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**Manning Diversified Forest Products
Research Trust Fund
MDFP20/97**

**Testing the Establishment and Growth of the
Elite White spruce Hybrid Supertrees™
In Alberta – 1997/98 Final Report**

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Elite White spruce Hybrid Supertrees™
In Alberta – 1997/98 Final Report**

October 1998

**By Ken Glover – Boreal Concerns Inc.
Sherwood Park, Alberta
Canada**

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Disclaimer

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Acknowledgments

Mr. Gary Gurtler is to be commended for his commitment to forestry research through his generous act of donating a portion of his land toward the research and demonstration site. It is within the Gurtler Woodlot that the Elite White Spruce Hybrids or SuperTrees™ (*Picea glauca*) were planted and will provide years of observation and study. Thanks go out to the members of the organizing committee for the Gurtler Research and Demonstration Woodlot located near North Star, Alberta; Mr. Garry Gurtler, Manning Diversified Forest Products Ltd., Boreal Wood Centre, Prairie Farm Rehabilitation Administration, North Peace Applied Research, Alberta Tree Improvement & Seed Centre, Daishowa-Marubeni International Ltd., Ainsworth Lumber Co. Ltd., Paul Rowe High School, Alberta Agriculture Food and Rural Development, and the Woodlot Association of Alberta.

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Introduction

Elite White Spruce Hybrids or SuperTrees™ (*Picea glauca*), is a patent product owned by Insti-Trees Nursery, a Division of Forgene Inc. in Wisconsin, USA. The Insti-Trees Nursery Catalogue (Appendix 3) describes the SuperTrees™ as "...will grow up to twice as fast in volume, 33% faster in diameter, and 20% faster in height...they can reach mature size in as little as one-half the years usually required". Even if the SuperTree™ when planted in northern Alberta were to grow to maturity at a rate marginally less than twice as fast as what is usually required for a conventional white spruce (80 years), the implications would be tremendous for Alberta's forest industry. Both Alberta industrial and non-industrial (private woodlot) forest industries would realize significant benefits from a faster growing white spruce - conceivably reducing traditional harvest rotations by half.

The purpose of this research project became twofold. Firstly, to test the establishment and growth claims of the Elite White Spruce Hybrids or SuperTrees™ in northern Alberta. In the same light, provide some answers and proof for potential Alberta purchasers of this tree product. Secondly, to investigate and possibly present a growth and expansion opportunity for both industrial and non-industrial forestry in Alberta.

The general objectives of this research project were (1) to develop at least three test sites in the Municipal District of Mackenzie #23 in which the SuperTree™ would be planted beside an Alberta white spruce so that the two species could be closely monitored and measured (actually only two sites were utilized); (2) to promote the existence and establishment of the research project to the extent that each research site may become a demonstration site on its own; (3) to communicate and promote the research project and its findings through every means available. Rather than three research sites, only two were used.

At the same time this research project was being prepared and applied for, a united "forest community" effort was unfolding within the Manning, Alberta region. The idea which was planted by the Woodlot Association of Alberta and nourished by the Boreal Wood Centre was to create a Demonstration Woodlot within the Manning, Alberta region. The community initiative for a demonstration woodlot concept evolved into the Gurtler Research and Demonstration Woodlot, named after the private woodlot owner who provided the plot of land. As indicated in the title, the woodlot contained both a demonstrative and research component.

At the time this research project was approved Boreal Concerns Inc. was already a member of the organizing committee for the Gurtler Research and Demonstration Woodlot. It was decided that the Elite White Spruce Hybrid Research Project would be incorporated into the Gurtler Woodlot, and planted within the research component. A second planting site was located at a research area managed by Manning Diversified Forest Products Ltd.(MDFP).

Methods

1.0 Planting Site Locations

The establishment of the Gurtler Research and Demonstration Woodlot in North Star, Alberta adjacent to Manning, Alberta (Figure A) solved the decision on locating the planting site for the SuperTrees™. Testing of the Elite White Spruce Hybrids became an element within the research component of the Gurtler Research and Demonstration Woodlot.

Figure A: Location of the Gurtler Research and Demonstration Woodlot Where the Elite White Spruce Hybrid - SuperTrees™ are Planted.

2.0 Research Tree Stock

The original research project proposal consisted of the planting of 100 Elite White Spruce SuperTrees™ (*Picea glauca*) and 100 "improved" white spruce (*Picea glauca*) container stock from MDFP stock grown at the Alberta Tree Improvement Centre. Through the generosity of Forgene Inc. and Insti-Trees Nursery, 150 SuperTrees™ were ordered and donated for this research project. In addition 25 Cold-Pruff™ Norway Spruce (*Picea abies*) and 10 Cold Hardy Black Walnut (*Juglans nigra*) were ordered (and donated) for demonstration purposes within the Gurtler Woodlot. Due to problems at the Insti-Trees Nursery the stock which actually arrived for this project were; 300 SuperTrees™ and 30 Cold-Pruff™ Norway Spruce.

Ordering the tree stock proved quite easy and the fact that Forgene Inc. agreed to provide the stock free was a pleasant bonus. The real challenge in acquiring the research stock was getting it into Canada from the United States through Customs. Considerable time was required ensuring proper documentation were prepared such as; Application for Permit to Import, a Phytosanitary Certificate, proper labeling outside shipping boxes, Canada Customs Form, Excise Taxes, package size and weight, courier approvals (not all couriers will carry live materials), Airline approvals (not all airlines will carry live materials), and inspections by the Canadian Food Inspection Agency.

3.0 Origin of Stock

The Elite White Spruce Hybrid SuperTrees™ are white spruce (*Picea glauca*) trees genetically improved for growth rate. They were developed using genetic testing and selection, controlled pollination, and cloning through tissue culture and vegetative propagation. The trees were developed by Forgene Inc., a biotechnology / genetic engineering company and distributed by Insti-Trees Nursery, a division of Forgene Inc.. A more thorough Technical Fact Bulletin can be reviewed in Appendix 2.

4.0 Storage of Stock Prior to Planting

The SuperTrees™ and Norway Spruce were received at the Edmonton International Airport on June 2, 1998. It was already determined that planting within the research site of the Gurtler Woodlot would occur in early August, 1998. The SuperTrees™ were taken to the Alberta Tree Improvement and Seed Centre where John Quinn had the trees transplanted from their styrofoam blocks and potted. Once potted the research stock were set in shaded outdoor sheds along with the comparative Alberta white spruce container stock. There all trees were watered on a regular basis.

5.0 Research Design

Design and layout of the research site within the Gurtler Research and Demonstration Forest was coordinated by John Quinn from the Alberta Tree Improvement and Seed Centre in consultation with Boreal Concerns Inc. and other organizing committee members. In addition to the SuperTrees™ and the improved MDPF white spruce, the other species planted in the research site were:

White Spruce (*Picea glauca*) - local seed source
Aspen (*Populus tremuloides*) - local seed source
Hybrid Aspen (*Populus deltoides* var. *spp.*) - Eastern Canada seed source
Siberian Larch (*Larix sibirica* var. *spp.*) - prairie shelterbelt variety
Siberian Larch (*Larix sibirica*) - Raivola variety
Lodgepole Pine (*Pinus contorta* var. *latifolia*) - local seed source

White Birch (*Betula papyrifera*) - Zama Ridge seed source
Tamarack (*Larix laricina*) - Valleyview, Alberta seed source

There were 120 trees of each species planted in 4 repetitions of 30 per row and planted in a 3m x 3m spacing. Prior to planting, the Research site was treated with a herbicide (Round Up, 24D active agent) in the Spring of 1998 to eliminate all weed competition. The Research site was fenced using an 8 meter high "game" fence as a measure to eliminate browse by ungulates.

A second research site, managed by MDFP, was chosen where 106 SuperTrees™ were planted in scarified furrows. The Cold Pruff™ Norway Spruce were planted within the game fenced research site at the Gurtler location.

6.0 Planting the SuperTrees™

Planting of the research trees occurred on the days of August 4th and 5th, 1998. In total 226 SuperTrees™ and 10 Norway Spruce™ were planted. Since the trees were potted, they could not be planted using conventional mattocks or planting shovels. Each tree was planted by digging a hole with a spade and placing the pot-plug in the hole, then covering it by hand and either stepping on it or compressing the top dirt by hand. The soil was very compact and dry at the Gurtler site at the time of planting, while moderately better at the MDFP site which was scarified.

7.0 Measurements

No specific seedling measurements were taken during this first planting season. The Alberta Tree Improvement and Seed Centre will be performing complete measurements of all research trees within two years after planting; fall 2000. The Centre assumed responsibility for measurements of the SuperTrees™ along with the other planted experimental stock.

Discussion

This research project was as much an exercise in learning how to import live plants into Canada as it was research on testing the establishment and growth of the Elite White Spruce Hybrid (SuperTree™) in Alberta. Considerable documentation and approvals were required for importing the live SuperTrees™ into Canada. This system is confusing and most prohibitive for both industrial and non-industrial forest industries. As Alberta's forest industry evolves the interest in the use of exotic and non-indigenous trees will increase, and it would be necessary to seek improvements to the current import system.

At first observation, the Elite White Spruce Hybrids™ dwarfed in comparison to the Alberta improved white spruce stock. In fact, the Cold Pruff™ Norway Spruce appeared in better shape and health than its co-product, the more highly promoted SuperTree™ (Appendix 1 - P1). Not only did the SuperTrees™ appear inferior to the Alberta spruce stock, but the packaging was also less desirable than what is generally used for Alberta stock. The SuperTrees™ in the styrofoam block cavities were loosely packed which made it difficult for removal and transplanting (Appendix 1 - P2 & P3). The White Spruce Hybrids were however for the most part hardened off with good solid buds developed (Appendix 1 - P4). In contrast, the comparative Alberta improved white spruce had flushed (Appendix 1 - P5). All factors considered, if the SuperTree™ stock were not transplanted into pots at the Alberta Tree Improvement and Seed Centre and given a couple months to grow, the mortality would have been significant. It is fair to note that the poor appearance and health of the SuperTree™ could have been the result of transportation and/or troubles experienced at the nursery while the stock was growing. Apparently prior to its removal the roof of several greenhouses collapsed on the growing stock as a result of heavy snowfalls.

The duration at the Alberta Tree Improvement and Seed Centre proved most beneficial for the SuperTrees™. At the time of planting on August 4th and 5th, 1998 the trees appeared much healthier and had even established a little stronger root mass. While some of the buds flushed most remained closed and hardened (Appendix 1 - P4). Despite having a healthier stock, the real challenge for establishment would be surviving drought like conditions. Like most of Alberta this year, Manning where the trees were planted, received very little precipitation over the summer and only scattered showers were predicted during and after the scheduled planting dates. Postponement of the planting was contemplated, but it was decided to continue the research project and give the trees a reality test.

The Soil at the Gurtler site was at the best a Class 4¹ (Appendix 1 - P6). It should be noted that prior to the site being converted to pasture, the dominant tree crop was a mature aspen stand with an intermittent component of immature to mature white spruce (C3AwSw)². The soil at the Gurtler site where the SuperTrees™ were planted was very hard and dry, while at the MDFP site it was tilled and felt more moist (Appendix 1 - P7). Although the Gurtler site was treated for weeds there was very little organic matter in the soil; less than at the MDFP site. Planting was incredibly difficult using spades to plant the potted SuperTrees™ under a clear sky and 30° Celsius temperatures (Appendix 1 - P8 & P9).

The trees at the Gurtler site were watered a few days after planting where the trees at the MDFP site were not. The game fence at the Gurtler site was 8 feet high and was intended to prevent wildlife access and tree mortality caused by ungulate browse (Appendix 1 - P6). Despite protection from ungulates, lack of moisture prior to planting and over the ensuing months may be the main limiting factor for tree survival. Slightly better growing conditions exist at the MDFP planting site, but all stock here are subject to ungulate browse.

Aside from post-planting observations no specific growth measurements were taken. The Alberta Tree Improvement and Seed Centre assumed responsibility for the collection and recording tree data at the Gurtler research site. John Quinn with the Centre indicated that first measurements would not occur until two years hence, in 2000. With respect to post-planting observations, shortly after planting some of the trees appeared stressed (slightly discolored and drooping), but most did not display any severe problems.

¹ Canada Land Inventory for Agriculture capabilities - Class 4, "soils that have severe limitations that restrict the range of crops or required special conservation practices or both".

² Alberta Phase III tree inventory classification

Concluding Remarks

It is often said that first impressions hold true, however for the Elite White Spruce Hybrid SuperTrees™ the jury is still out. At the onset it was visually noticeable that the Alberta improved white spruce stock appeared healthier and more vigor than the SuperTrees™. In fact, the Cold Pruff™ Norway Spruce were healthier than the SuperTrees™. Potting and nurturing the Wisconsin stock for two months prior to planting proved most beneficial for the trees and this research project. Unfortunately, one rarely gets the opportunity of postponement in a larger commercial planting application. Locating the SuperTrees™ within the fenced area of the Gurtler Research and Demonstration Woodlot was the most logical community choice. Involvement by the community, local industry and agencies were vital in making the Gurtler Woodlot get off the ground. These supportive ingredients will keep this site and this research project a focal point within the community well into the future. Although extremely dry weather did not help planting conditions this summer, the Gurtler site at best offers a less than marginal environment for the research stock. Soil and moisture conditions will prove to be limiting factors for seedling survival. For certain, the trees planted in the Gurtler site will become the litmus test for other plantings within the region.

The other important experience from this research project was the whole process of importing live plant materials into Canada. As Alberta's forest industry evolves, acquisition of exotic "super trees" will grow in interest and practice. The current system of importing live plants into Canada is very cumbersome, too much so for the average non-industrial and some small industrial forestry operators. Streamlining or even clarifying the plant importation process would support innovation and perhaps business opportunities for Alberta's forestry community.

At this time the SuperTrees™ cannot be discounted. The Elite White Spruce Hybrids still hold the claim as potential "miracle" trees for industrial and non-industrial forestry in Alberta. More time is needed for tree growth, observation, and measurement before we can make any strong conclusions. The only real conclusions we can make from this research project at this time are; that industry and government are actively supporting research toward improving Alberta's forest industry, and that there exists a remarkable amount of support and collaboration for the community forestry legacy project called the Gurtler Research and Demonstration Woodlot.

APPENDIX 1

(Pictures)

Picture 1 - Comparison picture taken upon receipt of the SuperTrees™ on June 3, 1998, two months prior to planting. Note the health and size difference between the 2+0 Alberta white spruce and the 2+0 SuperTrees™. Note the relatively healthy appearance of the Cold Pruff™ Norway Spruce.

Picture 2 - Styrofoam blocks in which the SuperTrees™ were planted and transported.

Picture 3 - Comparison of SuperTrees™ and Norway Spruce. Note the loosely packed plug of the Elite White Spruce Hybrid, yet strong root development.

Picture 4 - SuperTrees™, depicting the solid hardened buds. Also note the pots in which these trees were transplanted into and remained for two months until planting.

Picture 5 - Alberta Improved White Spruce stock. Note that the stock had flushed and that the stock appears healthy and vigor.

Picture 6 - The 8' game fence installed at the Gurtler site. The visually dry conditions during the planting period. Absence of competing weeds from the previous herbicide treatment.

Picture 7 - MDFP site where some of the SuperTrees™ were planted. Note the tilled furrows and absence of any protection from ungulates.

Picture 8 - Note the soil used for potting and the size of the pot-plug. Some roots are visible along the sides, evidence of some root growth over the two month period at the nursery.

Picture 9 - Planted SuperTree™, note the use of a spade rather than a conventional planting shovel. Observe the dry conditions and lack of organic matter in the soil.

APPENDIX 2
**(Technical Fact Bulletin on the Elite White
Spruce Hybrid SuperTrees™)**

INSTI-TREES
NURSERY

FORGENE, INC.

ELITE WHITE SPRUCE HYBRIDSTM (U.S. Patent No. 5,304,725)

TECHNICAL FACT BULLETIN

What are Elite White Spruce HybridsTM? They are white spruce trees that are genetically improved for growth rate, with the genetic potential to grow over twice as fast as conventional white spruce. They were developed using genetic testing and selection, controlled pollination, and cloning (producing genetically identical copies) through tissue culture and vegetative propagation (rooting of cuttings). They are produced as containerized rooted cuttings and look like conventional white spruce seedlings, but grow faster!

Who developed them? They were developed by Forgene, Inc., a biotechnology/genetic engineering company, and are distributed by Insti-Trees Nursery, a division of Forgene.

Why were they developed? They were developed to bring tree growers the benefits of much faster growing white spruce. White spruce, one of the three most important planted tree species in North America, produces some of the most valuable fiber known for pulp and paper production. Pulp and paper companies in the northern U.S. typically pay a premium for white spruce logs because its long fibers are desirable in high-quality paper products. The tree is also important for Christmas trees, landscaping, lumber, wildlife habitat, and soil conservation. With the buildup of heavy deer populations in the northern U.S., white spruce is increasingly the choice for tree plantings, because it is one of the few trees not usually browsed by deer. There is probably no other major tree species in North America that will have more value added by faster growth than white spruce.

How were they developed? They were developed using quantitative genetics, tree breeding, and biotechnology. The approach, based on cloning crosses between tested, genetically-superior parent trees, is illustrated on the following page.

Insti-Trees Nursery
P.O. Box 1370
Rhineland, WI 54501
715 -365 -8733

THE FORGENE, INC. METHOD

FOR PRODUCING GENETICALLY ELITE WHITE SPRUCE HYBRIDS*™

Controlled crossing between genetically superior trees to produce improved hybrid seed.

Tissue Culture Micropropagation

(*in vitro* except where noted)

Cutting stock plants are grown in greenhouse, either directly from seed or from tissue culture plantlets derived from seed via tissue culture micropropagation. Each stock plant is pruned repeatedly to cause proliferation of shoots (branches) or "bushiness".

Each new shoot on stock plants can become a cutting which is clipped from the stock plant and rooted in soil in a container in the greenhouse.

Rooted cuttings remain in the same container and are grown in the greenhouse into trees ready for sale.

How fast do they grow? Research by Forgene, Inc. projects that the Elite White Spruce HybridsTM will grow 124% faster in volume (wood produced), 33% faster in diameter, and 19% faster in height than unimproved white spruce in northern Wisconsin and elsewhere under similar growing conditions. This means that the Elite White Spruce HybridsTM can be grown to harvest in as little as one-half the time needed to grow conventional white spruce. Twice as much wood volume can be produced in the same amount of time for a given area of land. Only one-half as much land can produce the same amount of wood. Associated research indicates that they will also be genetically superior in growth rate throughout much of the northeastern quarter of the U.S., from southern Ontario, Quebec, and New Brunswick, Minnesota, Wisconsin, Michigan, and Maine to as far south as Maryland.

How long will they live and how big will they get? The Elite White Spruce HybridsTM are expected to have the same life span and maximum size of conventional white spruce. White spruce is a long lived tree species, attaining an age of up to 250-300 years, with up to 120 feet height and 4 feet diameter, if undisturbed.

What is the basis for their superiority? The genetic improvement in growth rate which we have achieved for the Elite White Spruce HybridsTM is based on nearly two decades of replicated field tests in the north central and northeastern United States and southeastern Canada of the genetic lines and highly selected parents used to produce the hybrids. The population of potential parent trees crossed to produce the hybrids was selected as the fastest growing trees from the families most superior in growth rate. This is an accepted genetic method known as combined index selection. The actual parent trees used in the breeding were selected from this population of fast growing trees by choosing those with the best form and vigor and largest size while ensuring a cross pattern with genetic balance and diversity. The parent trees were 177% superior in volume growth rate to the average white spruce growth for the overall genetic field test.

The actual genetic improvement in growth rate for the Elite White Spruce HybridsTM was calculated using one of the standard quantitative genetics equations that form the basis of all crop breeding:

genetic improvement = narrow-sense heritability x selection differential,

where 1) heritability is the proportion of the superiority of the parent trees that is passed on to their hybrid offspring, and 2) selection differential is the actual superiority of the parent trees of the hybrids when compared to all trees tested. All values are actual data from the field testing. The heritability values were also checked for agreement with values reported in the scientific literature for white spruce.

The growth rate superiority and broad adaptability of the hybrids was further assured by incorporating in the parentage a genetic line with consistently proven growth-rate superiority over a broad area of the northern United States and southern Canada (the Ontario River Valley provenance or geographic seed source). The pollinations were also designed so that several geographically diverse provenances were crossed to produce the hybrids. Forest geneticists believe that such "inter-provenance crosses" may produce additional growth rate superiority in the Elite White Spruce HybridsTM beyond the calculated improvement stated in this bulletin, a desirable improvement called "hybrid vigor". These inter-provenance crosses also help assure that the Elite White Spruce HybridsTM contain greater genetic diversity than conventional or wild white spruce which is an important safeguard against unforeseen diseases, insects, and environmental stresses over the life of the trees.

What are the growing site requirements and spacing recommendations?

Site requirements are the same as for conventional white spruce.

Medium and heavier textured soils are better than sandy soils unless the trees can be watered. Good control of competing grass, weeds,

and brush with herbicides, mulching, mowing, or hand or machine cultivation is necessary to achieve good survival and to realize the full growth potential. White spruce can be grown throughout most of the northern one-half of the United States and the southern one-half of Canada. White spruce also does well in the southwestern United States in higher rainfall areas (higher elevations) and under irrigation. Recommended spacing is 6x6 feet (1210 trees/acre) or 8 x 8 feet (680 trees/acre) for pulpwood and timber plantings and 5 x 5 feet (1,740 trees/acre) for Christmas tree production. For windbreaks the trees should be spaced 4 to 8 feet within the row if single row, 6 to 10 feet if multiple rows. For single row privacy and noise screens the trees should be planted 4 to 6 feet apart and at least 15 feet from structures.

What are the benefits to growers? Although the results will vary depending on growing site, weather, silvicultural methods, etc., the average projected benefits of the Elite White Spruce HybridsTM to growers include:

- Tree farmers and pulp and paper companies can grow wood production plantations to maturity and harvest in as little as one-half the time required for conventional white spruce. For example, on a moderately good growing site in northern Wisconsin at an 8 x 8 feet spacing at 50 years after planting, the projected size of an average tree of Elite White Spruce HybridsTM is 80 feet height, 10.9 inches diameter (dbh), and 25 cubic feet of bolewood versus 67 feet height, 8.2 inches dbh, and 11 cubic feet volume for conventional white spruce. The estimated rotation age (planting to final harvest cycle) for lumber production with the Elite White Spruce HybridsTM is 40 to 50 years versus 80 to 100 years for conventional white spruce, with a commercial thinning of pulpwood at 20 to 25 years.

Because of the potential for faster early growth of the Elite

White Spruce HybridsTM where good weed control is practiced,

- Christmas tree producers can grow trees to marketable size in as much as 2 to 4 years less time than for conventional white spruce. This allows Christmas tree growers to profit from the premium paid for white spruce in the market. As an additional benefit, the Elite White Spruce HybridsTM are likely to respond more favorably to shearing than conventional spruce because of their increased vigor. They also normally will have increased resistance to late spring frosts because of their field test origin and faster growth away from the soil surface.
- Nurseries and homeowners can grow trees to landscaping size up to 20% sooner than for conventional white spruce.
- Windbreaks, privacy screens and borders, soil conservation plantings, and wildlife plantings can reach effective size up to 3 to 5 years earlier than conventional white spruce plantings.

In general, the dramatically faster growth of the Elite White Spruce HybridsTM can reduce rotation lengths and production costs, accelerate cash flow, and greatly increase the profitability and effectiveness of forestry, Christmas tree, and landscaping activities as compared to conventional white spruce. Based on economic studies done by the National Research Council in Canada, the net present value to the grower of white spruce seedlings genetically improved to this degree is at least 600% greater than for conventional white spruce. In other words, the Elite White Spruce HybridsTM are estimated to be six times more valuable to growers than conventional white spruce seedlings.

To order or for further information, contact:

Insti Trees Nursery
(A Division of Forgene, Inc.)
P.O. Box 1370
Rhineland, WI 54501
1-800-236-5353

APPENDIX 3
(Insti-Trees Nursery Catalogue)

ITEM NO. A42 **Butternut** (*Juglans cinerea*) Beautiful, sought-after nut tree is closely related to black walnut, but occurs naturally farther north. Fine hardwood valued for its rich sweet nuts. Used in quality furniture and cabinetry as substitute for walnut. **Help a threatened species by planting it.** Butternut canker has killed many trees, but replanting seedlings can increase the number of resistant individual trees and resistant populations may emerge. Northern Minnesota zone 3 seed source. Fast growing decorative tree grows to 60 ft. Thrives in full sun. Best in moist well-drained soil, but will tolerate lighter rocky soils. 18"-30" ht., hardy zone 7 thru zone 3.

<u>10 trees</u>	<u>25 trees</u>	<u>50 trees</u>	<u>100 trees</u>
\$49	\$99	\$178	\$299

ITEM NO. A43 **American Chestnut** (*Castanea dentata*) Once the predominant timber tree over much of the eastern U.S., chestnut blight decimated the native stands to near extinction earlier this century. Produces high-value lumber that is beautiful & decay resistant. Extra bonus - delicious sweet nuts. Magnificent tall straight trees in timber plantings, large graceful shade tree in yard plantings. Our seedlings are grown from seed from land races in southwest Wisconsin and southeast Minnesota that have been blight-free for generations. Science is fast approaching a cure for chestnut blight. **Help preserve this remarkable tree by planting it.** Grows to 90 ft. Likes moist, well-drained soil best. Plant in full sun or partial shade. 12"-18" ht., hardy zone 7 thru zone 4.

<u>10 trees</u>	<u>25 trees</u>	<u>50 trees</u>	<u>100 trees</u>
\$49	\$99	\$178	\$299

ITEM NO. A41 **Cold Hardy Black Walnut** (*Juglans nigra*) Now you can grow North America's premier hardwood. *We are one of the few sources of cold climate walnut.* Ours grow north of the natural range - all the way into zone 3!! Selected from zone 4 and zone 3 northern land races. Walnut has long been considered on the most valued hardwoods for veneer and fine furniture. High quality individual trees **often command thousands of dollars at harvest.** Large flavorful nuts in demand for baking. Stately, long-lived shade tree thrives in sun and moist, rich well-drained soils. Grows to 90 ft., hardy zone 8 into zone 3.

SEEDLINGS AVAILABLE IN 2 SIZES

Item A41A: **Black Walnut Seedlings** at 5"-10" ht.

<u>10 trees</u>	<u>25 trees</u>	<u>50 trees</u>	<u>100 trees</u>
\$39	\$79	\$133	\$230

Item A41B: **Black Walnut Seedlings** at 11"-20" ht.

<u>10 trees</u>	<u>25 trees</u>	<u>50 trees</u>	<u>100 trees</u>
\$49	\$99	\$178	\$299

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giving cells - 13 to 20 cubic
bands) and styroblocs - three times the
conventional growing containers.

FORGENE ELITE™ WHITE SPRUCE HYBRIDS -

A HIGH TECH GENETICS BREAKTHROUGH!!

NEWS FLASH!! U.S. PATENT OFFICE AWARDS PATENT (No. 5,304,725) to THE SUPERTREE™!! Patent History Made — **FORGENE ELITE™** White Spruce Hybrids. Reap the unique benefits of cutting-edge technology by planting **FORGENE ELITE™** White Spruce Hybrids. This nationally acclaimed **SUPERTREE™** was developed by our parent company, **Forgene, Inc.**, a genetics company, to grow dramatically faster than conventional white spruce.

White spruce (*Picea glauca*) is a favorite evergreen for landscaping, Christmas trees, windbreaks, wood production, wildlife plantings, and soil conservation. It is an excellent species to plant in deer areas — as it is usually not eaten by deer. It does well on a wide range of soils — does best on heavier soils. Tolerant to both extreme cold and heat. Commands a premium price in the paper pulpwood and Xmas tree markets.

SUPERTREE™ GROWS TO MATURE SIZE FASTER!!

Projections show these elite hybrids will grow up to twice as fast in volume, 33% faster in diameter, and 20% faster in height on average northern U.S. growing sites than today's standard unimproved white spruce. Their expected genetic superiority throughout the northern U.S. based on two decades of growth tests of the parents of the hybrids. Although results will vary by site and growing conditions, the improved growth rate of the **FORGENE ELITE™** White Spruce Hybrids means they can reach mature size in as little as one-half the years usually required. An elite hybrid 15 years after planting, can exceed 25 feet tall and be well over 6 inches in diameter. 1st place in the Society of American Foresters National Planting Competition. For further information, request our **FORGENE ELITE™** White Spruce Hybrids Technical Fact Bulletin.

ITEM NO. A5 FORGENE ELITE™ White Spruce Hybrids (U.S. Patent No. 5,304,725) Compare to conventional white spruce — **grow faster!** Beautiful symmetrical foliage with blue-green needles. Likes sun to partial shade. Excellent for landscaping, Christmas trees, windbreaks, wildlife cover and wood production. 4"-9" ht., hardy zones 7 to 2.

25	50	100	150	300	450	600 - 1000
\$39	71	128	155	260	355	\$.69 (price per tree)

ITEM NO. A6 Fraser fir (*Abies fraseri*) The most valuable Christmas tree in the U.S.!! Commands premium price on Christmas tree lots. Highly valued in landscapes, not only for its beautiful, dense, symmetrical and pyramidal shape, but also for its incomparable needle retention. Shiny, silvery-blue, pleasant-to-touch, bright green foliage is silver on the underside. Does best in cool, moist, well-drained soil. 4"-8" ht., hardy zones 5 to 3. (Plus zones 6 and 7 at higher elevations.)

25	50	100	150	300	450	600 - 1000	1050 - 3000
\$28	51	92	124	218	302	\$.57 (price per tree)	\$.48

Norway Spruce

ITEM NO. A4 COLD-PRUF™ * Norway Spruce (*Picea abies*) Now available from Insti-Trees Nursery is **COLD-PRUF™** Norway Spruce! Our elite trees are genetically improved to be highly resistant to winter cold injury. One of nature's fastest-growing spruces, this tree named Germany's Black Forest. Rapid growth rate and a dense, dark, shiny-green foliage combined with gracefully drooping branches, have made it a widely planted, extremely attractive ornamental and windbreak tree. Adaptable to most soils, but prefers moisture. Likes full sun to partial shade. Valuable timber, pulpwood, and Christmas tree. Plant **COLD-PRUF™** Norway Spruce and capitalize on the superior characteristics of this beautiful tree. A **PROVENANCE SELECT™** tree. 4" - 10" ht., hardy zones 7 to 2.

25	50	100	150	300	450	600 - 1000
\$29	55	98	126	225	308	\$.59 (price per tree)

ITEM NO. A9 MISTY BLUE™ / MAJESTIC™ Colorado Blue Spruce (*Picea pungens*) America's favorite landscaping tree - now 90% blue!! Exceptionally beautiful tree will be the envy of your neighbors! 20 years of research has produced this premier spruce. Highly valued, well-known ornamental, windbreak and Christmas tree. Deep blue-green to silver-blue needles. This tree is the most adaptable of the spruces. Drought tolerant. Prefers well-drained soils, full sunlight. Requires little shaping. 4" - 7" ht., hardy zones 7 to 2. *Misty Blue is a trademark of Better Trees, Inc. Majestic is a trademark of Wahmhoff Farms Nursery.

25	50	100	150	300	450	600 - 1000
\$29	55	98	126	225	308	\$.59 (price per tree)

ITEM NO. A10 Black Hills Spruce (*Picea glauca* var. *densata*) Shapely tree native to the Black Hills. Dense and symmetrical. Extremely hardy and tolerant of wind, heat, cold and drought. Desirable as specimen tree. Lovely, short blue-green needles. Favorite for landscaping, windbreaks, screening and Christmas trees. Prefers well-drained soils and sun to partial shade. 4" - 6" ht., hardy zones 6 to 2.

25	50	100	150	300	450	600 - 1000
\$27	50	88	118	208	271	\$.49 (price per tree)

To Order Call Toll Free 1-800-236-5353

REES NURSERY
Box 1370
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Phone: (715) 365-8733

ORDERS: 1-800-236-5353
FAX: 1-715-365-8737

ORDER INFORMATION

ORDER EARLY.

Poplars: shipped February thru June. All other trees shipped April thru June. Other items shipped year round.

Orders must be accompanied with full payment including shipping, handling, and tax charges. Exceptions allowed are government purchase orders. No cash orders. All charges are F.O.B. Rhinelander, Wisconsin.

Shipping Policy

Prices listed are for "all of one variety" - no combining varieties for quantity prices permitted.

PLEASE NOTE: All tree orders must be for quantities listed. Container tree orders exceeding 600 must be in multiples of 50, over 3000 in multiples of 100.

Shipping Information

Orders will be shipped at proper time for your area unless otherwise instructed. You will be notified if shipping date must be changed due to causes beyond our control. Shipment will be by most practical method, usually UPS. *UPS does not deliver to P.O. Box numbers, so please list street address.* Normal delivery in continental U.S. is 2 - 4 days. We strongly recommend UPS 3-day select for shipments to the East and West Coasts. Guaranteed 3-day delivery eliminates the possibility of delayed delivery to distant destinations.

Shipping/Handling:

	ground	3-day select
Under \$10.00	\$2.95	\$3.95
\$10.00 - \$30.00	\$3.95	\$7.95
\$30.00 - \$500.00.....add	15%	20%
\$500.00 and up.....add	10%	20%

Prices do not include 5% WI sales tax and 1/2% county tax where applicable, which we are obligated to collect on WI orders unless supplied with an exemption certificate.

Canada orders: \$250 minimum, payment in \$US, add \$15 for phytosanitary certificate for each shipment.

Restrictions for Western States: Agricultural regulations in AZ, CA, HI, ID, MT, NV, UT & OR prevent us from shipping any variety of pines into your state. No shipping of red cedar to CA.

Refunds: All orders accepted subject to crop conditions. We reserve the right to cancel any portion of order should stock meeting grading standards be less than expected for any reason, including, but not limited to: natural causes, errors in count, labor problems, theft, or other causes beyond our control. In any event we will refund the amount originally received for portion of order not delivered, which is our maximum liability. Any discrepancies in quantity/stock ordered must be reported to us in writing within seven (7) days of receipt of stock. Claims for any other reason must be filed in writing by April 1 for spring same-year shipments. Adjustments, if warranted, will be in replacement stock or purchase price refund, at our option. In no case shall Rees Nursery be held liable for more than the original purchase price. Claims apply to original purchaser only.

We make no warranty, either expressed or implied.

RANGE OF AVERAGE ANNUAL MINIMUM TEMPERATURES FOR EACH ZONE

ZONE 1	BELOW -50° F	■
ZONE 2	-50° TO -40°	■
ZONE 3	-40° TO -30°	■
ZONE 4	-30° TO -20°	■
ZONE 5	-20° TO -10°	■
ZONE 6	-10° TO 0°	■
ZONE 7	0° TO 10°	■
ZONE 8	10° TO 20°	■
ZONE 9	20° TO 30°	■
ZONE 10	30° TO 40°	■
ZONE 11	ABOVE 40°	■

NEW U.S.D.A. HARDINESS MAP. . .

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