Learning through Comparisons: A Look at Forestry in Minnesota, Ontario, Finland and Sweden

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A Report Prepared to Support the Project:
Seeing the Forest AND the Trees: How to Make the Most of Minnesota's Woods

A Project of the Blandin Foundation and the Vital Forests/Vital Communities Initiative

October 29, 2008

Dovetail Partners, Inc.

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Introduction

In 2007, the Blandin Foundation initiated a new project as part of the Vital Forests/Vital Communities Initiative. This project, *Seeing the Forest AND the Trees: How to Make the Most of Minnesota's Woods*, was launched with a goal of engaging participants in a learning process that would help improve forest productivity. The project has included study tours in the Great Lakes region, and in September 2008, project participants traveled to Finland and Sweden to examine forestry and wood utilization practices.

More than 45 forest sector stakeholders have been involved in the project, including representatives from the Forest Service, Minnesota Department of Natural Resources, University of Minnesota, and Minnesota Forest Resources Council. Policy makers, industry representatives, and non-governmental and environmental organizations are represented.

The project identified several key learning objectives:

- Increase the quality and value of forests and the products that come from them in Minnesota and other Lake States.
- Optimize the balance of forest benefits, including timber, bioenergy and non-traditional forest products, ecosystem services and biodiversity, and public access and recreation.
- Develop a shared vision and public policy recommendations for forest management in Minnesota, including increased productivity and environmental and landscape sustainability.

To address these objectives, project participants engaged in various learning tracks to examine opportunities for and potential barriers to increasing forest productivity. The learning tracks include public policy, public engagement, systems change, private forest landowners, environmental review and permitting, and bioenergy and biochemicals. A key project learning strategy has been to examine alternative approaches used by forestry decision makers in other regions, and to identify best practices that can be replicated or adapted to provide local benefit. Specifically, the project has focused on Minnesota, Ontario, Finland and Sweden for comparison. This report provides background regarding the forestry situations in each of these regions, identifying the contrasts and similarities of each. Additional data about each region is included in the Appendix. This report has been created by and for the participants of the *Seeing the Forest AND the Trees* study tour to inform their experience and share the learning with others.

Background

Each of the four regions included in the study – Minnesota, Ontario, Finland and Sweden – offers a unique perspective and track record regarding forest productivity. Information as to forest conditions; investments in research, development, and forest-related education; economic indicators; forest policies; and community engagement practices provide a starting point for understanding the forest situation within each region.

Minnesota

The state of Minnesota has a population of 5.2 million, with 60% of Minnesotans living in the Twin Cities metro area. Minnesota is the 12th largest state geographically in the U.S., and ranks 21st in population.

Minnesota's landscape is characterized by intensive agricultural production in the southern and western regions, forestry and mining activities in the northern regions, and a mix of high technology and light industrial development in the urban areas of the Twin Cities, Duluth, Rochester and other communities.

Minnesota hosts the headquarters of several major corporations, including Target, General Mills, Cargill, and Best Buy. The "twin cities" of Minneapolis and St. Paul are the nation's third-largest trucking center. Duluth has the nation's largest inland harbor; and Rochester is home to the Mayo Clinic, a world-famous medical facility and research center.

The state unemployment rate is about 5.8% and per capita income in 2007 was estimated at $41,353. Tourism is a major revenue producer in Minnesota, with arts, fishing, hunting, water sports, and winter sports bringing millions of visitors each year.

Minnesota produces more than 75% of the nation's iron ore. The state is also a leading producer of corn, wheat, rye, alfalfa, and sugar beets. Other leading farm products include butter, eggs, milk, potatoes, green peas, barley, soybeans, oats, and livestock. Minnesota ranks among the nations top five producers of ethanol (from corn) and wind energy; both activities are centered in agricultural communities, with major impacts on rural economies.

Minnesota's factories produce non-electrical machinery, fabricated metals, flourmill products, wood products, plastics, a range of electronic products including computers, scientific instruments, and processed foods. The state is also a leader in the printing and paper-products industries.

An estimated 88% of Minnesotans are high school graduates and 27% have completed a college degree or more.

Forest Conditions and Productivity

There are more than 16 million acres of forests in Minnesota, representing about one-third of the state's land area. About 54% of the forestland is under public management, including federal, state and county-managed lands. A small percentage of forestland (3.2%) is tribally owned. Forest industry, investment organizations, and private individuals own the remainder (43%). There are more than 190,000 private woodland owners in Minnesota, and 82,000 of these landowners have at least 20 acres.

Forest conditions in Minnesota have changed since European settlement. Conifer forest types decreased as the pine resources were exploited in the early 1900s. Aspen and hardwood cover types expanded to occupy cutover and burned areas. Today, the aspen-birch forest type is dominant, comprising 6.3 million acres. Conifer forest types account for 4.4 million acres, 80% of which is spruce-fir.

The net volume of growing stock in Minnesota's forests is estimated at about 15.1 billion cubic feet. Hardwood forest types represent some 68% of growing-stock volume and 63% of sawtimber volume. Hardwood forest types are concentrated on private lands (51%) while softwood forest types are concentrated on public lands (76%). The net average annual growth of live trees on Minnesota's forestland is estimated at 551 million cubic feet, while average annual removals approximate 342 million cubic feet.

Minnesota is home to several rare habitats and 439 threatened, endangered, and of special concern plant and animal species. Of the threatened or endangered species, 128 (30%) are associated with forested habitats. Unique habitats in Minnesota include remnant prairie areas and transitional savannas. Several species, including those associated with the boreal forest as well as hardwood tree species, are at the edge of their habitat ranges in Minnesota. Moose, white-tailed deer, Canada lynx, goshawk, gray wolf, and bald eagles all occur in Minnesota. There are also several significant migratory bird flyways, including waterfowl routes through western Minnesota, songbird nesting habitats and migration routes in northern Minnesota, and "Hawk Ridge" in Duluth, which provides an opportunity to view an average of more than 94,000 raptors in migration each fall.

Forestry Research and Development Investment

Minnesota is home to several forestry research institutions, including the University of Minnesota Departments of Forest Resources, Bioproducts and Biosystems Engineering, and Fisheries, Wildlife and Conservation Biology; research units are located in St. Paul, Cloquet, and Grand Rapids. Forestry research is also conducted at the University of Minnesota's Natural Resources Research Institute (NRRI) in Duluth, and the Northern Research Station of the U.S. Forest Service. Institutionally-funded forestry research at the University of Minnesota's St. Paul campus and Cloquet and Grand Rapids research stations was about $2,000,000 in 2008. Forestry research sponsored through external funding represents an additional $3,000,000 to U of M units. The University of Minnesota has also established the Initiative for Renewable Energy and the Environment (IREE) that includes research with bioenergy, byproducts, and forest-based biomass resources. In 2007 the Legislature established more permanent funding for IREE, reaching $5 million annually in 2009. Additional research done at the Northern Research Station of the U.S. Forest Service is focused on the 20 northeastern states, including Minnesota. The entire research budget for the Forest Service in FY 2008 was $280 million, which if distributed equally between the 50 states would approximate $5.6 million per state. Research is also conducted and supported by the Department of Natural Resources and the Minnesota Forest Resources Council.

Private sector firms, including primary and secondary forest product producers, are also active in forest-related research. An annual research review is hosted by the Sustainable Forests Education Cooperative to communicate findings and translate research into changes in field practices.

Forestry Education

The University of Minnesota at its St. Paul campus offers the only accredited 4-year forestry degree program in the state. An average of 16 undergraduate and 21 graduate students complete the University's forestry programs each year, including graduates of the Biobased and Biosystems Engineering Department that pursue careers in forest-based industries.

There are also two forestry technician programs in Minnesota at the Itasca Community College and Vermillion Community College. The Minnesota Logger Education Program provides educational programming for the logging community and business owners.

Economic Indicators

An estimated 39,800 people are employed in Minnesota's forest products industry. The annual value of forest products manufactured in the state is about $7 billion, accounting for about 2.7 percent of gross state product. There are 5 pulp and paper mills, 3 recycled pulp and paper facilities, 3 hardboard and specialty mills, and 6 manufacturers of oriented-strand board in the state. There are also an estimated 500 sawmills, 150 associated industries, and over 800 secondary manufacturers. Major building material manufacturers have operations in Minnesota, including manufacturers of windows and doors, cabinets, store fixtures, molding and millwork, panelized wall sections and trusses, laminated beams, and specialty products.

Forest Policy, Environmental Review, and Community Engagement

Minnesota has a multi-layered approach to environmental review and forest policy. The layered approach is in part a result of the large amount of public land and the necessary involvement of federal, state and county-level land management agencies. Given these complexities, the Minnesota Forest Resources Council (MFRC) was established in 1995 to promote sustainable forest management within the state and advise the governor and federal, state, county and local governments on sustainable forest resource policies and practices. The governor appoints the chair and fifteen members of the Council, including representatives from the primary and secondary forest industries, labor, research and higher education, tourism and resort interests, conservation and environmental organizations, loggers, private landowners, and various land management entities. The Minnesota Indian Affairs Council also appoints a representative.

The Council has been responsible for developing the state's voluntary timber harvesting and forest management guidelines, promoting regionally based sustainable forestry initiatives, and providing information needed to support sustainable forest management through research, monitoring, and information management initiatives. Organizations such as the Legislative-Citizen Commission on Minnesota Resources (LCCMR), the Minnesota Environmental Partnership (MEP), and private foundations such as the Blandin Foundation and McKnight Foundation have also influenced Minnesota's forest sector.

The LCCMR makes funding recommendations to the legislature for special environmental and natural resource projects. The LCCMR has supported a variety of forestry related projects including conservation easements and the Forest Legacy Program, third-party forest certification and logger certification, and research efforts by the University of Minnesota, Department of Natural Resources, and MFRC.

The Minnesota Environmental Partnership (MEP) is a coalition of more than 80 Minnesota environmental and conservation organizations. These organizations represent more than 450,000 Minnesotans in their collective membership and advocate for policy changes that support the environment, including clean energy, water quality and habitat protection.

Minnesota is home to several private foundations that provide support for a variety of environmental programs and projects, including forestry related efforts. The McKnight Foundation has supported projects that protect the resources of the Mississippi River, and the Blandin Foundation has established a Vital Forests/Vital Communities Initiative and provided major funding for various initiatives.

In the realm of environmental review, Minnesota has been a leader in third-party forest certification, providing a unique opportunity for public engagement and market-based transparency. Minnesota has more third-party certified forestland than any other state with the first certificates issued for state and county-managed lands in Aitkin County in 1997. Since that time, more than 7.5 million acres of forestland have been certified in Minnesota and a Master Logger Certification program has been established to certify harvest operators. More than 100 forest product companies are also chain-of-custody certified to produce, label and market certified forest products. These products are recognized by green building programs and green procurement initiatives that give preference to eco-labeled and environmentally preferable products. The certification programs include requirements for public reporting, stakeholder consultation, and continuous improvement.

Ontario

The province of Ontario has a population of more than 12.5 million, with 97% living in southeastern Ontario, including the urban centers of Toronto and Ottawa. Ontario is the largest Canadian province by population and second largest in area. Ontario is Canada's leading manufacturing province accounting for 52% of the total national manufacturing shipments in 2004.

The province's unemployment rate is about 6.4% and per capita income in 2007 was estimated at $34,526 (USD). The top five manufacturing industries are transportation equipment, metal products, food processing, chemicals, chemical products and electrical and electronic products. Ontario's leading exports are autos and auto parts, machines, electrical products, metals, and plastics. In the service sector, the largest industries are finance, insurance and real estate, trade related services, professional services and health care.

Ontario has a 75% high school graduation rate, and the government has set a target for an 85% graduation rate by 2011. As of 2006, 24 percent of Ontario's young people aged 19-22 went on to study in a university, with another 14 percent attending community college. These attendance rates are approximately double those of 25 years ago.

Forest Conditions and Productivity

There are more than 176 million acres of forests in Ontario, representing about two-thirds of the land area. More than 90% of the forestland (including 62% of the productive timberland) is in public ownership. Private individuals own about 13 million acres. There are an estimated 150,000 private woodland owners in Ontario, and 80% of the private woodlands are in southern Ontario.

Forest types in Ontario range from the boreal barrens in the north to hardwood forests in southern Ontario along the northern shores of the Great Lakes. Hardwood forest habitats have been reduced from a pre-settlement area of more than 7 million acres to a remaining 1 million acres that are largely privately owned. The mixed forest region of Ontario encompasses about 50 million acres and includes both deciduous and coniferous cover types. The largest forest region is the boreal forest with black spruce and jack pine cover types dominating an area of more than 120 million acres. Current inventory data shows little change in the area of black spruce, white spruce, white cedar and tamarack over the past several decades. There have been small increases in white and red pine cover types. The area of balsam fir has been consistently declining due to significant outbreaks of spruce budworm and resulting tree mortality. Recent estimates indicate that over 42% of the productive forest is over 80 years in age.

The net volume of growing stock in Ontario's forests is 2.04 billion cubic feet, with hardwood forest types representing about 39% of growing-stock volume. Net average annual growth is estimated at 1.2 billion cubic feet while average annual removals are about 826 million cubic feet.

Ontario has a total of 183 threatened or endangered species. Ontario's forests are home to 21 plant species and 9 animal species that are considered threatened or endangered. About 40% of the species at risk in Canada occur in the Province of Ontario and primarily in southern Ontario.

Forestry Research and Development Investment

The primary organization involved in forestry research in Ontario is the Forestry Division of the Ontario Ministry of Natural Resources. One provincially-funded institution is the Ontario Ministry of Natural Resource's Centre for Northern Forest Ecosystem Research (CNFER) located on the campus of Lakehead University in Thunder Bay. The Centre conducts applied research with a focus on boreal forest management strategies. Additional provincially-funded research is associated with universities. The majority of forest products and forest harvesting research in Ontario and in Canada at large is conducted by FP Innovations, a public-private partnership with an annual budget of about $100 million; 60% of the FP Innovations budget is provided from government sources, with the remainder from industry.

In November 2004, a Minister's Council on Forest Sector Competitiveness was established in Ontario, followed by establishment of a Forest Sector Competitiveness Secretariat in late 2005. The Ontario provincial government announced a series of programs, totaling more than $1 billion over 5 years, to help stimulate new forest-sector investments in value-added manufacturing and co-generation of bio-based energy. While not intended to support research, the competitiveness-oriented effort is in part dedicated to stimulating development.

Forestry Education

There are two accredited universities offering Bachelors of Science (BS) and higher degrees in forestry in Ontario: Lakehead University and the University of Toronto. The number of forestry graduates from Lakehead University was 48 in 2003 (down from 55 in 2001, but up significantly from 1996 when the number of graduates annually averaged 34). There are nine accredited university forestry programs in all of Canada. There are also six forestry technician programs in the province, including one on-line program.

Economic Indicators

Estimates of forest sector employment in Ontario differ depending upon the method of collecting data. Using figures from Statistics Canada's Labour Forces Survey, direct forest sector employment in 2007 was 66,800. In contrast, the annual survey of Employment, Payrolls, and Hours shows 2007 forest sector employment at 57,047. Among the forest-related jobs are nearly 200 professional foresters and about 800 forestry technicians. More than 50 communities in Ontario are forest-dependent to some degree. There are at least 160 forest –sector processing facilities in Ontario and when employment estimates include jobs in the forest industry as well as forest-based tourism businesses, fishing and hunting, equipment manufacturing, transportation, and retail and service industries, the forestry cluster represents over 275,000 jobs in Ontario. The industry produces an estimated $11 billion worth of products annually, accounting for about 2.2 percent of the annual gross product of the province. In 2007, the value of forest product exports from Ontario was estimated at $5.7 billion. The main products were pulp and paper, softwood lumber, oriented strand board (OSB), medium density fiberboard (MDF), and plywood. An estimated 95% of the value of exports was to the United States.

Forest Policy, Environmental Review, and Community Engagement

Given the dominance of public land ownership in Ontario, the Ontario Ministry of Natural Resources (MNR) is the dominant management agency responsible for implementing national and provincial forestry policy, environmental reviews, and stakeholder engagement activities. The Crown Forest Sustainability Act (CFSA) is the leading national policy that defines forest sustainability and provides for the administration and regulation of forest management planning, forest resource agreements and licenses, information management, forest operations, revenue collection, trust funds, compliance and enforcement mechanisms. Under the Canadian system, resource licenses are issued to regulate forest industry and management activities. The larger licenses are referred to as Sustainable Forest Licenses (SFL) and are issued for 20-year time periods with renewals required every five years and based upon the results of independent reviews. The forest products companies pay stumpage fees to the government for the volume of timber harvested. The licensee approach used in Canada places the Ministry of Natural Resources primarily in a regulatory and enforcement role. The applicable Forestry Compliance Handbook and compliance monitoring programs outline the responsibilities of the licensees and the MNR. Annual inspection reports are prepared and publicly available.

Ontario has been very active in third-party forest certification efforts. In 2004, the Ministry of Natural Resources announced the intention to require certification for all licensed forestry operations. To date more than 65 million acres of Ontario's forestlands have been third-party certified.

Finland

Finland has a population of 5.2 million, with 60% of the population living in towns and cities concentrated in the southern part of the country. More than 1 million Finns live in the Helsinki metropolitan area.

The geography of Finland includes more than 185,000 lakes, and coniferous forests, called *taiga*, dominate the landscape. This forest type is similar to the barren boreal forests of northern Ontario. The taiga forest includes 75% of Finland's land area and is less productive than the country's more southerly boreal forests.

Service industries, including real estate, business services, transportation and communication activities, dominate the Finnish economy at nearly 65% of GDP. Manufacturing industries represents 30% and include electronics and electrical equipment, engineering, forest products, chemicals, shipbuilding, and textiles. The leading agricultural products include pork, beef, wheat, rye, barley, oats, dairy products, potatoes, and rapeseed. Finland is a member of the European Union and the European Monetary Union, meaning Finns use the common Euro currency.

The unemployment rate is about 6.8% and per capita income for 2007 was $35,500 (USD). An estimated 92% of Finns are high school graduates and 40% have completed at least one college degree. The Organization for Economic Cooperation and Development (OECD) and their Programme for International Student Assessment (PISA) has consistently ranked the Finnish school system as an international leader in education, including top rankings in natural sciences, reading comprehension, mathematics, and problem solving.

Forest Conditions and Productivity

There are more than 56 million acres of forests in Finland, covering about 70% of the land area. Most of the forests in Finland are privately owned (61%) and there are an estimated 440,000 Finnish woodland owners. These private lands provide 80% of the timber used by forestry industry.

The major tree species in Finnish forests include Scots pine (*Pinus sylvestris*) (65.6%), Norway spruce (*Picea abies*) (23.7%), and birch (*Betula spp.*) (8.9%). Forest management practices in Finland have included a long history of selective logging with a transition to more even-aged management (clear cutting and planting) beginning in the mid-1900s. Forest cover has largely been maintained throughout the historically forested areas, with exceptions in the more densely populated southern parts of Finland. Concerns about forest fragmentation and changes in forest landscape structure in southern Finland have been raised in recent years in response to harvesting patterns, expanded logging roads, and land use changes.

The net volume of growing stock in Finland's forests is 78 billion cubic feet. The net average annual growth is estimated at 3.4 billion cubic feet while average annual removals are about 2.1 billion cubic feet. Harvesting activities impact about 1.5 million acres per year, or 2.7% of the forested area. An estimated 63% of the treatments are thinnings, 24% involve clearcutting, and the rest are primarily seed tree or shelterwood treatments.

The European Union Habitats Directive lists protected sites and species for the region. A total of 83 animal species and 46 plant species listed in the Directive are found in Finland. Listed species include the European beaver, wolf, wolverine, brown bear, and lynx. The most recent surveys indicate that there are about 200 wolves, 150 wolverines, 1,200 lynx, and 975 bears in Finland.

Forestry Research and Development Investment

An estimated €87 million ($115 million USD) of public funds is spent annually on forest sector research in Finland. The leading Finnish research organization is the Finnish Forest Research Institute (METLA) that operates under the Ministry of Agriculture and Forestry. The Ministry also maintains 13 Regional Forestry Centres that aid in translating research into changes in field forestry operations. Forest-related research is also conducted by the pan-European forest research organization, the European Forest Institute (EFI), located at Joensuu. External funding is provided, in part, by the Academy of Finland, the central scientific administrative body within Finland whose mission is to promote general scientific research and to develop international scientific cooperation. The Finnish forest industry is also actively involved in research; major industry research institutes are Oy Keskuslaboratorio (KCL) that focuses on chemical processes, and Suomen Puututkimus Oy where research on mechanical wood processing takes place.

In 2007 a forest cluster was formally organized within Finland, including forest industry companies as well as home builders, machinery and equipment manufacturers, chemical industry companies, the communications sector, universities, and research institutions. A forest cluster research strategy was adopted and a *Strategic Centre for Science, Technology, and Innovation of the Forest Cluster* was set up. A new organization *Forest Cluster Ltd*. was also established to coordinate research and funding. An objective of doubling forest sector research funding – from €350-400 million to €700-800 million – by 2030 has been identified.

Forestry Education

In Finland there are two universities that offer forestry degrees: the University of Helsinki and the University of Joensuu. Education related to forest products is provided at eight universities: the University of Helsinki, the Helsinki University of Technology, the University of Joensuu, the Tampere University of Technology, the University of Oulu, the University of Jyvaskyla, Lappenranta University of Technology, and Abo Akademi University.

A number of vocational schools offer professional training in forestry and natural resources in Finland. These institutions also offer adult education, including courses directed at forest owners, and advanced professional courses of study.

In addition to formal training in universities and technical schools, forestry education is provided to children nationwide under the leadership of the Finnish Forest Association (FFA) and the National Board of Education. With organizational support provided by the Ministry of Agriculture and Forestry, guidance for forestry-related youth education is provided by a national steering committee that includes teachers at all grade levels, forest owners, the Finnish Forest Industries Federation, the Finnish Forest Research Institute, the Finnish 4H Federation, and a number of other representatives of forestry, agriculture, environmental education, and

outdoor recreation organizations. Forestry education in schools takes the form of forest days for individual schools and classes, forest weeks for schools of some towns and municipalities, and excursions to forests and forest products factories. All programs are free, with financing provided by the Finnish Forestry Association, which raises money through a voluntary sales promotion fee paid by members and linked to timber trade.

Economic Indicators

There are an estimated 83,000 people employed in forestry in Finland, and more than 4,000 forestry and forest products sector enterprises. The forest industry accounted for 2.4% of employment, 3.5% of GDP, and 15% of industrial production, in 2007. The Finnish forest industry includes 40 paper and packaging mills, 38 pulp mills, 170 sawmills, and 20 plywood, particle board/fiberboard mills. Forest industry exports represented 19.1% of all of Finland's annual exports in 2007, as compared to 12% in Sweden, 10% in Canada, and 2% in the United States.

There is significant trade in forest products between Finland and its eastern neighbor, Russia. In Europe, about 60% of Russian roundwood exports have gone to Finland in recent years. At the end of 2007, an estimated 16-20% of the timber used annually by the Finnish industry was imported from Russia. There is concern and speculation about what impact the proposed increase in the Russian tariff program might have on the Finnish (and Swedish) forest sectors. In a February 2008 survey conducted by the Finnish Forest Research Institute (Metla) and the Karelian Research Centre of the Russian Academy of Sciences, the reported conclusion was an estimated employment reduction in eastern Finland of almost 6,000 jobs and a total production decline of almost two billion Euros as a result of the proposed Russian tariffs. More broadly than the forest sector alone, as many as 20,000 jobs may be at risk, including railway operations, which realize 20% of their business from Russian timber imports. Russia raised tariffs on wood exports from 6.5% to 20% - and not less than €10/m^3 ($26/cord) - on July 1, 2007, to 25% - and not less than €15/m^3 ($40/cord) - in April 2008. The next increase is scheduled for January 2009 at which time the tariff will be 80% - and not less than €50/m^3 - ($130/cord).

The forest industry produces 80% of the bio-energy in Finland and about 40% of the wood harvested by the industry is used for bio-energy production. Bioenergy provided 25.5% of Finland's energy needs in June 2008.

Forest Policy, Environmental Review, and Community Engagement

Because more than 60% of the forestland is privately owned and 80% of the timber harvest is from these lands, much of the forest policy and forest law enforcement in Finland relates to regulating and monitoring private forestry practices.

Recent studies have found high levels of compliance with forestry laws in Finland. In 1997, 96% of forest owners were found to be in compliance with the 1996 Forest Act. Penalties for violations can include fines or imprisonment, but no violations meriting these penalties were found.

To achieve high levels of compliance, Finland offers "extension services" to landowners, and estimates are that over a five-year period 82% of landowners are directly contacted through these programs. The Finnish programs offer a number of incentives to support forest management activities, including low interest loans, subsidies, and tax exemptions. The funding for these programs comes from harvest taxes. Recently, the Finnish government has introduced plans to cut taxes on timber sales in an effort to encourage more harvesting and secure a sufficient supply of wood for the forest products industry in response to the planned further increases in Russian tariffs.

The Finnish forest industry has been working to reduce emissions to air and water over the past several decades. Since 1992, emissions to air have decreased by 30-80% and landfill waste by 85% per ton of production. Carbon dioxide (CO_2) emissions from fossil fuel sources have decreased by 40% since 1990. As an indication of progress in reducing emissions and effluents, drinking water in Helsinki is taken from a lake where pulp, paper and chemical mills release their purified wastewater.

Finland is active in third-party forest certification with nearly all managed forests certified. To reduce the costs of certification for the many small forest owners, Finland uses a "regional certification" approach that recognizes compliance with the certification standard at a larger scale than the individual property.

Sweden

Sweden has a population of over 9 million, with about 84% living in urban areas and the southern part of the country. About 1 million people live in the vicinity of Stockholm.

Sweden's landscape includes predominantly agricultural land uses in the southern part of the country and forest cover types to the north. The major natural resource based industries of Sweden include forestry and timber, hydroelectric power, and mining, including iron ore, copper, lead, zinc, gold, silver, tungsten, uranium, arsenic, and feldspar. Sweden's manufacturing sector accounts for 50% of GDP. The leading exports from Sweden include machinery, transport equipment, motor vehicles, wood products, paper, pulp, chemicals, iron and steel products.

An estimated 71% of the work force of Sweden is in the services sector, with 28.2% in industry and 1.1% in agriculture. Leading employers include telecommunications, computer equipment and biotechnology.

The unemployment rate in Sweden is 4.5% and per capita income in 2007 was $36,900 (USD). An estimated 72% of Swedes are high school graduates and 40% have completed a college degree or more.

Sweden is a member of the European Union, but rejected participation in the European Monetary Union in a public referendum with 56% voting against. Sweden maintains its own currency, the Swedish krona (SEK).

Forest Conditions and Productivity

There are over 69 million acres of forests in Sweden, covering more than 60% of the land area. A little over 14 million acres of forests are located in high mountains and subalpine coniferous forests; these areas are considered non-productive and are in government ownership. The government in total owns about one-third of the forestland. Of the more than 56.6 million acres of productive forest land, private individuals own 50%, forest companies 25%, other private owners 6%, the federal government 17%, and other public entities 1%.

The major tree species in Sweden include spruce (42%), pine (38%), and birch (11%). Softwood cover types represent 80% of the forest area. Sweden is the world's second largest exporter of sawn timber and the fourth largest exporter of pulp and paper.

The net volume of growing stock in Sweden's forests is 106 billion cubic feet. The net average annual growth is estimated at 3.5 billion cubic feet while average annual removals are about 3 billion cubic feet.

Sweden is home to a number of threatened or endangered species, including 3 plant species, 7 mammals, and 2 birds.

Research and Development Investment

Total spending on forest research at universities, technical colleges, and research institutes in Sweden in 2005 was SEK 820 million ($108 million USD),with SEK 450 million ($56 million) of this funded through institutional budgets, and SEK ($52 million) through external funding from Skogforsk (the Forestry Research Institute of Sweden), and other sources. Skogforsk is the central research body for the Swedish forestry sector and is financed jointly by government and the Institute's members. Support is also provided by the Royal Swedish Academy of Agriculture and Forestry, and the Research Council for Forestry and Agriculture. In addition to publicly funded research, Swedish forest companies funded an estimated SEK 1.2 billion ($158 million) of R&D activity in 2005. There has been considerable investment in forest-related bioenergy and biochemicals research in recent years.

Major research institutes involved in forestry and forest products research in Sweden include Skogforsk, the Swedish Pulp and Paper Research Institute, the Institute for Packaging and Logistics, the Swedish Environmental Research Institute, the Stockholm Environment Institute, the Swedish Institute for Wood Technology, and the Swedish Wood Ultrastructure Research Centre.

Forestry Education

In Sweden, programs of forestry education are offered by upper secondary schools and by the Swedish University of Agricultural Sciences (SUAS), with a main campus and administrative centre in Uppsala, and with branch campuses at other locations throughout the country. The Gammelkroppa School of Forestry, a private university located in Filipstad, is also a major player in forestry education. Other universities provide education relative to forest products and wood science. These include: the Chalmers University of Technology program in forest products and chemical engineering, the Brinell Centre's School of Mechanical and Materials Engineering program in pulp and paper chemistry and technology in Stockholm, and the Lulea

University of Technology program in wood technology. Overall, there are 30 schools in Sweden with accredited forestry programs and there are a total of approximately 1,000 students enrolled.

In addition to university-level education, various upper secondary schools give a basic three-year course as well as special courses for machine operators, forest farmers and foremen. All secondary schools and universities provide not only basic courses but also in- service training for forest owners. Moreover, a network of County Forestry Boards and the Forest Owners' Associations provide family forest owners with large-scale advisory services and extension courses.

Economic Indicators

An estimated 101,200 people were employed in the forest and forest products sectors in Sweden in 2007. Of these, 27,200 were forestry employees, 39,200 worked for wood processing industries, and 34,800 worked in the pulp, paper, and paperboard industries. The forest and forest product sectors generated products valued at about $33 billion in 2007, and these sectors accounted for 11.8% of industrial employment, 11.6% of exports, and 3.1% of the country's gross national product.

There are 46 paper and 44 pulp mills, 165 large sawmills (i.e. sawmills producing >1 million cubic meters of lumber annually), and 8 board mills (plywood, particleboard, and fiberboard) in the country. Overall, there are about 250 mills distributed throughout Sweden and local communities rely heavily on these businesses for local employment and tax revenues. An estimated 80% of the Swedish forestry work force is unionized.

Forest Policy, Environmental Review, and Community Engagement[1]

The current national forest policy was enacted by Parliament in 1993. It incorporates the commitments made by Sweden at the United Nations Conference on Environment and Development (UNCED) at Rio de Janeiro in 1992. Underlying this policy is the conviction that there will continue to be a demand for renewable products in the future and that Swedish forests can remain an important raw material base for processes that recognize principles of ecological cycles. Goals for both forest production and sustaining the forest environment have been established. These two types of goals carry equal weight. The preservation of biological diversity is a key element of the new forest policy.

Sweden's forest policy states that forest management will be characterized by multiple uses. Forests should be able to sustain hunting and the gathering of wild mushrooms and berries as well as active silviculture. The traditional Swedish "right of common access" implies that regardless of who owns the land, everyone is entitled to hike through the natural landscape and to pick mushrooms and berries that grow there. This is an important element of the multiple-use concept, but it also assumes that people behave in a respectful way. To the Swedes, common access is an important tradition and a privilege that is rarely abused. Similar policies and rights exist in Finland.

[1] This section reprinted essentially verbatim from borealforests.org (2008)

In northern portions of Sweden and Finland, the Sami (Lapp) minority pursue reindeer husbandry in forestlands on the basis of ancient rights. The Sami are legally entitled to use lands owned by others to feed and protect their reindeer herds.

The chief responsibility for forest policy in Sweden is vested in the Ministry of Industry and Commerce, whereas the practical application of forest policy rests with the Swedish Forestry Administration. This consists of the National Board of Forestry (Skogsstyrelsen) located in Jönköping, and the 10 County Forestry Boards (Skogsvårdsstyrelser). Locally there are some 100 districts where forestry-trained personnel are in close touch with forest owners. Forestry Administration operations include implementation of the Forestry Act, advisory services, distribution of government grants to forest owners performing contractual services, conducting forest inventories, dissemination of information, issuance of timber scaling regulations, and development and maintenance of forestry statistics and forecasts of trends in the forestry sector.

Sweden has seven forest owners' associations and many family forest owners are members of the one serving their region. The associations cooperate in the Swedish Federation of Forest Owners (Skogsägarnas Riksförbund). Their 89,000 members own 5.8 million ha of forestland (about 50% of all family held forest land). The associations were formed to improve the financial yield of forestry operations among their members. Their services include coordinating the timber trade and helping forest owners with logging and silvicultural practices. In order to ensure a steady market for timber and to control pricing, the associations have built up their own forest companies.

The Swedish Forest Industries Association (Skogsindustrierna) is the main organization of the forest industry, with 14 companies as members. The task of the association is to monitor and represent the interests of its members, while creating broader public understanding of the need for a competitive forest industry in Sweden. Among its other tasks are to promote and monitor the interests of its member companies abroad. Sweden's forest companies are manufacturers of a range of pulp, paper and sawn goods. The Swedish Forestry Association (Sveriges Skogsvårdsförbund) is an independent, non-profit organization that promotes forestry and related nature conservation. It organizes forestry conferences and study tours, and provides information about the forestry sector.

Where our Paths Cross

Each of the four regions included in the study – Minnesota, Ontario, Finland and Sweden – offers a unique perspective and track record regarding forest productivity. Information as to forest conditions; investments in research, development, and forest-related education; economic indicators; forest policies; and community engagement practices provide a starting point for understanding the forest situation within each region. There are some clear similarities between the regions, including each region having a:

- Northern climate
- Substantial forested area
- Similar forest types and topography
- Similar prominence of lakes and waterways
- Forest sector that is economically important
- Significant investment in forestry research and institutions

Where our Paths Diverge

There are also some clear differences between the regions, including:

- Larger relative impact of the forest sector to the total economy in Finland and Sweden as compared to Minnesota and Ontario
- Finland and Sweden annually harvest a greater proportion of net annual growth than Minnesota or Ontario
- Forest products oriented research investment is lower in Minnesota than in any of the other regions examined
- Greater public ownership in Ontario than in other regions examined

Strengths, Weaknesses, and Opportunities

Returning to the key learning objectives of the project *Seeing the Forest AND the Trees: How to Make the Most of Minnesota's Woods*, there are several conclusions that can be drawn in relation to each region's major strengths, weaknesses and opportunities and lessons that can inform forestry policy and productivity in Minnesota.

- Minnesota could harvest a greater proportion of net annual growth, and in the process increase forest sector employment and the net contribution of the forest sector to Minnesota's economy.
- Minnesota could shift its forest management practices to favor a larger component of older and later succession stands as part of a strategy to allow landowners to gain periodic income from intermediate thinnings as well as from harvest at maturity.
- More frequent, periodic harvests may be a key to effective harvesting and use of forest biomass for production of energy, industrial chemicals, and other emerging product categories.
- Minnesota should markedly increase investments in forestry and forest products research, including in the area of bioenergy/biochemicals development.

The study participants have identified the following priority ideas and recommendations for action in Minnesota.

- Develop a forest bioenergy strategy for Minnesota
- Increase the use of intermediate harvest activity across all land ownerships to advance forest productivity, whether for timber, wildlife, recreation, biodiversity, and/or biomass
- Build a statewide and regional constituency for investment in productive forests
- Increase the engagement of family forestland owners in sustainable and productive forest management

The Bottom Line

In 2007, the Blandin Foundation initiated the project, "Seeing the Forest AND the Trees: How to Make the Most of Minnesota's Woods," with a goal of engaging participants in a learning process that would help improve forest productivity. The project has included study tours in the Great Lakes region, and in September 2008, project participants traveled to Finland and Sweden to examine forestry and wood utilization practices. This report was created by and for the participants of the *Seeing the Forest AND the Trees* study tour to inform their experience and share the learning with others.

A key learning strategy used throughout the project has been to examine alternative approaches used by forestry decision makers in other regions. Specifically, the project has focused on the regions of Minnesota, Ontario, Finland and Sweden for comparison. The forestry situations in each of these areas formed a basis for exploring the contrasts and similarities of each with the goal of identifying best practices that can be replicated or adapted to provide local benefit. The areas included for comparison ranged from forest conditions, investments in research and development, economic indicators, forest policies, and community engagement practices.

The study illustrated that there are opportunities for Minnesota to improve productivity and undertake strategic actions that will enhance Minnesota's forest sector. These opportunities include addressing bioenergy opportunities for the state, increasing the use of intermediate harvests and silvicultural treatments that enhance forest values, building statewide support for forestry investments, and increasing the engagement of family forest owners as key partners in sustainable forest management.

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Appendix A: Matrix

	Minnesota	Ontario	Finland	Sweden
General Information				
Total population	5,155,000	12,690,000	5,244,749	9,045,389
Annual population growth rate	1.17%	1.10%	0.112%	0.157%
Total land area (acres)	50,985,000	265,766,428	83,557,449	111,188,525
Population density (people per acre)	0.10	0.05	0.06	0.08
Population dispersal in forested areas	60% of Minnesota's population lives in the Twin Cities region.	97% of Ontario's population lives within the Great Lakes-St. Lawrence and Deciduous Forest regions (southeastern Ontario).	60% of the population lives in towns and cities concentrated in the southern part of the country. More than 1 million Finns live in the Helsinki metropolitan area.	84% live in urban areas and the southern part of the country. About 1 million people live in the vicinity of Stockholm.
Per capita income 2007 (USD)	$41,353	$34,526	$35,500	$36,900
Unemployment rate	5.8%	6.4%	6.8%	6.1%
Forest sector as a % of the entire economy	2.7%	2.2%	3.5%	3.1%
Forest sector employment as a % of total employment	1.6%	0.9-1.0%	2.4%	2.4%
Forest sector production as a % of total industrial production (value)	11.0%	1.9%	15.0%	11.8%
Forest sector exports as a % of total exports	4.3%	2.9%	19.1%	11.6%

	Minnesota	Ontario	Finland	Sweden
Land Tenure				
Forestland Base				
Total forest area (acres)	16,343,000	176,008,095	56,834,238	69,189,223
Forest as a % of the land area	32%	66%	73%	69%
Forest area per capita (acres per person)	3.17	13.87	10.84	7.65
Productive forestland (Timberland) (acres)	15,033,000	140,463,995	50,639,306	56,563,000
Reserved forests (acres)	1,744,772 (11%)	23,121,679 (13%)	6,027,000 (11%)	14,079,000 (20%)
Productive forestland as a % of the forestland	89%	80%	87%	81%
Trends (Changes in forest productivity over 10/20 yr period)	Forestland increased from 16.2 million acres in 2003 to 16.3 million acres in 2005. Timberland increased from 14.8 to 15 million acres during the same time.	From 1990 to 1994, 46% of the available provincial harvest volume was utilized. From 1995 to 2000, this number rose to 66% and by 2004 had risen to 70%. This rate of utilization is approaching the capacity threshold for timber that is available and economically feasible to harvest.	In the past several years Finland has harvested 74% of the annual increment.	The growing stock of within forests has almost doubled since the 1920s. The utilization rate is 65 to 70% of the annual increment.

	Minnesota	Ontario	Finland	Sweden
Timberland Ownership				
Public Forestland Ownership				
State/Provincial (acres)	4,093,000	85,974,739	----	----
Federal (acres)	2,045,000	985,682	16,308,955	23,695,000
County/Municipal (acres)	2,002,000	----	2,965,264	565,000
Total public forestland (%)	54%	62%	34%	35%
Private Timberland Ownership				
Industrial companies (acres)	303,000	1,967,967	4,695,000	14,141,000
Other incorporated (TIMO/REIT)	1,200,000	0	0	3,394,000
Non-incorporated (Family/NIPF)	5,390,000	12,683,334	32,865,016	28,281,000
Total private timberland (acres)	6,893,000	14,651,301	37,560,016	45,816,000
Percent timberland privately owned	46%	14%	66%	81%
Number of private timberland owners	194,000	150,000	440,000	335,805
Number of private timberland owners with at least 20 acres	82,000	30,000	280,000	90,667
Average age of landowners	60 years old (U.S. average)	60 years old (Canada average)	Age < 40 years = 13% of forest area, 40-59 years = 47%, Age 60+ = 40%	50-64 years old
Average size of holding	28 acres	67 acres	86 acres	123 acres
Tribal/First Nation Timberland				
Percent timberland tribally owned	3.20%	0.70%	----	----

	Minnesota	Ontario	Finland	Sweden
Research and Development Investment				
General Population Education Level				
Literacy rate	13% of Minnesotans are in the lowest level of literacy.	22% of adult Canadians 16 years and over fall in the lowest level of literacy.	100% of persons over 15 years of age can read and write.	99% of persons over 15 years of age can read and write.
High sch. graduates (%)	88%	75%	92%	72%
Have completed college degree or more (%).	27% of Minnesotans have completed a college degree or more.	13% of Canadians aged 56 to 65 years have attended a university, compared to 28% for those aged 36 to 45.	40%	40%
				Research Investment
Public (federal and state) research annual spending (total investment)	U of M, St. Paul and Grand Rapids: (state and federal): $2,000,000/yr. Sponsored forestry research: $3,000,000/yr. Additional research is done at the Natural Resources Research Institute, and the Northern Research Station of the U.S. Forest Service. The Initiative for Renewable Energy and the Environment (IREE) includes forestry-related research, with a budget reaching $5 million annually in 2009.	The majority of forest products and forest harvesting research in Ontario and in Canada at large is conducted by FP Innovations, a public-private partnership with an annual budget of about $100 million; 60% of the FP Innovations budget is provided from government sources, with the remainder from industry.	An estimated €87 million ($115 million) of public funds is spent annually on forest sector research. The leading Finnish research organization is the Finnish Forest Research Institute (METLA) which operates under the Ministry of Agriculture and Forestry. The Ministry also maintains 13 Regional Forestry Centres that aid in translating research into changes in field forestry.	Total public spending on forest research in 2005 was SEK 820 million ($108 million),with SEK 450 million ($56 million) of this funded through institutional budgets, and SEK ($52 million through external funding from Skogforsk (the Forestry Research Institute of Sweden), and other sources including the Royal Swedish Academy of Agriculture and Forestry, and the Research Council for Forestry and Agriculture.

	Minnesota	Ontario	Finland	Sweden
Private annual research spending	A number of private sector firms are involved in forestry/forest products research in Minnesota (i.e. UPM Kymmene, Andersen Windows/Aspen Research, Marvin Windows, etc), but funding magnitude is proprietary.	The primary mechanism for private sector investment in Ontario is through FP Innovations. FP Innovations has an annual budget of about CDN$100 million (2007), of which about $38 million is provided by industry.	The Finnish forest industry conducts internal proprietary research and joint funding of major industry research institutes - Oy Keskuslaboratorio (KCL) that focuses on chemical processes, and Suomen Puututkimus Oy where research on mechanical wood processing takes place.	Swedish forest companies funded an estimated SEK 1.2 billion ($158 million) of R&D activity in 2005.
Forestry/wood products research spending as a percentage of forest sector revenues	In Minnesota, research spending is at least 0.2% of the $6.6 billion in forest sector revenues. This does not count research at the USFS Forest Products Laboratory or the Northern Research Station or other national research laboratories whose projects either focus on advance forestry and wood products in Minnesota.	In Ontario, industry funding through FP Innovations is about 0.1% of revenues. When all research funding, including federal funding, is considered, the percentage rises to about 0.3%. Additional research through Environment Canada, the provinces and universities brings total funding to about 0.6%.	In Finland 3.5% of GDP is spent on research and development, placing Finland number one globally in this metric.	Private sector forestry and wood products R&D spending was 1.2% of revenues in 2004.
Mechanisms for translating research into on-the-ground changes in practices	In Minnesota, an Annual Forest and Wildlife Research Review is held. The provincial government of Ontario provided $2.68 million in funding for extension/outreach efforts to the forest sector in 2003/2004, a 22% increase from 1999/2000. Ministry of Agriculture and Forestry and 13 Regional Forestry Centres in Finland help influence practices. Finland ranks #1 in knowledge transfer between Universities and companies with 22 science and technology centers. Sweden has a bio-business incubator in Uppsala that is a government and private sector partnership.			

	Minnesota	Ontario	Finland	Sweden
Forestry Education Investments				
Number of accredited forestry degree programs	There is one accredited forestry degree program in Minnesota, the University of Minnesota, St.Paul.	There are two accredited universities offering BS and higher degrees in forestry in Ontario: Lakehead University and the University of Toronto. Other university level environmental programs are: Brock University - Tourism and Environment program, Queens University - School of Environmental Studies, and University of Waterloo - Faculty of Environmental Studies - programs in ecological restoration, environmental assessment, parks, eco-tourism. There are nine accredited university forestry programs in Canada.	In Finland there are two universities that offer forestry degrees: the University of Helskinki and the University of Joensuu. Other universities provide forestry-related education through departments of botany and zoology. Education related to forest products is provided at eight universities: the University of Helskini, the Helsinki University of Technology, the University of Joensuu, the Tampere University of Technology, the University of Oulu, the University of Jyvaskyla, Lappenranta University of Technology, and Abo Akademi University.	Forestry education in Sweden is offered through the Swedish Univeristy of Agricultural Sciences where 3-year forest engineer, 4 and 5 year forestry M.Sc., and advanced forestry M.Sc. degrees are awarded. In addition, a number of upper secondary schools (comparable to community and vocational colleges) offer 2 and 3-year forestry training.
Forestry education program ranking - undergraduate	The U of M's undergraduate forestry program ranked first in the United States in an examination of forestry and natural resources programs (1997). Finland is ranked as an international education leader with top rankings in natural sciences, reading comprehension, mathematics, and problem solving.			
Forestry education program ranking - graduate	In 2006 the Journal of Forestry compared forestry research programs, providing rankings based on number of refereed publications, number of citations of that work, and an overall perception-based composite score. In these rankings, the University of Minnesota forestry program ranked 4th in number of publications, 8th based on number of citations of those publications, and 6th in the perception based composite score.			

	Minnesota	Ontario	Finland	Sweden
Number of grads and undergrads from forestry programs per year	In Minnesota, an average of 16 undergraduates and 21 graduate students have received forestry degrees annually over the past five years.	The number of undergraduate and graduate degrees awarded by all accredited university forestry programs in Canada has declined from 394 in 2000 and 2001 to about 293 in 2003; although near term data makes it appear that a sharp decline has occurred, the number of graduates in 2003 was almost the same as in the period 1996-1998. The number of forestry graduates in Ontario (from Lakehead) was 48 in 2003 (down from 55 in 2001, but up significantly from 1996 when the number of graduates annually averaged 34).	The Graduate School in Forest Sciences (GSForest) was established in 1995 and currently has about 79 PhD student positions. The courses organized by GSForest are mainly funded by the Academy of Finland. GSForest is coordinated by the Faculty of Forest Sciences, University of Joensuu.	Number of forestry graduates from the Swedish University of Agricultural Sciences in 2006/2007 were: 3-yr. forest engineer – 1 4/5 yr. educ. leading to a Masters degree in forestry – 19 4-yr forestry M.Sc. – 23 5-yr forestry M.Sc. – 8 Advanced forestry M.Sc. – 11 Number of forestry graduates from upper secondary schools in 2006/2007 were: Natural resource utilization – forestry specialization –349
Forester Licensing/continuing education	In Minnesota, there is the SAF Certified Forester Program; Stewardship Plan Preparer and SFIA Approved Plan Preparer status.	The Registered Professional Forester status requires specific educational and practical experience. The Ontario Professional Foresters Association is the governing body for foresters.	All vocational schools offer adult education, including courses directed at forest owners, and provide advanced professional courses of study.	All secondary schools and universities provide not only basic courses but also in- service training for forest owners.

	Minnesota	Ontario	Finland	Sweden
Forestry technician programs	There are two forestry technician programs in Minnesota: Itasca Community College and Vermillion Community College.	There are six in Ontario, College Boreal, Fleming College, Northern College, Northern Lights College, and Sault College of Natural Environment and Outdoor Studies. One other program operates as a virtual program, with on-line - based degrees this is Athabasca University which offers associated field training at their Lindsay campus).	A number of vocational schools offer professional training in forestry and natural resources in Finland.	There are two universities offering forest technician programs in Sweden. In addition to formal technician programs, various upper secondary schools offer a basic three-year course as well as special courses for machine operators, forest farmers and foremen. The number of graduates of these programs in 2006/2007 was as follows: Basic forestry ed. (40 wks) – 31 Cerified vocational educ. In forestry (1-1.5 yr.) – 85 Univ. diploma in forest mgmt. (2 yr.) Compl w/o degree – 18 Fully accredited – 11
Logger education (post-secondary)	The Minnesota Logger Education Program (MLEP) established in 1995, provides assistance to the logging community through educational programming and established Minnesota Master Logger Certification.			
Logger recruitment programs/efforts	In Sweden, the industry has taken steps to improve job opportunities, including: (a) large-scale, nation-wide training facilities for forest workers; (b) higher wages; (c) mechanization, aimin at easier work; (d) more convenient houses and camps; (e) improvement of the forest road network;(f) prevention of accidents; (g) permanent instead of seasonal employment.			

	Minnesota	Ontario	Finland	Sweden
Use of mechanized logging	Tree felling is increasingly done by felling machines in Minnesota (84 percent) rather than by chainsaws (16 percent). Mechanized logging has been adopted in Sweden to help reduce the cost of industry operations and maintenance. This has proven to provide some complications however because much of the land owned is in small chunks and often have complicated ownership issues. Thus it is harder for larger operations to use mechanized logging. Finland is 95% mechanized and made a rapid transition directly from hand-felling to cut-to-length systems in the mid-1980s.			
Forestry personnel as a percentage of population (foresters per capita)	Foresters as a percentage of the general population: 0.8%. Figures for 2007 indicate that 39,800 Minnesotans are employed in the forest sector.	The number of employed professional foresters (BS degrees or higher) in Ontario is 193; there are 799 employed forest technicians. There are 0.087 employed foresters/forest technicians per 1,000 Ontario residents. The total number of forest sector jobs in Ontario in 2007 was 66,800 (as reported by the Provincial Labour Force Survey), or 57,047 (as reported through the annual survey of Employment, Payrolls, and Hours).	Foresters as a percentage of the general population: 0 .9%. In 2006 approximately 73,000 people were directly employed in the forest sector in 2006)	Foresters as a percentage of the general population: 3.0%. (includes people with 2 and 3-yr. degrees) In 2007, an estimated 101,200 people were directly employed in Sweden's forest sector.

	Minnesota	Ontario	Finland	Sweden
Forest Management Investments				
Gov't assistance for reforestation & mgmt activities	In Minnesota, 30,000-35,000 acres of state forestlands are reforested annually. 10,000 acres are reforested through planting and seeding, 5,000 acres are site prepped for planting and seeding annually. The 2008 Capital Budget for State Forest Land Reforestation included the Governor's Recommendation of $3,000,000. In Finland there have been $72 million in state loans for forestry. In Sweden, $1.8 million dollars has been spent on wildlife habitat projects and $3.8 million dollars for conservation.			
Investments in insect and disease research/treatment	USDA Forest Service activities in forest protection biotechnology research include approximately $5 million per year. Universities and industry spend on the order of $2-3 million per year. In 2006, $14.02 million dollars was spent in Finland.			
Fire management investments	Firefighting is 31.5% of the MN DNR Div of Forestry Budget, representing $39.7 million			
Industry Infrastructure				
Variety of wood using industries	5 pulp and paper mills, 3 recycled pulp and paper, 3 hardboard and specialty, 6 OSB, 500+ sawmills, 150 associated industries, over 800 secondary manufacturers	Users include producers of logs; chips; lumber; pulp; paper and paperboard; oriented and laminated strand lumber; I-joists; plywood, OSB, MDF, particleboard panels; furniture; cabinets; flooring; windows and doors; siding; specialty products.	Sawmilling, wood-based panels, other wood-based products, pulp and paper, converted paper products	Pulp and paper, joinery and board industry, sawmilling, packaging and converting, forestry operations
Cost Competitiveness of existing industries	The Finnish Forest Industries Federation works to ensure industry competitiveness. Sweden has used a variety of public policies to secure forest sector growth and competitiveness, including state subsidies for transportation, management activities, energy production, and devaluation of currency.			

	Minnesota	Ontario	Finland	Sweden
Ecological Indicators				
Third-party certified forest area	7.4 million acres	65 million acres	51 million acres	44.4 million acres
Certified as a % of total forest area	45%	37%	95%	64%
Percentage of hardwood covertypes	In Minnesota, Hardwood forest types increased from 10.4 to 10.6 million acres from 2003-2005, and represent 68% of growing-stock volume and 63% of sawtimber volume. Hardwoods are about 15% of the covertypes in Finland and 17% of the covertypes in Sweden.			
Major species/cover types	The aspen-birch forest type, with 6.3 million acres of timberland is the dominant forest type.	Spruce, Pine, Fir, Hemlock, Cedar and other, Larch, Aspen/Poplar, Birch, Maple	Scots pine (65.5%), Norway Spruce (23.7), Other conifers (.1%), Birch (8.8%), Aspen (.3%), Alder (.3%)	42% Spruce, 38% Pine, 11% Birch, 6% Other deciduous trees, 3% dead trees
Percentage of softwood cover types	In Minnesota, conifer forest types increased from 4.3 to 4.4 million acres from 2003-2005. 4/5ths of all the coniferous timberland is in the spruce-fir forest type (3.3 million acres). Softwoods represent 85% of the growing stock and 88% of the covertypes in Finland. In Sweden, conifers represent 80% of the covertypes.			
Forest age distribution	In Minnesota, Northern Hardwood stands average sixty to eighty years of age with representatives of all age classes. Stands have between eighty and one hundred forty sq. ft of basal area, with most being maintained between eighty and one hundred twenty sq. ft. After the year 2122, northern hardwood acres should be equally divided among basal area classes 80 – 100, 101 – 120, and 121 – 140 for perpetuity. Ontario has 3,924 ha in regeneration, 23,801 immature, 43,465 mature, 27,940 overmature, none in uneven aged and 9,493 unclassified. All of Canada has 31% young, 37% mature/overmature, 32% uneven-aged or unclassified for maturity			
0-20 years	18%	----	19%	23%
21-40 years	17%	----	17%	21%
41-60 years	27%	----	16%	15%
61-80 years	23%	47% mature	14%	11%
81-100 years	8%	----	13%	10%
>100 years	5%	17% old-growth	18%	20%

	Minnesota	Ontario	Finland	Sweden
Rare, threatened and endangered (RTE) species	439 plants and animals are designated by the MN DNR to be endangered, threatened or species of special concern. 30% (128) are affected by forest management activities. There are 15 mammals, 32 amphibians and reptiles, and 20 birds that are listed and forest dependent. A total of 158 fish species are also listed in Minnesota. 12 are listed on the federal list of endangered or threatened species. There are 183 total RTE species in Ontario. In Canada, the Endangered Species Act received Royal Assent on May 17, 2007 and is set to come into force on June 30, 2008. In Finland, 37% of the endangered species are forest-based.			
Natural regeneration	State land: 18,134 acres, Private: 2,412 acres	296,494 acres (2005)	74,000 acres; 25-30% of the Scots pine is natural regeneration	28% of entire felled area
Artificial regeneration	State land: 4,805,134 trees, Private: 3,991,800 trees	259,782 acres (2005)	543,631 acres	67% of entire felled area
Area planted	State land: 6,584 acres Private: 6,653 acres	210,382 acres (2005)	296,526 acres seeded or planted	88% of harvest area
Area seeded	Counted with planted areas (see above)	49,400 acres (2005)	296,526 acres seeded or planted	22% of harvest area
Use of ecological classification systems (ECS)	Minnesota is divided up in to 9 ESC systems they include Northern MN and Ontario Peatlands, Northern Superior Uplands, Western & Southern Superior Uplands, N. MN Drift & Lake Plains, MN & NE Iowa Moraines, Paleozoic Plateau, Lake Agassiz & Aspen Parklands, Red River Valley, and the North Central Glaciated Plains. Ontario has four main kinds of forests: The Hudson Bay lowlands, Boreal forests, Great lakes-St. Lawrence region, and the Deciduous Forest. Finland has four ecoregions: Hemiboreal, Southern Boreal, Middle Boreal, and Northern Boreal.			
Leading silvicultural practices for improving productivity	Finland has identified the top practices to be clearing of regeneration areas (site prep and reduction of competition), soil preparation, artificial regeneration, seedling stand improvement, and forest fertilization			
Measures of forest change (forest types, age classes) over the last 25-yrs	Recent studies have found increases in white pine along with improved age-class distribution and some reductions in aspen covertypes.	Consistent downward trend in the area of balsam fir (due to spruce budworm). Over 42% of the Crown production forest is older than 80 years.	The structure of Finnish forests has changed significantly over the past 80 years. The forests are more even aged. During the last 10 years the share of Norway spruce has been declining.	One of the largest problems in Sweden is moose browsing on young pine trees. Between 2003-2007 50% of pines were affected.

	Minnesota	Ontario	Finland	Sweden
Economic Indicators				
Growing stock	Net volume of growing stock of 15.1 billion cubic feet (1,009 cubic feet/acre).	240 billion cubic feet (61% conifer, 39% hardwood)	78 billion cubic feet	106 billion cubic feet
Percentage growing stock on public land	Hardwood forest types are concentrated on private lands (51%) while softwood forest types are concentrated on public lands (76%).	84.4%	60%	40%
Net annual increment	0.551 billion cubic feet, approximately 3.1% of the current live-tree volume on forest land.	2.2 billion cubic feet (about 0.9% of total growing stock)	3.4 billion cubic feet	2.8 billion cubic feet
Harvest area	120,000 acres per year (estimate)	459,030 acres (2006); 556,276 acres (2005)	1.5 million acres approx. 2.7% of the entire forested area in: Thinnings 948,884 acres, clear fellings 358,302 acres, seed tree and shelterwood 66,718 acres, removal of seed trees and shelterwood 130,965 acres, Other fellings 24,710 acres.	533,000 acres final felling, 580,000 acres thinning, 645,000 acres precommercial thinning (2006, Swedish National Forest Inventory)

	Minnesota	Ontario	Finland	Sweden
Annual harvest	0.342 billion cubic feet, nearly 1.9% of the current live-tree volume on forest land	0.826 billion cubic feet	2.1 billion cubic feet	1.7 billion cubic feet
Annual harvest per acre of forest (ft^3/ac)	20.9	4.7	48.6	24.6
Forest products exports	Forest products exports in 2007 approximated $0.7 billion, or 4.3% of total exports from Minnesota. Minnesota has been a net importer of roundwood in recent years, but it is likely not currently. The total value of forest sector goods sold in Minnesota is $6.6 billion.	$5.8 billion (CDN) (2007) Compares to exports of $6.9 billion in 2006 (2.9% of total exports from Ontario) and $8.4 billion in 2005. Primary exports were pulp and paper products ($4.1 b), softwd lbr ($0.45 b), OSB ($0.26b), MDF ($0.125b), and plywood ($0.11b). Ninety-five percent of the value of exports was to the United States.	€12.3 billion ($16.2 billion) in 2007.The forest industry overall accounted for 19.1% of total Finnish exports in 2007.	$4.9 billion; 11.6% of the value of Sweden's exports in 2007 were forest products.
Forest products imports	Canada exported $735 million in forest products to Minnesota in 2006. The leading lumber exports to Minnesota were softwood lumber at $210 million, wood pulp at $148 million and newsprint at $139 million.	$5.6 billion (CDN)	649.7 mill. m^3 u.b.	$8.2 billion

	Minnesota	Ontario	Finland	Sweden
Wood sector employment	The sector represents 39,800 jobs in Minnesota. The wood sector represents 11-12% of the entire employment in Sweden	Based on the Labour Force Survey, the number of direct jobs in the forest industry in Ontario in 2007 were 66,800 (down from 84,400 in 2005), with 27,700 in pulp and paper (down from 34,400 in 2005), 31,200 in wood products mfg (down from 39,000 in 2005), 5,200 in forestry and logging (down from 7,700 in 2005), and 2,500 in support activities (down from 3,300 in 2005).	In Finland, Forestry represents 23,000 persons, Forest Industry (60,000 persons); a further break down of the Forest industry employment is as follows: sawmilling (10,000 persons), Wood based panels (6,000 persons), Other wood products industry (16,000 persons), pulp and paper industry (30,000 persons), converted paper products (4,000 persons).	An estimated 101,200 people were employed in the forest and forest products sectors in Sweden in 2007. Of these, 27,200 were forestry employees, 39,200 worked for wood processing industries, and 34,800 worked in the pulp, paper, and paperboard industries.
Corporate income tax rate (% of business income)	In the U.S. the federal tax rate is 35-39% depending upon taxable income; state tax rate is 9.8%, but the state tax is deductable in calculating the federal tax.	Ontario's combined federal-provincial corporate income tax rate is 34.12%	The corporate tax rate in Finland is 26%, with a mandatory re-investment tax.	The federal corporate tax rate in Sweden is 26.3%.
Tax revenue as a % of GDP	For the United States as a whole, overall tax revenue as a percent of GDP was 26.8% in 2007.	For Canada as a whole, overall tax revenue as a percent of GDP was 33.5% in 2007.	Overall tax revenue as a percent of GDP was 43.3% in 2007.	Overall tax revenue as a percent of GDP was 51.1% in 2007.
Capital gains tax (%)	15% The highest tax rate on a net capital gain is generally 15% (or 5%, if it would otherwise be taxed at 15% or less).	15%	28%	30%
Minimum wage	$6.55/hour	CDN$8.75/hr	No minimum wage – rely on Union bargaining.	No minimum wage – rely on Union bargaining.

	Minnesota	Ontario	Finland	Sweden
Fuel costs (diesel, 10/08)	Diesel – avg $3.29/gal	Diesel – avg $4.35/gal	Diesel – avg $6.87/gal	Diesel – avg $9.40/gal
Average haul distances (woods to mill)	The average distance in Sweden 321,522 feet; Maximum of 120 miles. Most loggers in Sweden and Finland typically operate within 30 miles of their home.			
Truck weight limits	80,000 lb limit	111,333 (6 axle)	132,000 (7 axle)	132,000 (7 axle)
Stumpage costs	All-species average pulpwood & bolts $23.13/cord, Jack Pine $27.37-33.52/cord, aspen $27.01-28.44, Oak $17.46-20.85	All species Canada average for pulpwood and bolts $32 USD /m3	Birch logs $72/m3, Pine & Spruce logs $95, Spruce pulpwood $33, Pine & Birch pulpwood $24	Average prices of delivery logs in 2007, Cubic metre solid volume excl. bark: Pine sawlogs: $58 per m^3, Spruce sawlogs: $56 per m^3, Pine pulpwood: $33 per m^3,Spruce pulpwood: $34 per m^3, Birch pulpwood: $34 per m^3
Cluster development activities	Minnesota has no formal strategy to develop a forest cluster. Canada plans to establish regional research clusters across the country to enable provincial governments, universities, industry and other partners to work together more effectively. Two research clusters launched in 2005. Science enterprise "Algoma" cluster is in Sault Ste. Marie, Ontario, and focuses on science-based economic development and commercialization. The second cluster is called Forest Research Opportunity B.C. and is headquartered at the Univ. of British Columbia. Finland forest industries claim their country has the world's strongest forest cluster. The cluster is comprised of two major sectors—paper, board & pulp and wood products—plus a wide range of other sectors including chemical, packaging, forestry, printing, and energy. Companies and organizations within the cluster employ 200,000 people in Finland and abroad. Finland has a Finnish National Support Group composed of cluster companies and public financiers. Accomplishments of the Support Group include establishment of a Finnish Forest Cluster Research Strategy (2006) and a Strategic Center for Science, Technology and Innovation of Forest Cluster (2007). Similar to Sweden, Finland has a National Strategic Research Agenda (NRA) that provides support to the forest cluster. Sweden has one of the most advanced forest industry clusters in the world. The cluster is export oriented and ranks #3 in the world in sawn timber exports and #4 in pulp and paper exports. A recognized strength of the Swedish cluster is the National Strategic Research Agenda (NRA) that includes industry, forest owners, authorities (government) and the research community. The four NRA "process groups" are Forestry, Wood, Pulp & Paper, and Bio-Energy.			

	Minnesota	Ontario	Finland	Sweden
Social and Community Information				
Forest landowners association membership (including cooperatives)	There is the statewide Minnesota Forestry Association in Minnesota and several local forestry cooperatives and active woodland committees. The Ontario Forestry Association provides private forest owners across Ontario with a strong and united voice on issues affecting our forests. The OFA works on behalf of its members and participants in the province's Managed Forest Tax Incentive Program (MFTIP) to ensure the program's success. The Ontario Woodlot Association is a non-profit organization with a network of regional chapters located across the province. In Finland, there is the Central Union of Agricultural Producers and Forest Owners (MTK), also 14 Federations of Forest Owners that provide many services, including advice on timber sales. There are a total of 136 Finnish landowner associations with 280,000 members. Finnish landowners pay an annual fee of $3 per acre to support the associations (more than $37 million per year total). Sweden has 20 associations (130,000 member holdings) representing 172,973,767 acres.			
Tax incentive programs	In Minnesota, recent changes to tax law reduce property taxes for forest lands with a stewardship plan in place. The Sustainable Forestry Incentive Act (SFIA) provides annual payments to forest landowners that enroll and place an 8 year easement on their property. In Ontario, woodland owners with 10 acres or more of forest lands can take advantage of the Managed Forest Tax Incentive Program. Landowners must prepare (or have prepared) a management plan for a 20 year period. This plan includes a 5-year operating plan specifying the management actions to be carried out in the coming five years. The Plan must be approved by a Managed Forest Plan Approver. The landowners benefit under the program through having completed a Management Plan and paying reduced land taxes for the managed woodlot. The Conservation Land Tax Incentive Program in Ontario offers a reduction in property taxes to landowners who agree to protect natural heritage features on their property, such as provincially significant woodlands. In 2003, the program has over 15,000 properties participating.			
Cost-share programs	The Stewardship Program in Minnesota provides cost-share for tree planting and other practices on private lands. The Ontario Stewardship Program was initiated in 1995 by the Ministry of Natural Resources (MNR). MNR provides funding to each stewardship council to be invested in community level projects. MNR also maintains a central Opportunity Fund in partnership with local or provincially-based groups, to which councils can apply for assistance with activities that will have impact at the landscape level. MNR is able to influence activities by directing the Opportunity Fund to priority areas, such as education, tree planting and stream restoration. In Finland, $80 million is paid annual in incentives to private landowners to support timber stand improvement, bioenergy harvesting, road maintenance and other forest management practices.			

	Minnesota	Ontario	Finland	Sweden
Legal Environment, including environmental review and permitting				
Public involvement in environmental review and judicial process	Public involvement in public forest planning occurs through: 1) distribution of the initial assessment information 2) public comment period to identify key forest management issues and solicit public opinion of preferred management 3) A public review and comment period for the draft strategic direction, draft 10-year stand selection to implement the strategic direction, and resulting estimates of new access needs. 4) Public review and comment on proposed plan revisions.	The public is highly involved in the environmental review process. Typically steps taken to complete a new plan: contact aboriginal communities, resource based tourism operations, select plan author and appoint planning team, prepare terms of reference, review membership and fill vacancies on local citizens committee, prepare terms of reference, assemble and update background info., prepare for state one (consultation)	The main elements of Finnish forest policy are defined in the National Forest Programme 2010, while the regional objectives are written down in the Regional Forest Programme. The Forest Biodiversity Programme for Southern Finland METSO supplements the National Forest Programme in objectives concerning ecological sustainability. The long-term planning of forest policy is supported by the Future Forum on Forests.	There is some public involvement, only during the development of the ways to achieve the objects which are set forth from the Swedish Parliament. It took over 2 years to develop thirteen quantitative targets to be achieved within a specific time. These are known as the national forest programmes (nfps).
Percentage of women holding political office	In Minnesota in 2006 women held office on school boards 37.6%; City Councils 28.1%, Mayors 13.2%, City Commissioners 11.4%. In 2007 women held 32.1% of the house, 40.3% of the senate, and were prominent as District judges 27.3% and Appellate Judges 37.5%.	In Canada, 6 of 27 cabinet ministers (22%), and 65 of 308 members of Parliament (21.1%) are women). Of the elected representatives to Parliament from Ontario, 23 of 106 (21.7%) are women.	Twelve of twenty cabinet posts in Finland are held by women and women hold 41.2 percent of the seats in Parliament.	In Sweden, women hold 45% of the positions in parliament, 50% in the cabinet

	Minnesota	Ontario	Finland	Sweden
Nature of dispute resolution processes (formal litigation, mediation, other informal processes, etc)	In Ontario, the typical resolution processes that are used in the review/dispute process include: institutional / organizational instruments such as establishing or changing the mandates, responsibilities, and/or actions of organizations and groups; regulatory instruments such as legislation, regulations, by-laws, enforcement procedures; non-regulatory instruments such as guidelines, codes of practice, self-regulation, directives, procedures, standards, and amnesty and incentive programs; negotiated formal or informal agreements among parties to achieve consensus and assign responsibilities; economic instruments such as taxes, grants, loans, fees, rebates, funding, subsidies, fines, market-based incentives/disincentives and communications instruments. Finland has 250 Forest Management Associations. The Swedish Forest Agency has 5 regions, 120 local offices in 45 districts; Sweden has also adopted the Ministerial Conference on the Protection of Forests in Europe (MCPFE).			
Management framework (Flow chart of forest management process management)	In Ontario, the policy framework and legal authority is framed by the provincial obligations such as the Ministry of Natural Resources' Statement of Environmental Values under the Environmental Bill of Rights; the Ministry's Forest Management Class Environmental Assessment approval under the Environmental Assessment Act; and national commitments set out in the National Forest Strategy and Action Plan. In Finland, the Ministry of the Environment defines environmental policies, sets administrative controls and makes strategic plans at national level. The Ministry also sets targets for environmental protection, drafts and develops environmental legislation, and oversees international co-operation. The Finnish Environment Institute (SYKE) produces and compiles environmental data, and develops new ways to protect water, the air and the soil, to improve waste management, and to improve the management of wastes and the supervision of chemicals. The institute also provides experts to participate in the drafting of environmental legislation. Finland's 13 regional environmental centres implement environmental protection measures and ensure that environmental legislation is observed in their respective areas. They also process environmental permits for medium-sized industrial plants and waste processing facilities, and restoration permits for contaminated sites. The Environmental Permit Authorities deal with permits for larger industrial plants, and permits issued under the Water Act. Municipalities promote and supervise environmental protection on a local scale. The following is the structure of the Forest Policy in Sweden: Government (Ministry of Agriculture, Food and Fisheries), Swedish Forest Agency (implementation and technical level), and Target groups (forest owners, forestry sector, public)			

	Minnesota	Ontario	Finland	Sweden
Forestry Knowledge on the Part of the Public				
What percent of children are exposed to forestry education?	There are no readily available statistics regarding how many or what percentage of children in Ontario are exposed to forestry education. The Canadian Forestry Association in conjunction with the Ontario Forestry Association advocates the protection and wise use of Canada's forests, water and wildlife resources through public awareness and education programs. Includes links to classroom resources for teachers and Envirothon Canada information. Ontario is particularly involved in the Envirothon effort and operates, through its website, a Focus on Forests initiative, through which teachers at all levels, K-12, can obtain lesson plans focused on forestry topics. In Finland virtually 100% of children are exposed to forestry education. Forestry education is provided to children under the leadership of the Finnish Forest Association and the National Board of Education. Guidance is provided by a national steering committee. Forestry education takes the form of forest days for individual schools and classes, forest weeks for some schools, and visits to forests and forest products factories. In Sweden, over the past six years more than 50,000 upper secondary school pupils have been involved in the "Journey into the Future" project exploring changes in the forest sector.			
Are there public/private endeavors to publish forestry information via the web or written materials such as magazines? Especially targeting the public and/or private woodland owners?	In Ontario, in conjunction with the Eastern Ontario Model Forest, Domtar Inc. maintains the McKinnon Forestry Centre, just north of Cornwall. The Centre is designed to educate visitors about sustainable forest practices and to highlight the area's natural environment. Air time is extremely difficult to obtain in Sweden, but some private associations have had the most viewed TV show on Wildlife Management and connection matters. The most outreach and education is with in the Forest Service not necessarily to the public because it is hard to get air time or put things in the newspaper			

This report was prepared by

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This Dovetail Report is made possible through the generous support of the Blandin Foundation and its Vital Forests/Vital Communities Initiative. For more information, visit http://www.blandinfoundation.org/.

This report was created by and for the participants of the *Seeing the Forest AND the Trees* study tour with the assistance of Dovetail Partners, Inc.

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