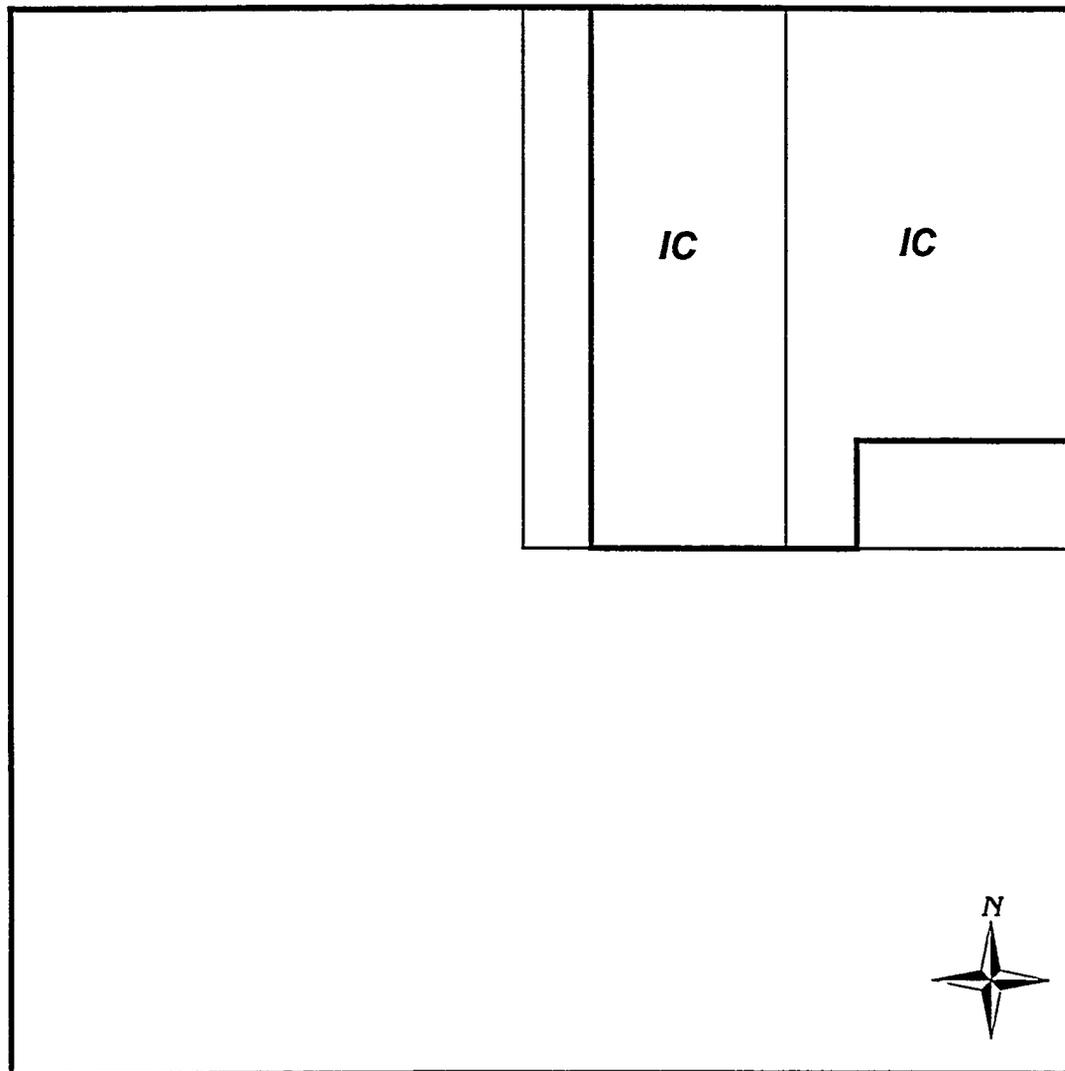


Scale 1" = 1,000'

SOIL NAME	MAP SYMBOL	LAND CAPABILITY
Arveson Loamy	Av	IIIw
Glyndon Silt Loam	AdA	IIe
Malachy Sandy Loam	MmA	IIIs
Marsh	Mo	---
Marysland Loam	Mp	IIw
Mayer Loam	Ms	IIIw
Vallers Sioux	Va	IIw

Fig. B7-1. Nelson soils map.

LANDOWNER: Nelson
LEGAL DESCRIPTION: SECTION TOWNSHIP RANGE
5 121 40

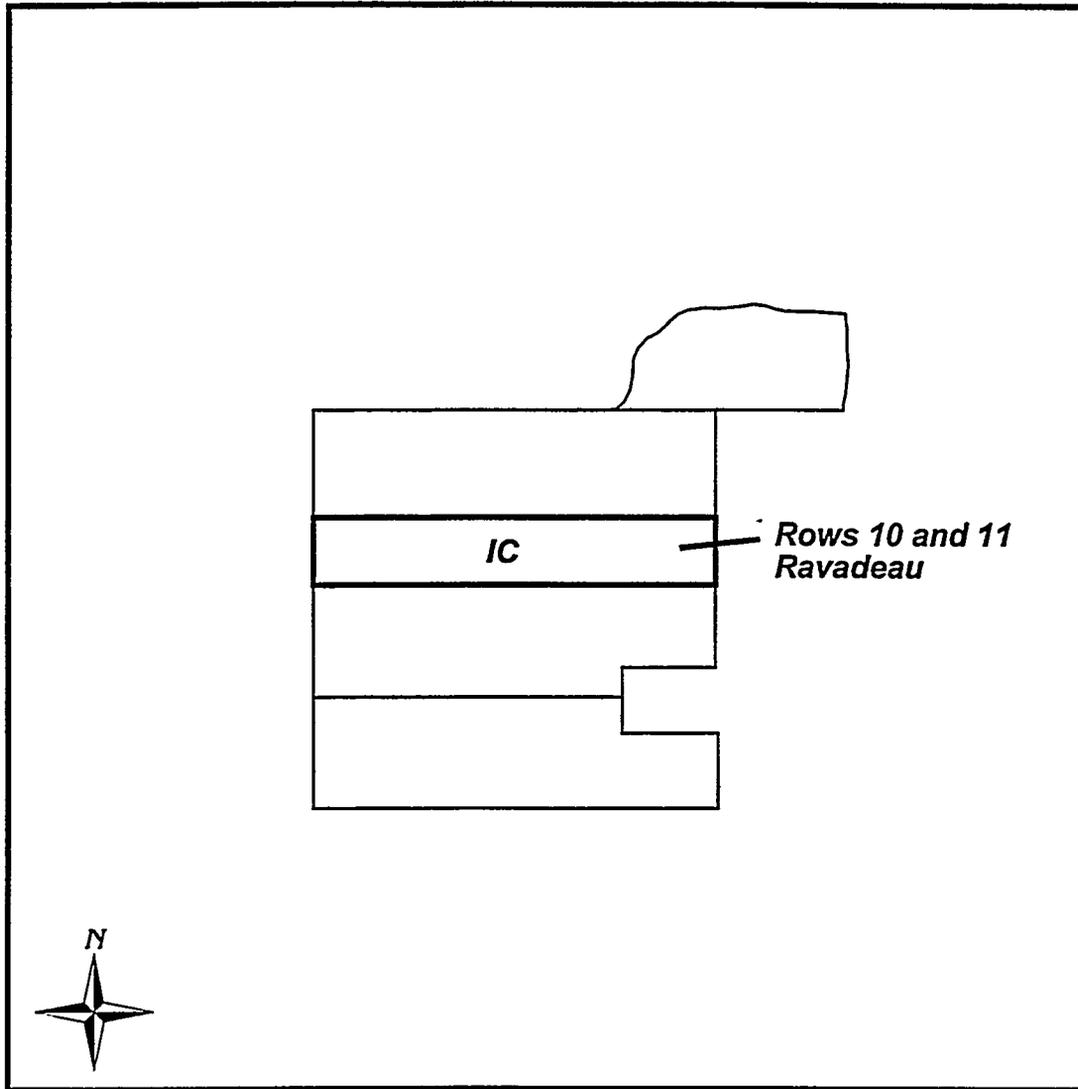


Scale 1" = 1,000'

Note: Hand planted 88,530 (Imperial Carolina — DN-34) trees.

Fig. B7-2. Nelson poplar clone map.

LANDOWNER: **Pohlig**
LEGAL DESCRIPTION: SECTION TOWNSHIP RANGE
36 128 37

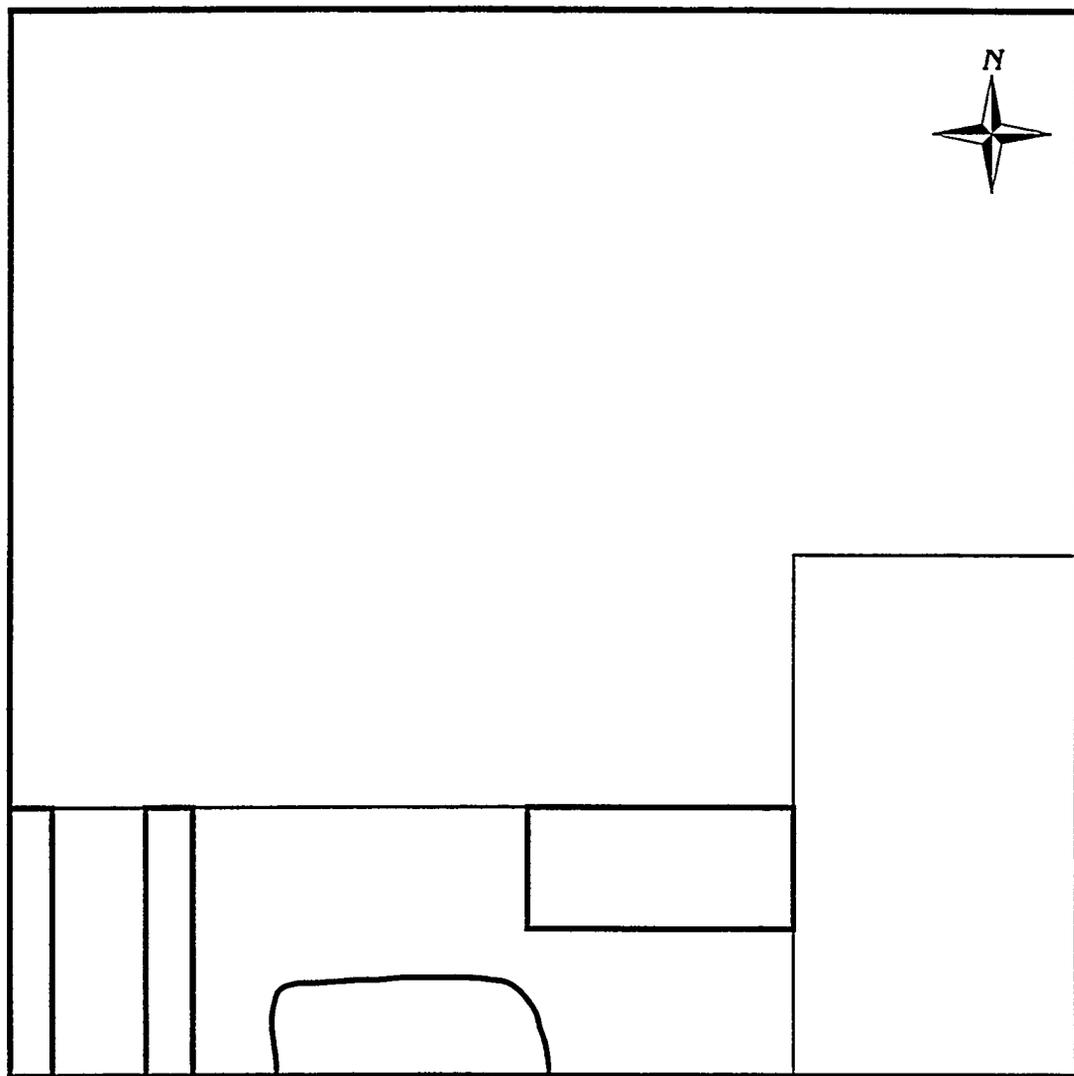


Scale 1" = 1,000'

Note: Machine planted 10,896 (Imperial Carolina — DN-34) trees.

Fig. B8-2. Pohlig poplar clone map.

LANDOWNER: Roguske
LEGAL DESCRIPTION: SECTION TOWNSHIP RANGE
9 122 33



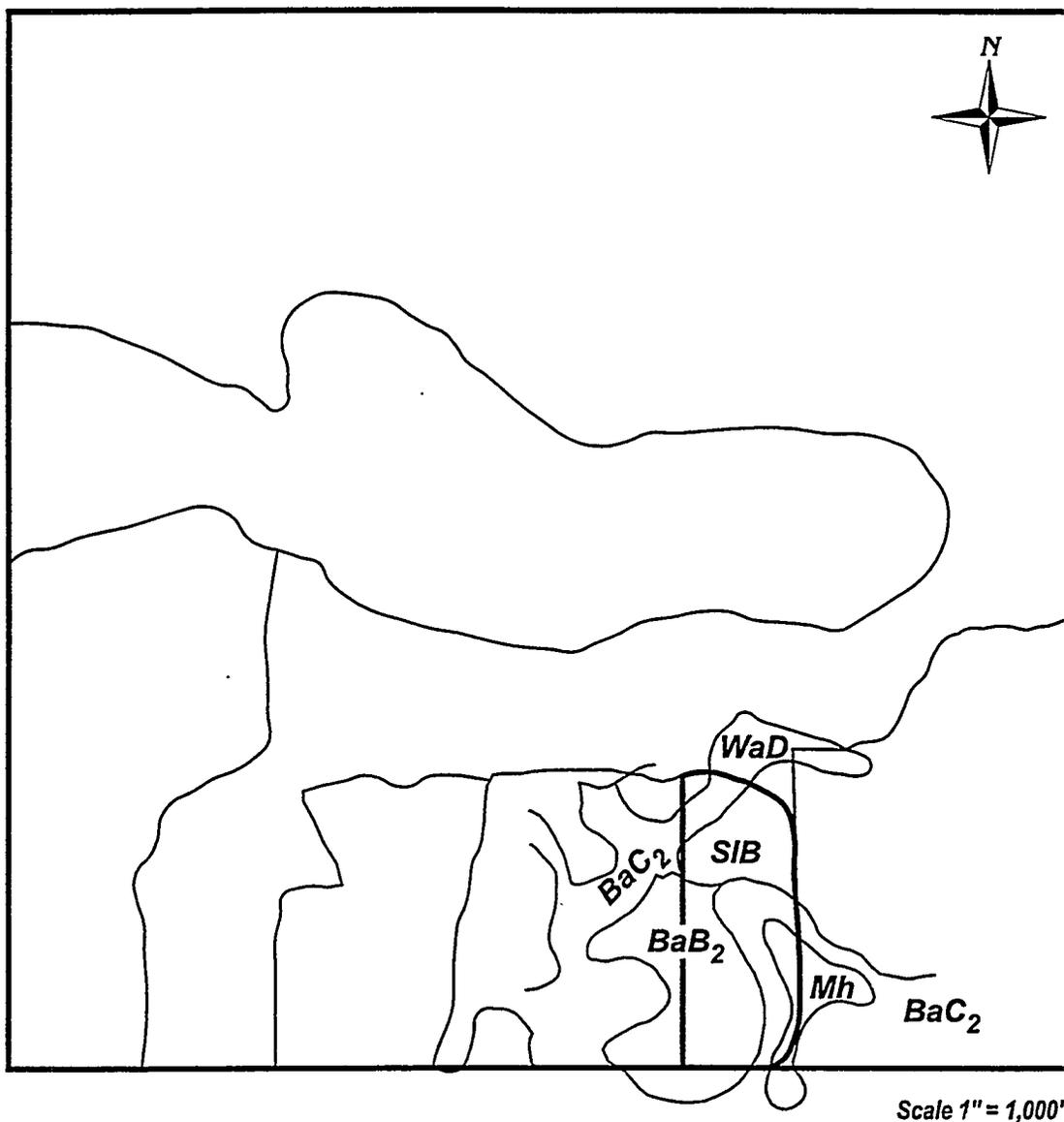
Scale 1" = 1,000'

Note: Hand planted 13,620 (Imperial Carolina — DN-34) trees.

Fig. B9-2. Roguske poplar clone map.

LANDOWNER: Sheets

LEGAL DESCRIPTION: SECTION TOWNSHIP RANGE
26,34 129 40

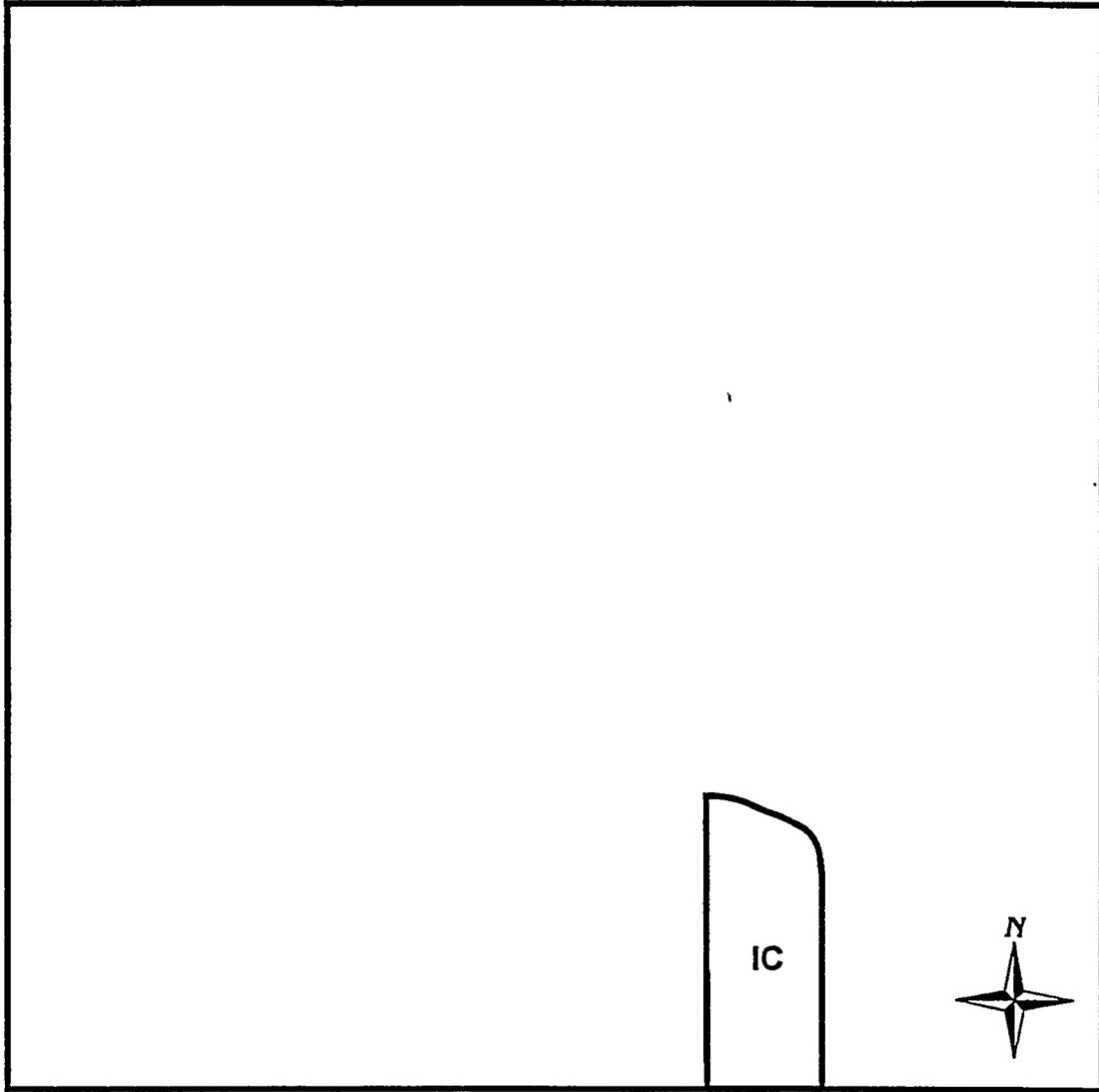


SOIL NAME	MAP SYMBOL	LAND CAPABILITY
Barnes Loam	Ba	Ile
Marsh	Mh	VIIIw
Sinai Clay	Sl	Ile
Waukon Loam	Wa	IIIe

Fig. B10a-1. Sheets soils map.

LANDOWNER: Sheets

LEGAL DESCRIPTION: SECTION TOWNSHIP RANGE

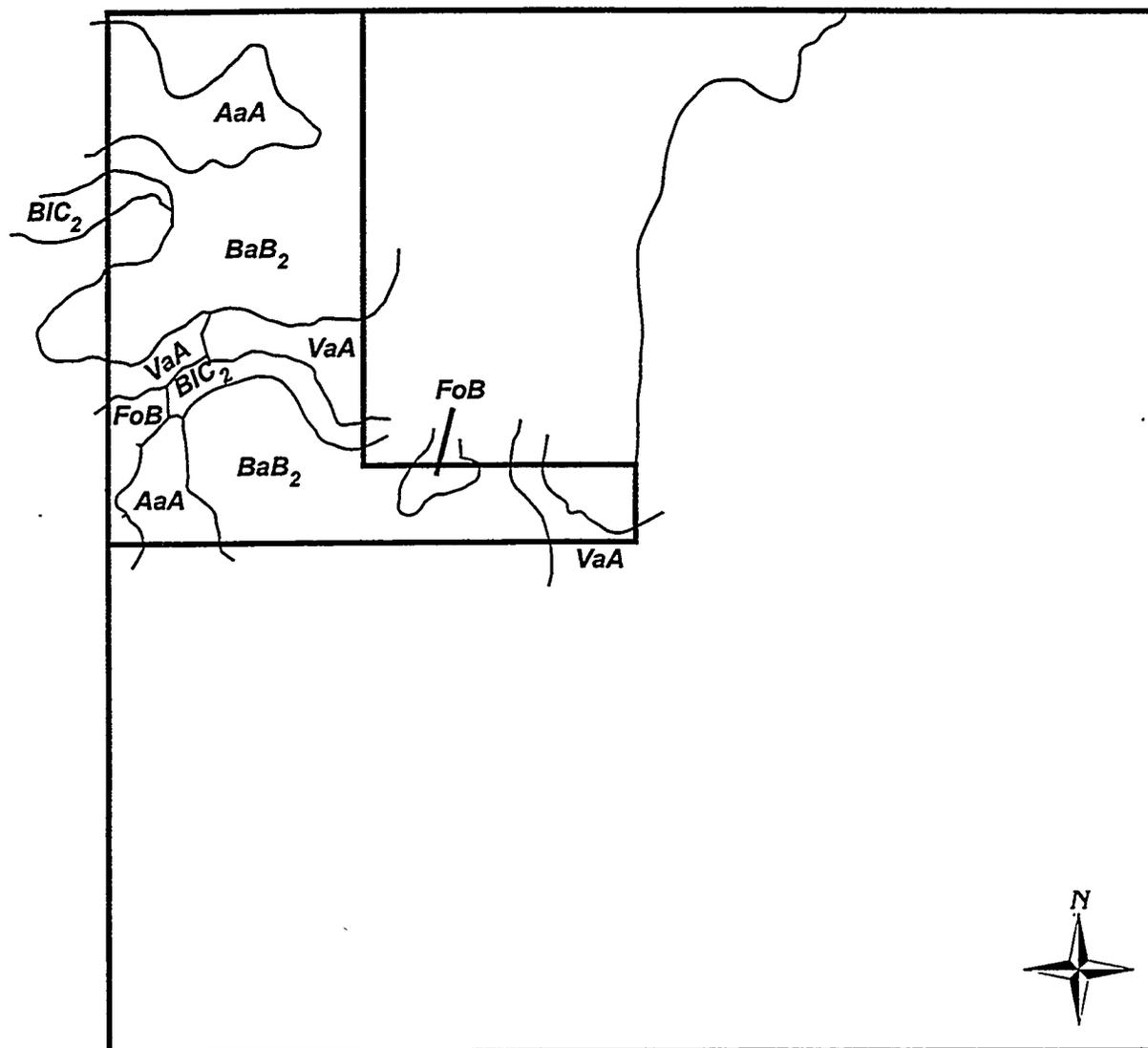


Scale 1" = 1,000'

Note: Machine planted (16.7 acres) 11,372
(Imperial Carolina — DN-34) trees.

Fig. B10a-2. Sheets poplar clone map.

LANDOWNER: Sheets
 LEGAL DESCRIPTION: SECTION TOWNSHIP RANGE
 26,34 129 40

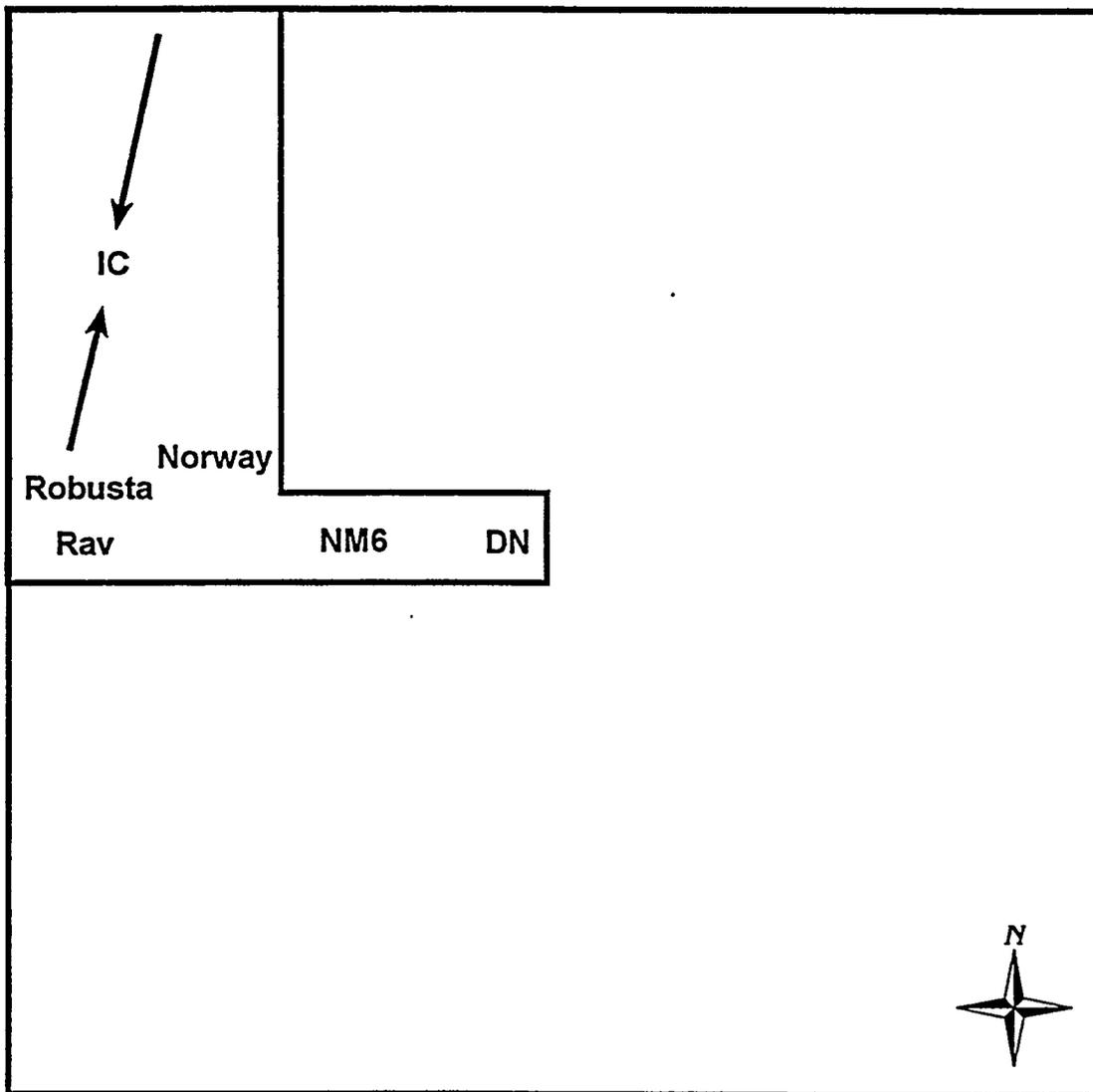


Scale 1" = 1,000'

SOIL NAME	MAP SYMBOL	LAND CAPABILITY
Aastad Clay	Aa	I-I
Barnes Loam	Ba	IIe
Barnes Langhei	Bl	IIe
Froman Aastad	FoB	IIw
Quam Muck	Qu	IIIw
Vallers Clay	VaA	IIw

Fig. B10b-1. Sheets soil map.

LANDOWNER: Sheets
 LEGAL DESCRIPTION: SECTION TOWNSHIP RANGE



Scale 1" = 1,000'

Note: Machine planted 88.2 acres.

SPECIES	NUMBER
Robusta — DN-17	24,000
Imperial Carolina — DN-34	47,402
Norway Poplar — DN-34	1,800
Raverdeau	3,450
DN-34	3,350
NM-6	1,050

Fig. B10b-2. Sheets poplar clone map.

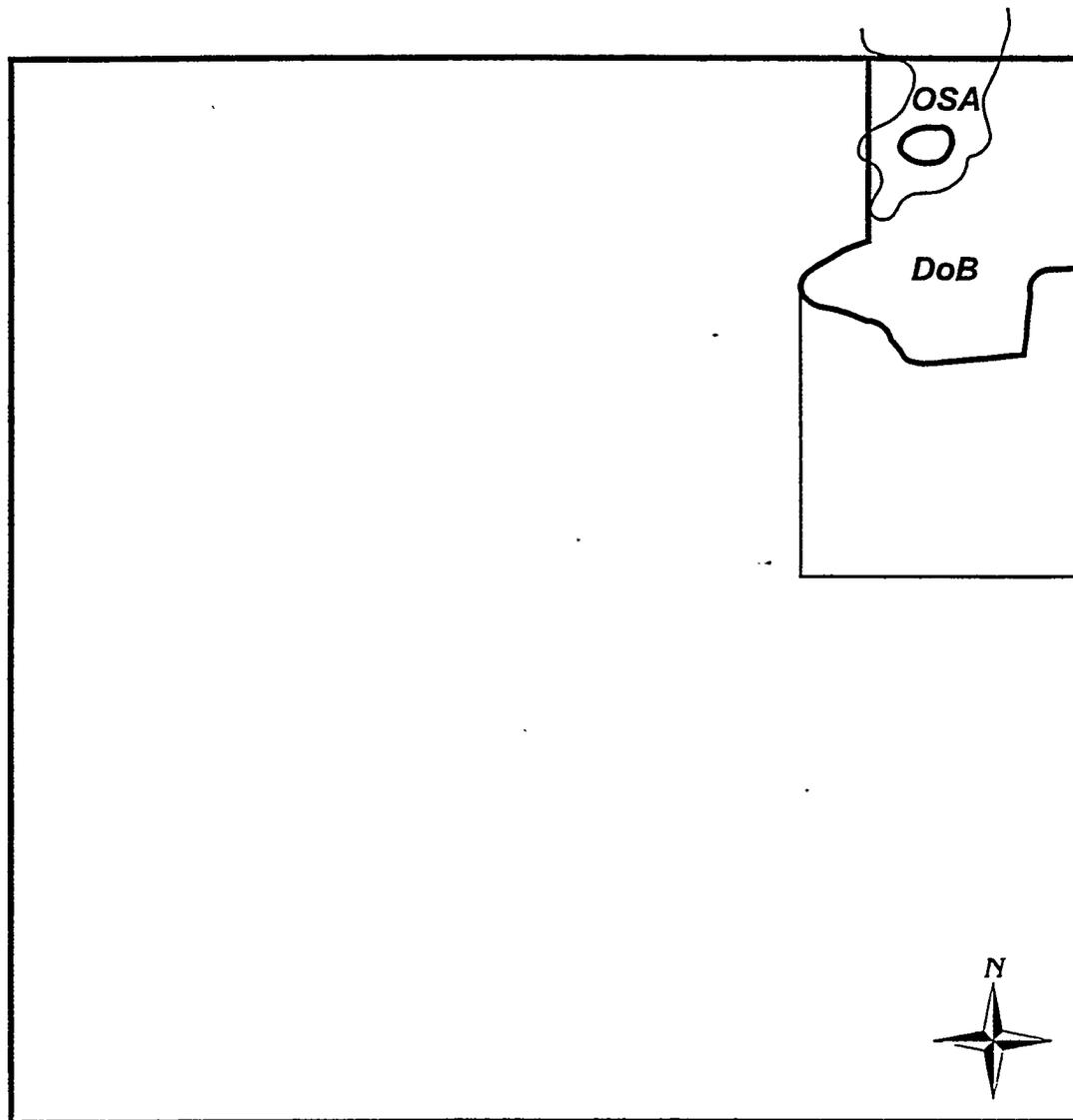
LANDOWNER: **Stroot**

LEGAL DESCRIPTION: SECTION TOWNSHIP RANGE

15

130

36



Scale 1" = 1,000'

SOIL NAME	MAP SYMBOL	LAND CAPABILITY
Dorset	DoB	IIIe
Osakis Loam	OsA	IIIe

Fig. B11-1. Stroot soils map.

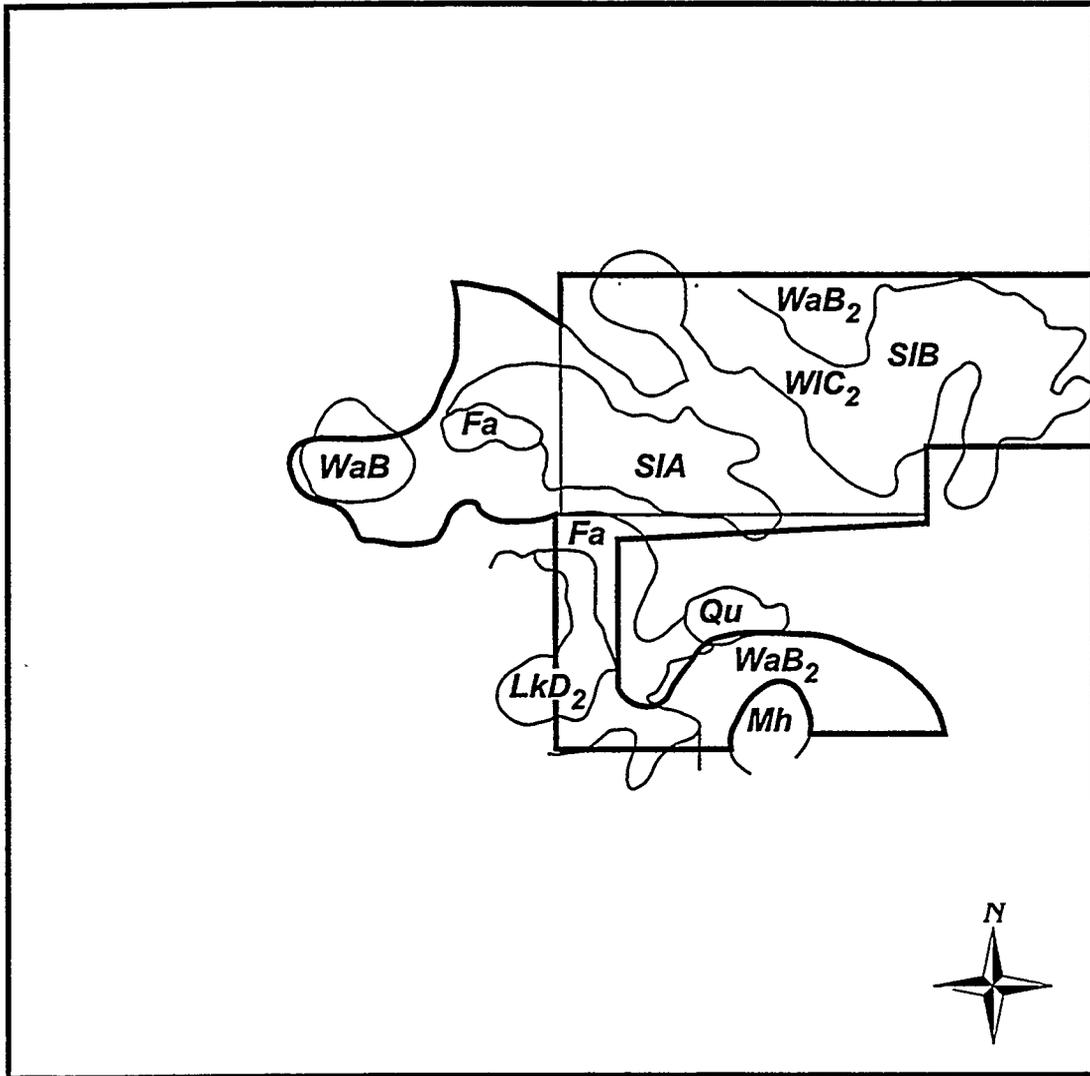
LANDOWNER: Swanson

LEGAL DESCRIPTION: SECTION TOWNSHIP RANGE

1

127

40

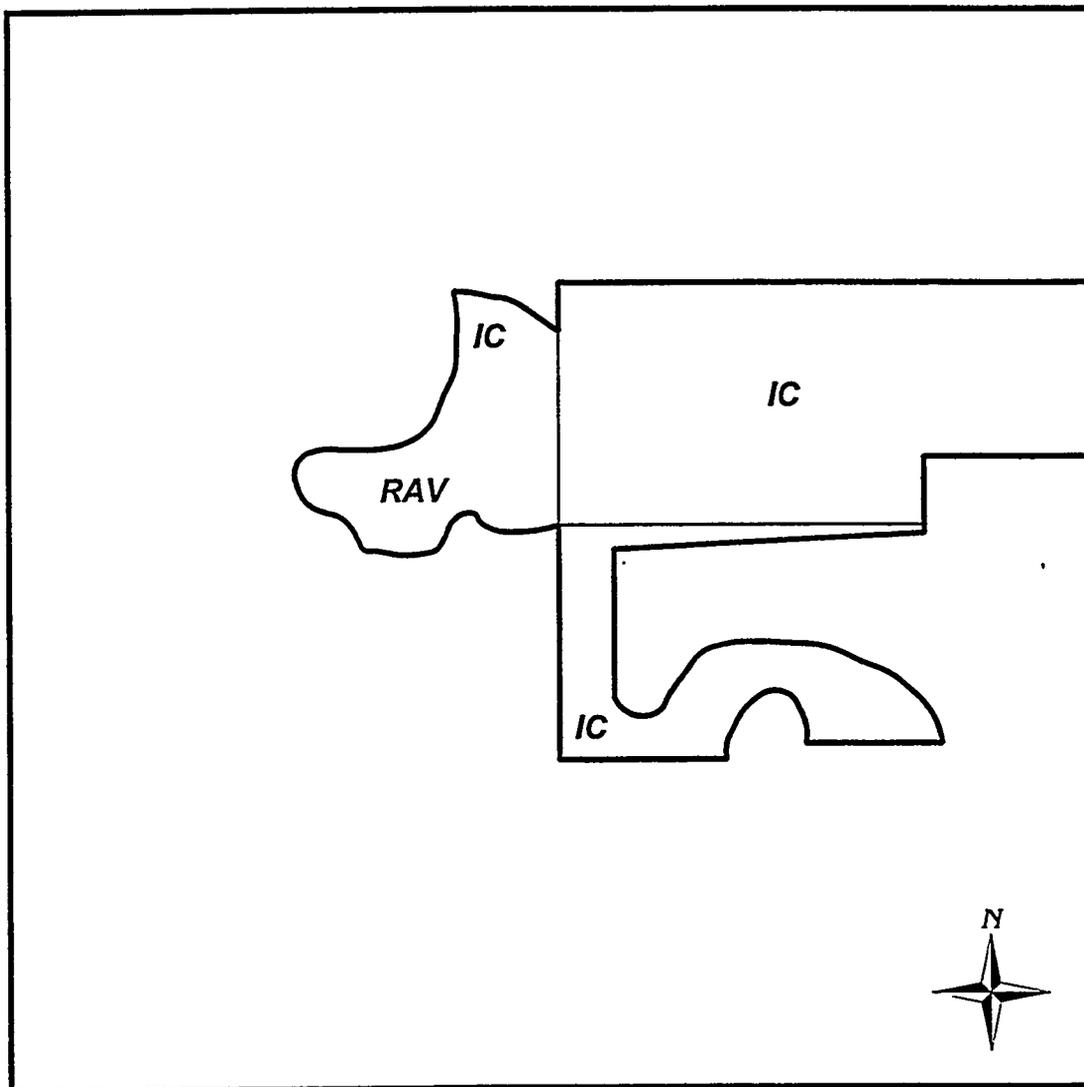


Scale 1" = 1,000'

SOIL NAME	MAP SYMBOL	LAND CAPABILITY
Flom Silty Clay Loam	Fa	IIw
Fanghei Waukon Loams	LkD ₂	IVe
Marsh	Mh	VIIIw
Quam Mucky Silty Clay Loams	Qu	IIIw
Sinai Clay	Sl	Ile
Waukon Loam	Wa	Ile

Fig. B12-1. Swanson soils map.

LANDOWNER: Swanson
LEGAL DESCRIPTION: SECTION TOWNSHIP RANGE
1 127 40



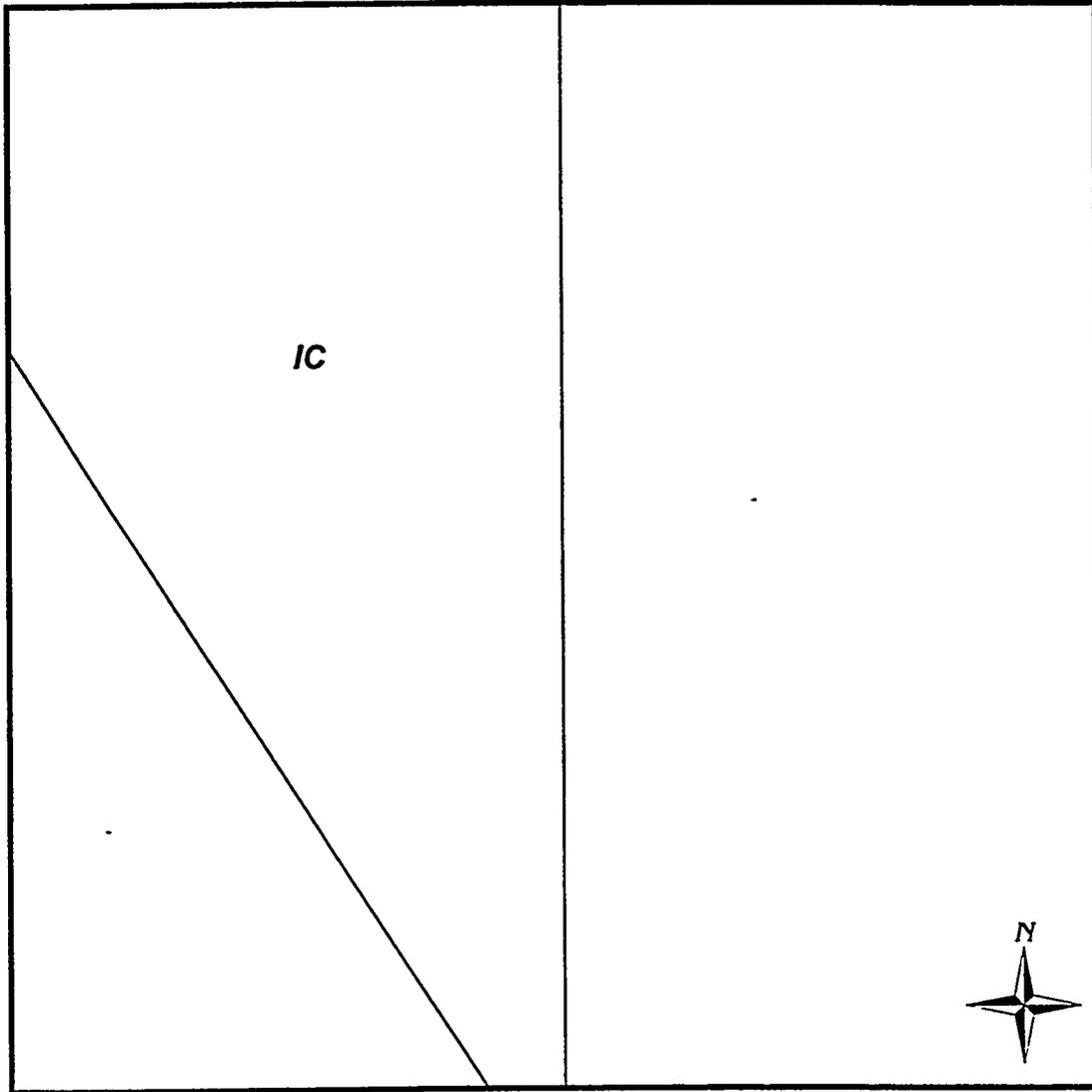
Scale 1" = 1,000'

Note: Machine Planted 71,709 trees.

SPECIES	NUMBER
Imperial Carolina — DN-34	61,709
Raverdeau	10,000

Fig. B12-2. Swanson poplar clone map.

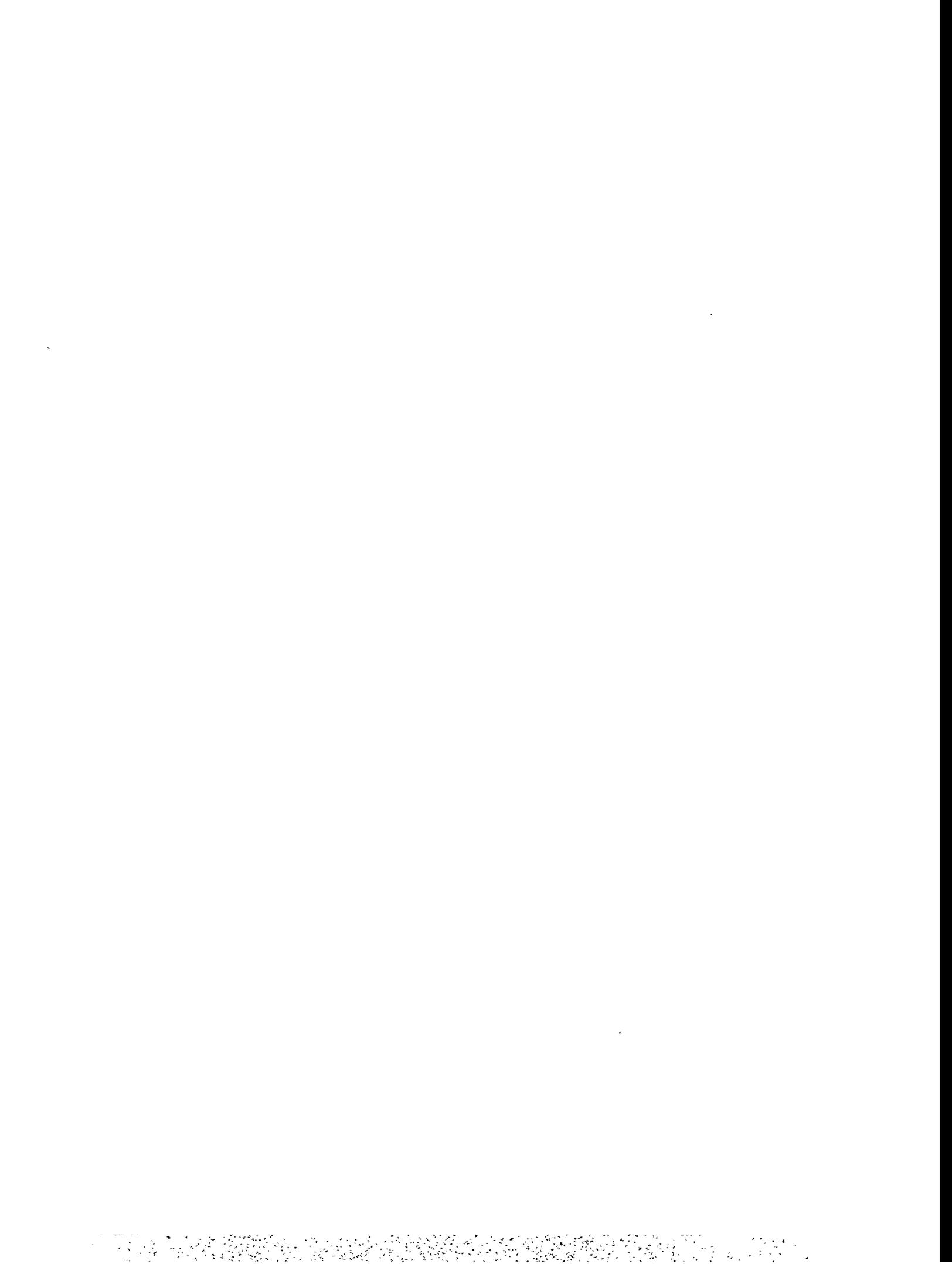
LANDOWNER: **Thompson**
LEGAL DESCRIPTION: SECTION TOWNSHIP RANGE
23 122 40



Scale 1" = 1,000'

Note: Planted 70,000 (Imperial Carolina — DN-34) trees.

Fig. B13-2. Thompson poplar clone map.



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