

**CONSERVATION AND SUSTAINABLE DEVELOPMENT IN
THE INTERNATIONAL BOREAL FOREST: A
COMPARATIVE STUDY OF REGULATORY AND FISCAL
POLICY IN SCANDINAVIA, RUSSIA, AND ALASKA**

**A Background Report for the National Round Table on the
Environment and the Economy, Boreal Forest Program**

by

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EXECUTIVE SUMMARY

This report outlines fiscal and regulatory policies established by the governments of Norway, Finland, Sweden, Russia, the United States, and the state of Alaska to promote the conservation and sustainable development of the boreal forest, with the aim of pointing out best practices and providing guidance for the formulation of Canadian policy. To provide a context for these discussions, the report also discusses international conventions and protocols relevant to the conservation of the forest and provides some background information on the forest and its resources in each jurisdiction.

Although there are no international conventions that address conservation of the boreal forest per se, there are ten main international conventions that are relevant to the conservation and sustainable development of the boreal forest and its ecosystems. Four of these aim to protect species and natural sites of particular value (the Convention on Biological Diversity, the Ramsar Convention for the Protection of Wetlands, the World Heritage Convention, and the Convention on Trade in Endangered Species), while the rest aim to reduce the effects of pollution, calling for reductions in emissions of specific pollutants (the Framework Convention on Climate Change and the Kyoto Protocol, the Vienna Ozone Layer Convention and Montreal Protocol, the Stockholm Convention on Persistent Organic Pollutants, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, and the Geneva Convention on Long-Range Transboundary Air Pollution and its eight associated protocols). The three Scandinavian countries considered are party to all or almost all of these conventions and protocols, as is Canada, whereas the United States is party to just over and Russia, to just under half of them. Most of the conventions and protocols to which the United States and Russia are not party are those requiring reductions in emission of specific pollutants. These patterns may bear some reflection on the policies of the various jurisdictions in question.

The other main difference that affects the way in which conservation and sustainable development of the forest is regulated in the various jurisdictions considered is in land tenure systems. In the three Scandinavian countries considered, the majority of the forest is under the ownership of private landowners in the form of relatively small parcels of land. In keeping with this system of land tenure, much of the regulation of forest use is carried out by local authorities, who also provide guidance, training, and technological assistance to help local forestland owners manage their forests in a sustainable manner. These governments do regulate uses of the forestland and other activities that may affect the health of the forest, but they also rely heavily on financial incentives such as cost-sharing and subsidy programs to encourage conservation and sustainable development. On the other hand, Russia's forestland is all public, managed through heavy regulation. Russia's regulation of use of the forest and its resources and of other activities that may affect the health of the forest is characterized by the sale of licenses, permits, resource sales (such as timber sales), and leases, which should provide tight control of such activities. However, with the current economic crisis in Russia, this system is proving to be unwieldy and ineffective. In response, Russia is moving towards a system similar to the Scandinavian systems, even proposing to allow for the privatization of forestland. Finally, in Alaska, the system is somewhat intermediate: the land is split between private/native owners, the state, and the federal government. Although management of all forestlands and activities that may affect the forestlands is somewhat regulated, the extent of regulation varies depending on the ownership of

the land, from National Park land that is strictly protected for environmental reasons, to Bureau of Land Management and State of Alaska land that is heavily exploited for resource use with less regard for the environment.

There are also differences in the fiscal policies in place to regulate use of the forest and activities that may affect the forest. Although the Scandinavian countries have many financial incentive programs (cost-sharing programs, subsidies, etc.), in keeping with their participation in the various international conventions and protocols discussed above, they also impose heavy green tax loads on pollution. Following the Scandinavian model, Russia has also recently established a system of taxation for various chemical emissions, although it still offers no financial incentives like those available in Sweden. In the United States, although green taxes are imposed and various subsidy and cost-sharing programs are in place, there are also several systems of tradeable emissions permits (although only one is relevant to Alaska and the boreal forest).

Although it is beyond the scope of this study to fully assess the effectiveness of the various regulatory and fiscal policies in place in the jurisdictions discussed, several specific policies are noted as possible best practices. The first of these is the Forest Trust Fund Program in place in Norway, under which all forest owners must contribute a specific percentage of their profits to a personal trust fund set aside for future investment in their forestland. Use of these funds must be approved by local forest authorities, and these authorities split the interest from these trust funds with the regional and federal forest authorities to be reinvested into the forest at the local, regional, and national scales. The environmental damage insurance programs in place in Finland and Sweden and pending in Russia are also on the list of best practices. Under these programs, companies involved in activities that may result in damage to the environment are required to purchase environmental damage insurance. These programs make use of a market mechanism to reduce the risk of environmental damage and insure that funds are available to repair any damage caused. Finally, there are the heavy green tax loads imposed by the Scandinavian countries in particular, and the tradeable emissions programs in place in the United States. The former provide for a simple cost for emissions, and have been found to be effective in some cases. The latter make use of a market mechanism to reduce emissions, and have also met with some success in the United States.

Although any of the best practices described above except Norway's Forest Trust Fund Program might work in Canada, further analysis is necessary before serious policy recommendations can be made. In particular, Canada must be considered within its North American context, with the United States as its main trading partner. Imposing expensive measures such as heavy green tax loads may not place Scandinavian companies at a competitive disadvantage because they function within the European context, but similar programs might deal a heavy blow to Canadian companies. Although policies in place in other political jurisdictions of the boreal forest may inform policy decisions in Canada, it is obvious that any policies recommended must be tailored to Canadian specifications.

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1 INTRODUCTION

This report explores government policies that encourage conservation and sustainable development of the boreal forest in Norway, Finland, Sweden, Russia, and Alaska. The forest is considered to include the land, surface and groundwater, and flora and fauna that make up a forest ecosystem; the definition therefore includes inland waters, wetlands, bogs, fens, etc. and their flora and fauna, as well as actual forest.

To address the issue of how various governments encourage conservation and sustainable development, this report provides a general outline of the regulatory and fiscal policies regulating use of the forest and its resources, with a focus on the forestry industry. The report also explores more general environmental policies regulating other activities that may affect the health of the forest. These activities include the production and treatment of waste and other pollution that may affect the quality of the air or water. This including sulfur dioxide (SO₂) and nitrate (NO_x) emissions, which contribute to acid rain and therefore cause damage to the forest.

To provide a context for the various policies and to simplify comparison with the Canadian system, the report begins with a brief overview of relevant international conventions and protocols to which each country concerned is party. The report also provides some general information on the different jurisdictions and their forests. Most importantly, it provides details on forest ownership and land tenure systems in the different jurisdictions, but it also includes information on threatened and endangered species, on export industries, and on the main uses of the forest.

For each jurisdiction, the report also attempts to evaluate how well the system works in promoting conservation and sustainable development of the forest. This is a difficult task considering the limited

timeframe of this project; it would require much more time to truly evaluate the health of the forest ecosystem in each jurisdiction and to draw conclusions about what may or may not be the result of the policy decisions on the part of the different governments. However, in most cases, the report is at least able to examine trends in emissions that may reflect the effectiveness of policies designed to control them.

Finally, this report provides a section on best practices. Suggestions are given as to which best practices might work within the Canadian system; however, a far more detailed analysis of the effects of these practices and of the possibility of implementing them in Canada is necessary before serious policy recommendations can be made.

2 RELEVANT INTERNATIONAL CONVENTIONS AND PROTOCOLS

In many cases, international conventions and protocols guide policy decisions in their member countries. In other cases, they are a reflection of policy concerns that have already surfaced in participating countries. Either way, they provide a context within which to consider national policies, and hence provide insight into any comparative discussion of policy. This is as much the case for policies concerning the conservation and sustainable development of the boreal forest as for any other policies.

Although there are no international conventions on forests in general or on the boreal forest in particular, there are several international conventions and associated protocols that may affect the conservation and sustainable development of the boreal forest. These include the United Nations Framework Convention on Climate Change and the associated Kyoto Protocol, the Convention on Biological Diversity, the Ramsar Convention on Wetlands of

International Importance Especially as Waterfowl Habitat, the Convention for the Protection of the World Cultural and Natural Heritage (World Heritage Convention), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Ozone Layer Convention (Vienna Convention) and associated Montreal Protocol on Substances that Deplete the Ozone Layer and its four amendments (London, Copenhagen, Montreal, and Beijing), the Stockholm Convention on Persistent Organic Pollutants, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, and the Geneva Convention on Long-Range Transboundary Air Pollution and its eight protocols (see Table 1).

The United Nations Framework Convention on Climate Change aims to limit greenhouse gas emissions and thereby curb the effects of anthropogenic activities on climate change. The associated Kyoto Protocol sets specific goals to limit greenhouse gases; most industrialized parties are committed to reducing their emissions by 5% from 1990 levels by 2008 or 2012. Although the Convention does not refer specifically to forests, the associated Kyoto Protocol does note the importance of forests as carbon sinks. Specifically, the Protocol allows industrialized countries to offset their emissions targets by increasing their carbon sinks through such activities as afforestation and reforestation, while activities that deplete the forest (such as deforestation) may be subtracted from the amount emissions permitted. Article 2 of the Protocol states that industrialized countries must promote sustainable development, afforestation, and reforestation. Although all

the countries considered here are party to the Framework Convention, neither Russia nor the United States have ratified the binding Kyoto Protocol (Table 1).

The Convention on Biological Diversity aims to promote the conservation and sustainable use of biodiversity, including forest biodiversity. Several programs specific to forest biodiversity operate under this convention. The Work Program for Forest Biological Diversity focuses on research and technology necessary for the conservation and sustainable use of forest biodiversity. The Ad Hoc Technical Expert Group on Forest Biological Diversity provide advice on scientific research and development, reviews information on the status, trends and threats to forest biodiversity, and makes suggestions about how best to carry out the aims of the Convention with reference to forest biodiversity. Finally, the Global Environment Facility and the Global Taxonomy Initiative are also relevant to forests: the first funds biodiversity-related projects in the forest and elsewhere, and the second deals with taxonomical issues of forest and other species. The associated Cartagena Protocol on Biosafety controls the import of genetically modified organisms that might harm native ecosystems by providing support and information to its member states. All but the United States are party to the Convention, although only Norway and Sweden are party to the Protocol (Table 1).

The Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat aims to promote the conservation and “wise use” of wetlands. It protects a specific list of wetlands deemed to be “of international importance”. Criteria for this designation include the support of threatened or endangered species or communities, of species important for the maintenance of biodiversity in a specific

biogeographic region, of more than 20 000 waterbirds or more than 1% of the population of any waterbird species or subspecies, or of “a significant proportion of indigenous fish subspecies, species or families”, etc. All countries considered here are party to the Convention (Table 1), and they all have designated protected wetlands in the boreal forest except for the United States: the only designated wetland in Alaska is a coastal rather than a forest site.

The Convention for the Protection of the World Cultural and Natural Heritage (World Heritage Convention) provides for the protection of listed heritage sites, with the aim of maintaining the cultural and natural heritage of its members for future generations. Forestlands may be included under the category of natural sites. The latest revisions (1999) include specific reference to the protection of habitats of significant importance to biodiversity. Although all countries considered are party to the Convention (Table 1), there are forest sites only in Canada, Russia, and the United States, although not in Alaska.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) has as its goal the protection of certain endangered species from overexploitation through international trade. Under the Convention, species are listed in one of three appendices, indicating different levels of protection. There are many forest species on these lists. All the countries considered here are party to the Convention except for Russia (Table 1).

The Ozone Layer Convention (Vienna Convention) and its associated Montreal Protocol aim to reduce the production and consumption of ozone-depleting chemicals (chlorofluorocarbons and halons). This Convention and the associated Protocol are relevant to the conservation of boreal forest ecosystems in that several components of these ecosystems have been found to be

negatively affected by increasing levels of UV that may result from ongoing depletion of the ozone layer (e.g., Xenopoulos and Frost 2003, Corn and Muths 2002). Although the Convention is just a framework agreement to work together to reduce the production and consumption of ozone-depleting chemicals, the Montreal Protocol provides detailed standards with the eventual goal of eliminating use of these chemicals. The London (1990), Copenhagen (1992), and Beijing (1999) Amendments expanded the list of regulated substances, while the Montreal Amendment (1997) brought in a licensing system to control trade of regulated chemicals. Most of the countries considered are party to the Convention and all its amendments (Table 1); Russia, not being party to the last three amendments, is not bound by any part of the Convention or the Protocol.

The Stockholm Convention on Persistent Organic Pollutants, Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, and the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade all deal with the management of hazardous wastes. This is relevant to the boreal forest in that such waste may be harmful to its ecosystems, as it may to any other ecosystems. The Stockholm Convention aims to reduce or eliminate the production and use of persistent organic pollutants such as DDT. The Basel Convention focuses on minimizing movement of hazardous waste across international borders (especially from developed to underdeveloped countries to be dumped) and on reducing the generation of such waste. The Rotterdam Convention requires those who export specific hazardous materials to obtain the prior informed consent of importers. This Convention provides support for potential

Table 1. International conventions and associated protocols that may affect management of the boreal forest, and the status of Norway, Finland, Sweden, Russia, the United States, and Canada with respect to these agreements. Notation is as follows: P = party to the convention/protocol (through ratification, acceptance, approval, or accession), S = signatory but not party to, O = observer but not party to, N = not involved.

Convention	Year Adopted	Year it Entered into Force	Norway	Finland	Sweden	Russia	U.S.A.	Canada
Climate Change Convention • Kyoto Protocol	1992 1992	1994 2004 (Feb)	P P	P P	P P	P S	P S	P P
Convention on Biological Diversity • Cartagena Protocol on Biosafety	1992 2000	1993 2003	P P	P S	P P	P N	N N	P S
Ramsar Convention on Wetlands	1971	1975	P	P	P	P	P	P
World Heritage Convention	1972	1975	P	P	P	P	P	P
Convention on International Trade in Endangered Species (CITES)	1973	1975	P	P	P	N	P	P
Ozone Layer Convention (Vienna Convention) • Montreal Protocol ▪ London Amendment ▪ Copenhagen Amendment ▪ Montreal Amendment ▪ Beijing Amendment	1985 1987 1990 1992 1997 1999	1988 1989 1992 1994 1999 2002	P P P P P P	P P P P P P	P P P P P P	P P P N N N	P P P P P P	P P P P P P
Stockholm Convention on Persistent Organic Pollutants	2001	2004 (May)	P	P	P	S	S	P
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	1989	1992	P	P	P	P	S	P
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	1998	2004 (Feb)	P	S	P	N	S	P

Geneva Convention on Long-Range Transboundary Air Pollution	1979	1983	P	P	P	P	P	P
• Protocol on Long-term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe	1984	1988	P	P	P	P	P	P
• Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at least 30 per cent	1985	1987	P	P	P	P	N	P
• Protocol concerning the Control of Nitrogen Oxides or their Transboundary Fluxes	1988	1991	P	P	P	P	P	P
• Protocol concerning the Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes	1991	1997	P	P	P	N	S	S
• Protocol on Further Reduction of Sulphur Emissions		1998	P	P	P	S	N	
• Protocol on Heavy Metals	1994							P
• Protocol on Persistent Organic Pollutants		2003	P	P	P	N	P	
• Protocol to Abate Acidification, Eutrophication and Ground-level Ozone	1998	2003	P	P	P	N	S	P
	1998	Unknown*	P	P	P	N	S	P
	1999							S

* The Protocol to Abate Acidification, Eutrophication and Ground-level Ozone will come into force after the 16th member has become a party through ratification, acceptance, approval, or accession.

importers so that they can make informed decisions, and technical assistance in the handling of these imports. These hazardous waste conventions are not as generally accepted: the United States is a signatory but not a party to either of the three, Russia is only party to the Basel Convention, and Finland is not party to the Rotterdam Convention (Table 1).

Finally, the Geneva Convention on Long-Range Transboundary Air Pollution (1979) and its eight associated protocols aim to reduce emissions of specific air pollutants, many of which damage the forest directly or play a role in causing acid rain, acidification, and eutrophication. For example, emissions of sulfur dioxide and nitrates are limited by the Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at least 30 % (1985), the Protocol concerning the Control of Nitrogen Oxides or their Transboundary Fluxes (1988), the Protocol on Further Reduction of Sulphur Emissions (1994), and the Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (1999). Goals are set to reduce emissions of volatile organic compounds by the Protocol concerning the Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes (1991) and the Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (1999), while specific goals to reduce emissions of heavy metals are set by the Protocol on Heavy Metals (1998) and to reduce emissions of persistent organic pollutants, by the Protocol on Persistent Organic Pollutants (1998). Finally, the Protocol on Long-term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (1984) sets up a monitoring program for European emissions of the pollutants covered by the Convention. The Scandinavian countries are party to the

Convention and all its protocols, but Russia, the United States, and Canada, although all party to the Convention, are not party to all its associated protocols (Table 1).

There is a pattern to the participation of the various countries considered in the international agreements discussed above. In general, the Scandinavian countries are party to all of the protocols and conventions discussed: only Finland has failed to become party to two of the more recent agreements (the Rotterdam Convention and the Cartagena Protocol), although it has signed these agreements (Table 1). Canada is also party to most of the agreements, leaving only three at the signatory stage (Table 1.) Russia and the United States have worse records of participation: Russia is party to just under half the agreements and has not even signed many of them, and the United States is party to just over half, although it has signed more. Conventions and protocols to which these two countries are not party tend to be those requiring reduction in emissions of specific pollutants (Table 1).

3 NORWAY

3.1 The Norwegian Forest In General

In Norway, 39% of the land area is covered by boreal forest, and about 59% of this (24% of the land area) is productive forest (Norwegian Ministry of Agriculture 2003). About 2% of the forest is protected (Norwegian Ministry of the Environment 1998). The vast majority of the forest is privately owned by small landowners (Fig. 1). There are approximately 125 000 properties, with an average size of 50 ha each (The Living Forests Program 1999a). There are about 900 rare or endangered forest species in the country and, although forest area is increasing, the area of forest allowed to grow without human intervention is declining (Statistics Norway 2003a): virgin forest accounts for less than 0.5% of

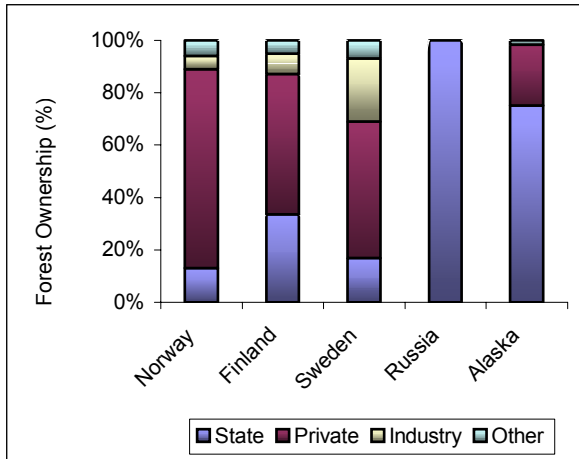


Figure 1. Forest ownership for the various jurisdictions discussed. Sources are as follows: Norway: Øistad 2001; Finland: Sevola 2003; Sweden: Swedish Forest Industries Federation 2003; Russia: Ministry of Natural Resources of the Russian Federation 2002; Alaska: Forest Health Protection, Alaska Region 2004.

the forested area (Norwegian Ministry of the Environment 1998). Norway also has important inland freshwater resources and oil and gas resources (Norwegian Ministry of the Environment 1998), the use of which may affect the forest. Norway's largest exports result from the oil and gas industry, the fisheries (largely coastal and anadromous salmonids), and forestry, in decreasing order (Norwegian Ministry of Agriculture 1998).

3.2 Uses of the Norwegian Forest

Norway's boreal forest is managed for multiple uses. It is most affected by the forestry industry, but may also be affected by extraction of oil and gas, generation of hydroelectricity, recreational activities, hunting and fishing, development such as road-building and urban expansion, and agriculture.

3.3 Norwegian Regulation of Forest Use and Activities Affecting the Forest

3.3.1 Regulatory Policy

Although private property rights are enshrined in the Constitution of Norway (1814) and most of Norway's forestland is under private ownership, the government

does maintain a fair amount of control over activities that may affect the boreal forest. Industrial use of forestland is regulated by the Forest and Forest Protection Act (1965, amended most recently in 1997), the Land Act (1995), the Planning and Building Act (1985, amended in 1990), and all their associated regulations. Recreational use of forestland is regulated by the Outdoor Recreation Act (1957) and the Act Relating to Motor Traffic on Uncultivated Land and in Watercourses (1977). Protection of wildlife and their habitat is legislated under the Nature Conservation Act (1970) (which also provides for protection of landscapes, etc.), the Wildlife Act (1981), the Act Relating to Salmonids and Freshwater Fish (1992), and all their associated regulations. The forest may also be affected by the Pollution Control Act (1981, amended in 1996), Act of Allodial Rights (1974), and the Concession Act (1975).

In keeping with the Kyoto Protocol, the Forest and Forest Protection Act (1965, amended in 1997) has as its main goal to promote production, afforestation, and protection of the forest. It requires that forest owners keep their forestland productive and empowers the forest authorities (municipal and county authorities as well as the Ministry of Agriculture) to take measures to ensure that this is so. Under this Act, the Ministry and other forest authorities may regulate road building, application of fertilizers and pesticides that may damage the forest, harvesting on areas of recreational or natural value, harvesting and establishment of "protection areas" (forest land that protects against landslide, avalanche, flood, etc.), and harvesting "for regeneration purposes". They may demand prior notification of harvesting activities in some cases, and they may even require that forest management plans be produced for private forestland. Although long-term forest management plans are prepared by

private forest owners' associations, this Act allows for data to be gathered for long-term forest management planning even for areas for which the owner does not plan to purchase such a plan, allowing for such plans to consider specific parcels of land within the broader landscape context. This Act also regulates the Forest Trust Fund program, as described in section 3.3.3.2 below.

The Forest and Forest Protection Act is complemented by the Land Act (1995), which states that land resource management must be "environmentally sound", as judged by the Ministry of Agriculture. It places value on soil conservation and multiple uses of the land "with a view to the needs of future generations". This Act still favours production, empowering the Ministry with the right to order that agricultural land be cultivated or leased out for cultivation, but it also gives the Ministry the right to expropriate private land in extreme cases of environmental mismanagement and the responsibility to approve all divisions of parcels of land, allowing the government to control against fragmentation of land ownership.

The Planning and Building Act (1985, amended in 1990) also gives the government some control over activities that occur on forestland. This Act has as its goal to coordinate development and land use planning processes concerning resource protection and development, incorporating principles of integrated resource management. The Act requires long-term and short-term land use planning at the national, county, municipal, and local levels, specifying that these must consider the protection of the land, multiple uses, including development, natural resource management, and the establishment of "nature areas" (including conservation areas) and areas for recreation. Land use plans are open to public scrutiny. Under this

Act, the Ministry of the Environment may require that detailed environmental impact assessments be carried out prior to development, and these also are subject to public scrutiny. This Act also protects forestland from development for nonforest uses.

Recreational uses of the land apart from hunting and fishing are largely regulated by the Outdoor Recreation Act (1957), which provides for public access to uncultivated private lands, including all forestland except young plantations. This Act prohibits all activities that may cause damage to the land, and the pursuant Act Relating to Motor Traffic on Uncultivated Land and in Watercourses (1977) prohibits the use of motor vehicles on uncultivated land in most cases. These measures may allow for recreation on forestland while limiting damage, although landowners are entitled to use motor vehicles on their own land and exemptions to the general restrictions on motor traffic may be granted (93% of applications for exemption were granted in 2002, for example (Statistics Norway 2003a)).

The Nature Conservation Act (1970, amended most recently in 1995) requires that conservation be considered in the management of natural resources. This Act gives the government the right to veto development projects that might harm the environment, or to require that scientific studies be carried out before a decision can be made about the project. National Parks are hereby protected from development, as are protected landscapes and nature reserves. Under this Act, species and plant communities of concern may be protected, as well as their habitat, and landowners may be compensated for loss of revenue due to protective measures. Thus, this Act provides for the protection of rare, threatened, and endangered species and their habitats

without engendering high costs to the landowners.

In keeping with the Convention on Biological Diversity, rare, threatened, and endangered species and their habitats may also be protected under the Wildlife Act (1981), which has as its goal the preservation of “the productivity of nature” and species diversity. Under this Act, all wildlife is protected unless otherwise specified, and this must be considered in the development of all land use plans under the Planning and Building Act (1985, amended in 1990). The Act legislates for government control of all hunting and trapping through regulations and licensing, except when human life is in danger, although it does state that regulations may allow wildlife to be killed in the case of damage to crops or to cattle or domestic reindeer. License fees are put into a national Wildlife Fund, which promotes wildlife management. The Act also prohibits the introduction of alien species without special permission from the Directorate for Nature Management.

The inland aquatic equivalent of the Wildlife Act is the Act Relating to Salmonids and Freshwater Fish (1992), which may also regulate for the protection of other freshwater organisms. This Act requires that these organisms and their habitat be considered in all planning activities (as legislated by the Planning and Building Act) and gives the government the right to veto projects that may adversely affect them, or to limit fishing or other exploitation in specific cases. It gives landowners exclusive rights to fish on their own land (barring specific protective regulations), but it also empowers the government to require those with fishing rights to draw up joint management plans for watercourses. All those who fish must contribute to the national Fishing Fund, which is administered by the Ministry of the Environment.

The Pollution Control Act (1981, amended in 1996) aims to reduce pollution and waste (including solids, liquids, noise, and light). It specifies that measures for pollution control and efficient waste management must be included in land-use planning, and that the polluters are responsible for the cost of such management. This does not include standard levels of pollution from forestry, agriculture, etc. Exemptions may be granted, but applicants may be required to carry out a thorough environmental impact assessment, which is subject to public scrutiny. The Act regulates the operations of wastewater treatment plants, prohibits littering, and gives the Ministry of the Environment the power to shut down operations they deem to be overly polluting, to require recycling, and to carry out inspections.

Finally, the Norwegian government regulates the sale of forestland. The Act of Allodial Rights (1974) encourages families to pass down lands rather than selling them outside the family, allowing the transfer of land within families at rates below market values and requiring that new owners within the family live on the land and keep it productive for at least 5 years. The Concession Act (1975) makes the same residency requirement for new owners outside of the family. These laws may encourage owners to take care of the land for future generations and to keep the land productive.

3.3.2 Fiscal Policy

3.3.2.1 Levies

The Norwegian government has levied several taxes on industrial pollution of the environment. The Pollution Control Act (1981, most recently amended in 1996) provides the regulative means by which a tax is collected on final industrial waste, with lower taxes on incinerated waste than on waste dumped in landfills. In keeping with the various international conventions

and protocols on reduction of pollution, the Norwegian government also levies taxes on sulfur (SO₂) emissions, diesel and petrol, unleaded gas, use of electricity, use of coal and coke, aviation fuel, vehicle use, non-refillable beverage containers, chlorinated solvents, lubricant oils, and pesticides (Norwegian Ministry of Finance 2004). These green taxes have been offset by reductions in income taxes and increased support for renewable energy sources and energy saving investments (Organization for Economic Cooperation and Development 2001).

3.3.2.2 Financial Incentives

Conservation and sustainable development of the forest are financially encouraged by the Forest Trust Fund and various cost-sharing programs and grants financed by the state budget. The Forest Trust Fund is legislated for under the Forest and Forest Protection Act (1965, amended in 1997). Under this program, all landowners must pay 8-25% of their annual profit from the forest into this fund. Each landowner can decide the amount, but must have special permission if it is less than 8%. This money is deposited into a trust fund for the owner at a local bank. The Forestry Department of the Ministry of Agriculture is then responsible for managing and authorizing the use of these funds. They may be used for forest management for environmental purposes, planning and building of forest roads, forest management in environmentally critical areas, forest management planning, and education and training. The interest from these funds is distributed among the Department, forest owners associations, and county- and municipal-level public forest agencies. The Department uses its part to fund programs that encourage sustainable forest management, including direct education and funding for educational institutions such as the Forest Extension Service Institute. Counties and

municipalities use their part to benefit forestry in the area in general (educational programs, etc.). Contributions to the trust funds are tax deductible, and a percentage is also tax deductible when funds are withdrawn for use (Øistad 2001). Since these trust funds are transferred with the land rather than with individual landowners, they represent a true investment in the future of each parcel of privately owned forest.

Similarly, cost-sharing programs and public grants focus on long-term investments rather than on short-term projects. They may be granted for road construction, but also for long-term forest management planning, investment in environmentally important landscapes, and silvicultural activities such as reforestation. Forest management plans prepared with state assistance are binding and must consider biodiversity, regeneration, and multiple land uses such as recreation, protection of wildlife habitat, etc. (The Living Forests Program 1999b). In 1999, state grants provided 36% of the funding for silvicultural activities on private lands, with money from the Forest Trust Fund paying for another 42% (Øistad 2001).

There are also state grants for sustainable production and consumption, and for use of renewable energy. The grants for sustainable production and consumption may cover up to 50% of the costs small and medium-sized enterprises put into innovations, and the renewable energy grants pay up to 60% of the costs for such enterprises to switch to use of renewable energy. Until 2000, there were also state grants and loans granted for innovations in environmental technology, which paid 35-40% of costs to support cleaner production methods for small and medium-sized enterprises (Clement and Hansen 2003).

3.4 Effectiveness of Norway's Policies

It is unclear whether the various green taxes and regulations have been

effective in reducing pollution in Norway. Sulfur emissions declined significantly between 1990 and 2001 (Fig. 2), but Statistics Norway (2004a) attributes this to a slow-down in the production of iron, steel, and ferroalloys rather than to the tax on SO₂ emissions.

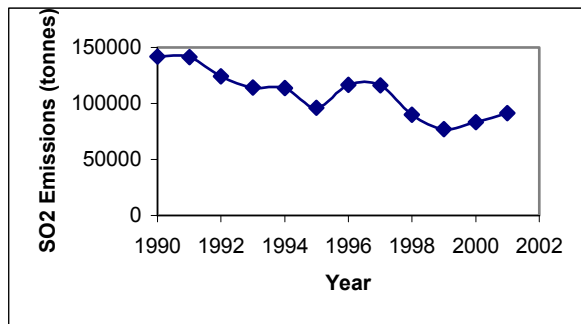


Figure 2. Norwegian sulfur emissions, 1991-2002. Source: Statistics Norway 2004a.

Statistics Norway also notes that, in 2001, a significant amount (43%) of waste from construction and demolition was unaccounted for; much of this waste may have been disposed of illegally (Statistics Norway 2002), thus avoiding the waste taxes. Regulation of wastewater treatment also does not seem to be very effective: according to Statistics Norway, in 2002, only 55% of the water from in Norway's wastewater plants was treated in accordance with all the regulations (Statistics Norway 2003b). In terms of energy use, only the use of petroleum products has declined since the 1970's (Statistics Norway 2003c).

However, the statistics do indicate that government subsidies encourage reforestation activities on private land. According to Statistics Norway (2004b), fluctuations in expenditures on such activities on private land are tightly linked to fluctuations in subsidies (Fig. 3).

4 FINLAND

4.1 The Finnish Forest in General

Approximately 75% (23 million hectares) of Finland's land area is covered

by forest, 11% (2.5 million hectares) of which is protected and another 5% of which is subject to limited use (Sevola 2003). This forest is almost exclusively boreal (Sevola 2003), is home to about 700 endangered

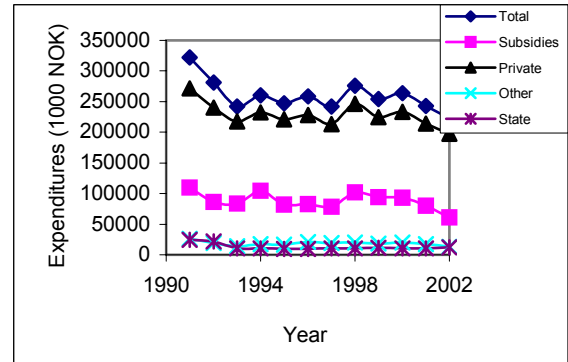


Figure 3. Expenditures on forest regeneration, afforestation, and forest drainage, 1991-2002. Source: Statistics Norway 2004b.

species, and is increasing in area (Kangas et al. 1997).

The Finnish forests, like their Norwegian counterparts, are largely privately owned (Fig. 1). There are 450 000 forest owners (Kangas et al. 1997); about 320 000 of these are private individuals (Sevola 2003), with an average forest area of 26 ha each (Mikkela et al. 2001). The vast majority of forestry practices are carried out on private land: in 2002, over 86% of the roundwood harvested came out of privately owned forests, just over 5% from industry-owned forests, and less than 8% from state-owned forests (percentages calculated based on Sevola 2003). Finland's public forests are managed by the Forest and Park Service, which functions under the Ministry of Environment and the Ministry of Agriculture and Forestry.

Finland's main export markets are Germany, the U.K., the U.S., Switzerland, the Netherlands, and other Nordic countries (Kangas et al. 1997). Forest products are mainly exported to Europe (~65%) (Sevola 2003). In 2000, forest products account for 21.7 % of Finland's exports, only exceeded by exports from the metal industry (49.7 %).

The chemical industry came in third with 10.7 % of exports (Statistics Finland 2004).

4.2 Uses of the Finnish Forest

Uses of the forest include forestry, berry and mushroom picking, collection of lichen, hunting (Sevola 2003), and recreation (Mikkela et al. 2001).

4.3 Finnish Regulation of Forest Use and Activities Affecting the Forest

4.3.1 Regulatory Policy

As in Norway, although much of the Finland's forest is privately owned, most legislation of forest use applies to private as well as public forest. The main regulatory laws on forest use are the Forest Act (1996), the Act on Forest Management Associations (1999), the Forest and Parks Services Act (1993), and the Forest Insect and Fungi Damage Prevention Act (1991). Other legislation that affects the forest includes the Act on Environmental Impact Assessment Procedure (1994), the Nature Conservation Act (1996), the Environmental Protection Act (2000), and the Land Use and Building Act (1999).

The Forest Act (1996) stresses sustainable use of the forest from an ecological and economic perspective, and places the responsibility for making sure that the forest is managed in a sustainable way on the regional forestry centers (as also set forth in the 1995 Act on Forest Centers and the Forestry Development Center Tapio). It requires that regional forestry centers produce and implement forest programs for their jurisdictions, setting overall targets for sustainable forest management with consideration for multiple uses of the forest. In keeping with the Convention on Biological Diversity, under this Act, biotopes of conservation importance must be conserved; these include riparian areas, sandy soils, wetlands with sparse stands, flood meadows, etc. The Act legislates for the classification of protection forests, which are deemed crucial to prevent the retreat of

the timberline. Specific forest management plans must be approved by the regional forestry centers before felling can be carried out on these forestlands. Regardless of classification, all landowners are responsible for ensuring regeneration and forest health on their land. They must inform the local forestry centers of their intention to harvest the forest 14 days to 2 years before such activities begin. These forest use declarations must include details on how the activity will be carried out, including details on felling and regeneration methods in the case of forest harvesting so that the forestry centers may judge whether or not planned activities are in keeping with the regulations and legislation. If the forestry centers are in doubt, they can carry out inspections and prohibit activities indefinitely. Those found to be in noncompliance with the laws and regulations can be fined and are held responsible for remedying the damage caused to the forest.

The Act on Forest Management Associations (1999) set up the system of local associations to provide support to small landowners. Finland's 206 Forest Management Associations provide forest owners with advice on forest management, forest taxation, and biodiversity conservation. In conjunction with the regional forestry centers set up according to the Forest Act (1996) and the Act on Forest Centers and the Forestry Development Center Tapio (1995), they draw up long-term forest management plans at low cost for local landowners and provide training and assistance in implementing these plans (Nordic Council of Ministers 1999).

The Forest and Parks Services Act (1993) set up the Forest and Park Service (Metsähallitus) as the instrument responsible for managing the state forests in a sustainable manner. For logging on state-owned land, Metsähallitus has a three-level

planning process that includes sustainable use and conservation as main goals. The process includes regional natural resource management plans, which cover 10 years and are revised every 5 years, landscape ecological plans, which vary in the period of time they cover but are also updated every 5 years, and operational plans. The regional and landscape ecological plans provide large-scale goals and objectives for land use and management, considering multiple uses. These planning processes involve extensive consultation with the public and other stakeholders such as environmental groups and local government authorities. The landscape ecological plans aim to protect natural areas, important habitats, threatened species, and ecological values while addressing economic and social objectives. The operational plans provide stand-level information on the blocks to be cut and the harvest and silvicultural methods to be used, with a particular focus on reforestation (Metsähallitus 2000).

Several shorter legislative acts provide for state regulation of specific activities on private as well as public land. For example, the Forest Insect and Fungi Damage Prevention Act (1991), lays out measures that must be taken by landowners to protect their wood from insect and fungal damage. The Act on Environmental Impact Assessment Procedure (1994) specifies that all peat-production areas of over 150 hectares; unfragmented forest, marsh-land or wetland areas greater than 200 hectares where ditching or drainage would cause permanent damage; permanent removal of tree cover; regeneration of forests with introduced species; and mining concessions are subject to environmental impact assessments on private as well as public land.

Legislation that is not exclusive to the forest but may have an effect on the health and management of the forest

includes the Nature Conservation Act (1996). Like the Forest Act, the Nature Conservation Act stresses sustainable use of natural resources and the environment. Although most of the Nature Conservation Act is not applicable to the forest, it does protect wild woods rich in broad-leaved deciduous species, hazel woods, common alder woods, and juniper meadows. Under this Act, landscape conservation areas may be set up to preserve and manage landscapes of value. The Act protects all wildlife, unless otherwise regulated, and regulates against the release of non-native species. It provides for the protection of threatened endangered species (listed in the Nature Conservation Decree of 1997) and their habitat, but specifies that this protection shall not “preclude the use of land for farming, forestry and development”, although steps must be taken to try to avoid causing damage to said species or habitats. On the other hand, species protected by the European Union must be protected at all cost, unless special derogations are granted. Landowners may be entitled to state compensation for losses due to imposed protective measures.

The Environmental Protection Act (2000) has among its objectives the reduction of pollution, the sustainable use of natural resources, and the promotion of sustainable development. It applies to all production of pollution and waste. In keeping with the “polluter pays” principle, it places the responsibility for avoiding, reducing, and cleaning up pollution squarely on the shoulders of the polluters. It specifically prohibits pollution of the soil, groundwater, and waterways. It empowers the government to regulate norms for acceptable levels of pollution and to require the use of technology designed to reduce said pollution, and requires the authorities to carry out inspections, thereby allowing the government to set standards in keeping with

the international agreements on pollution. The Act also sets up a system of permits for all activities that may cause pollution of the environment, whereby potential polluters are required to demonstrate that they will take specific measures to prevent or reduce pollution in their activities. Industries included under this permit requirement include all forest product processing plants, industries involving metalworks, oil and gas, energy generation, and chemicals oil, large harbour projects, motorways, and major hazardous waste disposal facilities (Environmental Protection Decree 2000). Applications for permits are subject to the scrutiny of the public and other interested parties.

Under the Land Use and Building Act (1999) and the accompanying Land Use and Building Decree (1999), land use plans must be developed at all administrative levels. National land use objectives must be drawn up for matters that may have a significant impact on the environment, among other things. In keeping with these objectives, regional development programs must then be developed by the regional authorities. These must pay special attention to the ecologically sustainability of land use, environmentally and economically sustainable arrangement of transport and technical services, and sustainable use of water and extractable land resources. Finally, local master and local detailed plans indicate general principles of land use and area-specific plans at the municipal level. Master plans must consider environmentally sustainable organization of transport, energy, water supply and drainage, and energy and waste management, reduction of environmental hazards, and protection of the landscape and natural environment. All plans are subject to public consultation processes.

Finally, as in other Scandinavian countries, the public has access to all land

for recreational purposes and to collect berries, mushrooms, etc. for personal consumption, provided they cause no damage (Everyman's right, as described in Mikkela et al. 2001). In Finland, only the permission of the owner is required to use motor vehicles on private land.

4.3.2 Fiscal Policy

4.3.2.1 Levies

In general, environmental damage in Finland is taxable. Several laws are in place to discourage damage to the environment. The Act on Compensation for Environmental Damage (1994) specifies that compensatory fees shall be paid by those responsible for soil, air, water, noise, vibration, light, heat, or smell pollution and "other similar nuisance". If it is obvious ahead of time that some activity will cause environmental damage, compensation can be demanded in advance, as a lump sum or as an annual payment. To help cover the costs of such compensation in case the offending party cannot, under the Environmental Damage Insurance Act (1998), all corporations whose operations risk damaging the environment must pay into environmental insurance policies. Insurance cannot be used to cover advance compensation fees, as described above. These environmental insurance policies must be provided by private insurance companies. Since private insurance companies must make a profit like any other business, and are therefore likely to insure high-risk operations only at very high premiums, this law is designed to provide a further impetus for corporations to act responsibly as regards the environment.

Several green taxes have been levied to reduce energy use and pollution. The Waste Tax Act (1987) and the Waste Oil Charge Act (1986) provide for taxes and charges to be levied for waste, as well as taxes on energy use, water protection, and pesticide use (Sevola 2003, Statistics

Finland 2003, Anderson et al. 2000). The green tax reform of the early 1990s also brought in taxes on beverage containers (lower for containers that are recyclable or part of a return program), lubricant oils, SO₂ emissions (specifically, a tax on fuels with high sulfur content), and the use of coal and coke. These taxes have been offset by cuts in taxes on labour (Organization for Economic Cooperation and Development 2001).

4.3.2.2 *Financial Incentives*

Under the Act on Financing of Sustainable Forest Management (1997), the state provides non-taxable financial support for activities that promote sustainable forest management on private forestland. Measures that promote sustainable forest management must ensure a sustainable timber supply, maintain biodiversity, and undertake forest ecosystem management. Applicants for financial aid must draw up valid multi-year forest management plans, the details of which are specified in the associated regulations. Specific activities eligible for financial aid include forest regeneration, prescribed burning, tending of a young forest, harvesting of energy wood, forest remedial fertilization, renovation ditching, construction of forest roads, activities carried out to conserve biodiversity, restoration of important habitats, and production of valid forest management plans. All loans and aid are administered by the regional forestry centres, which are also responsible for making sure that the funds are used appropriately.

There are also state grants and loans to encourage small and medium-sized businesses to promote and function in keeping with environmentally sound values. Up to 50% of the cost of efficient energy use may be paid by state energy conservation grants, and 50 to 100% of the cost of various environmental protection measures may be covered by environmental protection grants

(Clement and Hansen 2003). Low-interest loans may be granted to cover a portion of the costs of companies engaging in environmental protection activities (Clement and Hansen 2003).

Finally, there are tax breaks for the use of alternative sources of electricity. Specifically, the government refunds the costs of producing electricity from wind, wood, or waste gas from metallurgical processing (Organization for Economic Cooperation and Development 2001).

4.4 **Effectiveness of Finland's Policies**

As in the other jurisdictions considered, it is difficult to tell whether or not all the regulations in place in Finland actually result in the sustainable use and protection of the boreal forest. Forest cover is increasing (Statistics Finland 2002, Kangas et al. 1997), which may be an indication that at least the regulations about replanting are effective. However, the policies of the Finnish government have been criticized for their lack of protection of old growth forests (Finnish Nature League 2002), and this is supported by the statistics indicating a substantial decline in the percentage of forestland covered by old-growth since the 1920s (Statistics Finland 2002). It is unclear whether pesticide taxes work to reduce pesticide use: a reduction in pesticide use noted between 1990 and 1997 (Statistics Finland 1998) is likely due to the development of more powerful pesticides that require that lower doses be used rather than to pesticide taxes (Organization for Economic Cooperation and Development 1996). In keeping with several of the protocols associated with the Geneva Conventions, sulfur emissions declined by about 81 thousand tons between 1990 and 1995 (World Resources Institute 2003), but it is unclear whether this was in response to sulfur taxes. Furthermore, the incentive programs described above have been criticized for the lack of effective evaluation

of how well they work (Clement and Hansen 2003). In 2001, of the EUR 188 million spent on “silvicultural and forest improvement” on private forestland (road construction and maintenance, fertilization, soil preparation, replanting, etc.), 31% million came from state grants (Sevola 2003), slightly less than the 36% or financed through state grants in Norway (Øistad 2001).

5 SWEDEN

5.1 The Swedish Forest in General

In Sweden, 62% of the country (280 000 km²) is covered with forest, and the vast majority of this is boreal. As in Finland and Norway, most of Sweden’s forest is not state-owned: more than half of the forest is owned by 350 000 private landowners (Swedish Forest Industries Federation 2003, Sweden’s National Report under the Convention on Biological Diversity 1997) (Fig. 1). The private forest-owners of Sweden produce 61% of the total harvest volume (van Kooten et al. 1999). There are about 1950 rare or endangered forest species in the country (Sweden’s National Report under the Convention on Biological Diversity 1997) and, although forest area is increasing (Swedish National Board of Forestry 2002), there is very little virgin forest (Sweden’s National Report under the Convention on Biological Diversity 1997). Forest products accounted for 13.4 % of exports in 2003, second only to machinery and transport equipment (>50 %) and followed closely by chemicals and rubber products (12.8%) (Statistics Sweden 2004a). The main export markets for Swedish forest products are the U.K. and Germany, followed by Denmark, the Netherlands, and Norway (Swedish Ministry of Industry 2000).

5.2 Uses of the Swedish Forest

The main uses of Sweden’s forest are forestry, recreation, hunting and fishing, and

reindeer husbandry. However, Sweden also produces hydroelectricity, which may affect the forest. Agricultural practices may also affect the forest, as may mining practices.

5.3 Swedish Regulation of Forest Use and Activities Affecting the Forest

5.3.1 Regulatory Policy

As in Norway, the Swedish Constitution (1991) protects private property rights, entitling landowners to compensation if they cannot exploit their land in the most profitable way because of government regulation. However, there are still a large number of regulations for land use and other activities that may affect the forest. The main pieces of legislation are the Forestry Act (1993) and the Environmental Code (1998).

The Forestry Act (1993) requires that the forest be managed in an economically sustainable way, but that biodiversity also be protected. It applies to both publicly- and privately-owned forest. Under this Act, landowners are responsible for assuring the regeneration of cleared stands, but the government may regulate methods used to do so, as well as measures that must be taken to avoid insect outbreak. The government may also regulate the size and shape of felling areas, tree retention levels, etc. Furthermore, the government can regulate felling on large forest holdings to ensure a reasonable distribution of stands of different ages. Thus, landowners must consult the local County Forest Board before felling begins. They must also inform the Board of any drainage works to be carried out, and must detail environmental conservation and regeneration measures to be taken in conjunction with felling operations. The Act empowers the government to designate protected forestland (required to prevent erosion or the lowering of the tree line), and felling on these protected lands must be specially approved by the local County Forest Board.

Special permission must also be granted for felling of valuable broadleaved forest. Landowners may be subject to financial compensation for the loss of harvesting rights for such forestlands.

In 1998, the Environmental Code was passed to streamline the system of environmental legislation. This Code replaces 15 laws addressing issues from natural resource management, species protection, environmental protection, and water quality to the use of pesticides and chemical products (Swedish Environmental Protection Agency 2003a). Its main objective is to promote sustainable development. In general, it stipulates that the most environmentally sound technology possible must be used at all times, and it follows the “polluter pays” principle. The Code sets up a system of environmental courts to deal with environmental issues. Under the Code, the authorities retain the right to inspect activities and facilities to ensure compliance. Acts of noncompliance with the Code may be subject to fines or imprisonment.

In the sections on land and water use, the Environmental Code places particular emphasis on the protection of land and water that is not greatly affected by development. It protects a specific list of rivers and sections of rivers from hydroelectric development. It empowers the government to set up national parks and nature reserves, habitat protection areas, wildlife and plant sanctuaries, special protection areas, etc. These may include private land and are to be set up to preserve important species, habitats, and biodiversity in general. The government may also set up water protection areas to protect catchments. Furthermore, it may prohibit the killing of certain animal species and the collection or damage of plant species deemed to be in danger of extinction, and it may limit the release of non-native species and genetically modified

organisms. Landowners may be eligible for government compensation if these regulations interfere with their livelihood.

Under the Code, activities that threaten to damage the environment are subject to environmental impact assessments and permit procedures. These activities include iron and steel works, metallurgical works and ferro-alloy plants, pulp plants and paper mills, crude oil refineries or heavy petrochemical plants, plants for the manufacture of basic chemicals or fertilizers, cement plants, certain nuclear installations, combustion plants with an input power of at least 200 megawatts, large wind farms, certain facilities for the storage of natural gas, certain facilities for the treatment of hazardous waste, most hydroelectric power plants, certain water operations (damming, diversion, etc.), the construction of platforms for offshore oil or gas extraction and of anchorages or moorings for such platforms, etc. Approval must also be granted by the government for importing pesticides from non-EU countries, and pesticides must not be spread from aircraft or in any other way that would lead to their being spread over forestland. These impact assessments must be financed by the applicant and submitted to stakeholders before application for permission to carry out said activity. They must fully describe the activity, its potential impact, and any measures to be taken to limit the impact. They are subject to public scrutiny.

5.3.2 Fiscal Policy

5.3.2.1 Levies

Under the Forestry Act (1993), the government and the County Forest Boards are empowered to collect money from those who carry out logging operations for several reasons. County Forest Boards may demand that guarantees be paid before felling begins to ensure that the appropriate measures will be taken to ensure regeneration of forest stands. This Act also empowers the

government to collect fees to cover the costs of ensuring compliance. Finally, those who do not comply with the Act are subject to fines and must forfeit any timber felled to the government.

As stated above, the Environmental Code (1998) promotes the “polluter pays” principle: as well as being subject to fines for noncompliance, those responsible for pollution must pay compensations, are responsible for remedying the damage, and must take measures to assure that the situation is improved in the future. Compensation can be demanded for future damage where appropriate, and those whose property is damaged may require the party responsible for the damage to purchase said property. To make sure that the polluter can pay the appropriate costs, those who engage in activities deemed hazardous to the environment (i.e., those who require permits for their activities as outlined above) must purchase environmental damage insurance and environmental clean-up insurance.

The Environmental Protection Code empowers the government to collect taxes for waste collection and treatment. In keeping with the various protocols associated with the Geneva Convention, in 1991, the government established taxes on sulfur (SO₂) emissions (specifically, on fuels with high sulfur content). In 2001, in conjunction with a cut in income taxes and in social security contributions, it raised taxes on diesel fuel, heating oil, and electricity (Fischlowitz-Roberts 2002, Statistics Sweden 2004b). In 1990, the Act on Environmental Charges on Emissions of Nitrogen Oxides in Energy Production introduced a tax on nitrogen oxide emissions from combustion plants (Swedish Environmental Protection Agency 2000). The government also levies taxes on insecticides and commercial fertilizers (Statistics Sweden 2004b), as well as on natural gravel extraction (Organization for

Economic Cooperation and Development 2001).

5.3.2.2 Financial Incentives

Under the Forestry Act (1993), government subsidies are provided to assure the regeneration of selected valuable broadleaved forest. Classified as resource subsidies, these may cover up to 80% of the cost of establishing and maintaining such forests (Statistics Sweden 2003). The government of Sweden also awards many other environmental subsidies: in 2000, the government awarded SEK 2182 million in resource, energy, and transport subsidies (Statistics Sweden 2003). With specific regard to the forest, apart from the subsidies described above, subsidies are granted for conserving forest grazing land, wetland management and restoration, and repairing damage caused by air pollution and acidification. The government also encourages the use of clean technologies through incentives; for example, electricity generated through wind power is exempt from the energy tax (Organization for Economic Cooperation and Development 2001).

5.4 Effectiveness of Sweden’s Policies

Although the growing stock of the forest has been increasing (Swedish National Board of Forestry 2002), there has been a steady decline in the amount of old-growth forest (Swedish Environmental Protection Agency 2002), indicating that Sweden’s environmental policies may not be effective in protecting the diversity in age structure of the forest. However, some of the other policies discussed do seem to be having the desired effects.

There may be some evidence that the system of environmental taxes is having some positive effect on the environment. According to Fischlowitz-Roberts (2002), the restructuring of the tax system to increase taxes on energy and emissions led to a decrease of 80% in sulfur emissions

between 1980 and 1998. Statistics Sweden (2004b) also indicates that SO₂ emissions declined fairly steadily between 1993 and 2000 (Fig. 4); according to the numbers provided by Statistics Sweden, this decline was statistically significant ($R^2 = 0.793$; $F = 22.940$, $df = 7$, $P = 0.003$; linear regression performed in SPSS version 11.0). Norregaard and Reppelin-Hill (2000) agree that at least some of this decline is due to the sulfur emissions tax imposed in 1991.

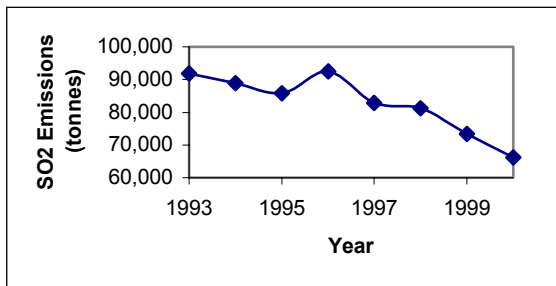


Figure 4. SO₂ emissions in Sweden between 1993 and 2000. Source: Statistics Sweden 2004b.

In addition, according to the statistics provided by Statistics Sweden (2004b), in keeping with some of the protocols associated with the Geneva Convention, emissions of nitrogen oxides also declined significantly between 1993 and 2000 (Fig. 5; $R^2 = 0.594$; $F = 8.767$, $df = 7$, $P = 0.025$; linear regression performed in SPSS version 11.0) Furthermore, the Swedish

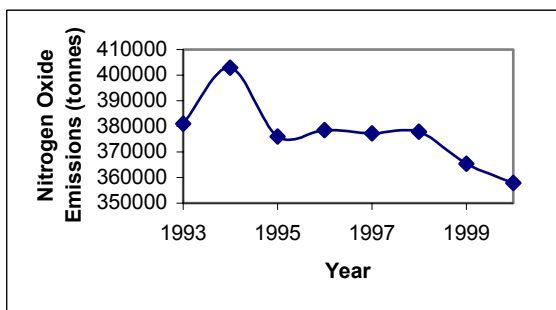


Figure 5. Nitrogen oxide emissions in Sweden between 1993 and 2000. Source: Statistics Sweden 2004b.

Environmental Protection Agency (1997) estimates that use of nitrogen fertilizers would be 10 % greater were it not for the taxation of these fertilizers. Finally, use of commercial fertilizers with phosphorus declined significantly between 1970 and 2000, but this is likely due more to the fact that so much has been applied that soils are no longer phosphorus-deficient than the levying of taxes on fertilizers (Swedish Environmental Protection Agency 2003b).

6 RUSSIA

6.1 The Russian Forest in General

Russia contains about 60% of the world's boreal forest (Holmes 2003), and about 26% of the world's virgin forest (Amirkhanov 1997). Forestland accounts for 69% of the land area of Russia, and the vast majority of this is boreal forest (Amirkhanov 1997). The area of forestland has been steadily increasing over the past ten years (Tishkov 2000), probably due in part to the current economic crisis in the country. There are 337 rare, threatened, or endangered species that make their home in Russia's forests (Amirkhanov 1997). About 22% of the forest is protected because it provides habitat for endangered species or is located along waterways, green belts, etc. (classified as Group I forest by the 1997 Forest Code); another 8% is highly regulated and somewhat protected because it is in areas of high population density or of low tree density (Group II forest); the final 70% is industrial forest (Group III), although 25% of this is inaccessible (Amirkhanov 1997). Forest products account for only a small percentage of exports, topped by minerals, oil and gas, metals, machinery, and the chemical industry (Russian State Customs Committee 2004).

Although the new Forest Code presently in preparation may change the ownership of the Russian forest (see below), at present, 100% of the forest is public,

99.9% under federal jurisdiction (Fig. 1). Of this, 94% is under the jurisdiction of the Forest Service (Ministry of Natural Resources), 2% is under the jurisdiction of the Department of Protected Areas (also under the Ministry of Natural Resources), 3% is under the jurisdiction of the Ministry of Agriculture because it occurs on agricultural land, and the rest is under the jurisdiction of the ministries of Defense and Education and of municipalities (<0.1%) (Ministry of Natural Resources of the Russian Federation 2002). Under the Forest Code (1997), the federal government allows use of the forest through a system of leases (for extraction) and licensing (for hunting and fishing, etc.).

6.2 Uses of the Russian Forest

Russia's boreal forest is most affected by the forestry industry, mining, and gas and oil extraction, but may also be affected by generation of hydroelectricity, recreational activities, hunting and fishing, development such as road-building and urban expansion, and agriculture.

6.3 Russian Regulation of Forest Use and Activities Affecting the Forest

6.3.1 Regulatory Policy

In Russia, all activities that may affect the environment are highly regulated. For example, there are 22 federal laws, 57 federal regulations, and 120 ministerial regulations that deal with forest-related issues (Amirkhanov 1997). In general, these laws and regulations have sustainable use of the land and its natural resources and environmental conservation as their main goals. The system is largely punitive; the legislation allows for the government to establish norms for environmental impact (excessive pollution, etc.), and those who exceed these norms are subject to fines, to suspension or revocation of their rights to use the land and its resources, or, in extreme cases, to imprisonment. They are also responsible for repairing the damage they

have caused. This applies to all land and natural resources (2001 Land Code, 1997 Forest Code, 1995 Water Code, 1998 Law on Waste, 1995 Law on Fauna, etc.). Since almost all land is public, the government is empowered to levy fees for almost all uses of the land and its resources: licenses for hunting and fishing, rental or other fees for forestry activities, etc. Many of the laws and regulations are repetitive and redundant, but I provide brief discussion of the main laws and regulations that affect the boreal forest below.

Use of Russia's forest is largely regulated through the 1997 Forest Code and associated regulations. This Code has as its objective the sustainable management and use of the forest, and regulates for multiple uses of the forest. It places responsibility for the conservation, protection, and restoration of the forest on the federal government, although the government can delegate these responsibilities, as in the case of a forestland lease. It allows for the right of public access to the forest for recreation purposes and for the non-commercial collection of mushrooms, berries, etc. without licenses or permits, as long as no environmental damage results. It also provides for parcels of forest to be leased out for industrial uses such as forestry. Leases may be from 1 to 49 years. All lessees must apply for permits to carry out their activities every year. According to the associated regulations (Forest Lease Regulations 1998), those with leases of over 5 years are required to pay the local forest authorities to produce binding long-term, large-scale forest management plans, which consider the principles of sustainable use, account for multiple uses of the forest, and specify how the user will plan for reforestation, protection from forest fires, etc. Although short-term (< 5 year) leases can be granted at the discretion of the forest authorities, long-term leases are granted by auction or tender and are subject

to the scrutiny of the general public, state environmental protection agencies, and other interested parties. The Forest Code also allows for the transfer of forestland out of the national forest fund for non-forest uses such as mining. In addition to an administrative fee, those granted such a land transfer must compensate the state for the loss of the forest, based on the value of the forestland as such (details regulated by the Regulation on Transfer of Land). In general, the Forest Code strictly regulates use of the forest and empowers the federal government to levy fines and revoke licenses and permits for forest use in cases of noncompliance.

The Law on Environmental Expertise (1995) specifies that all industrial uses of the land and its resources and proposed legislation that may affect the environment must pass an ecological impact assessment before being approved. This includes all industrial uses of the forest, as well as the transfer of forestland for non-forest uses (e.g., the transfer of forestland for mining purposes) and all industrial uses of non-forest land, many of which affect the forest. These impact assessments are open to public scrutiny, must be funded by the applicant, and are carried out under strict government regulation.

Like the Forest Code, the Law on Environmental Protection (2001) is based on principles of sustainable use and environmental conservation. In keeping with these principles, the law provides specific guidelines for environmentally responsible development and operation of all major industries (hydroelectricity, nuclear power, thermal energy, oil and gas, forestry, etc.). It states that users shall be held financially responsible for any damage to the environment, and makes it illegal to put Russia's flora, fauna, or natural resources in danger, giving priority to the protection of undisturbed areas. Industrial activities that may cause damage to the environment must

be approved by the public. Among other things, the law prohibits the use of some toxic chemicals on forestland, regulates the introduction of non-native or genetically modified organisms, and authorizes the government to regulate the use of fertilizers and pesticides.

The new Land Code (2001) complements and, in some cases, reiterates the Forest Code. It states that management of all land must be environmentally sound. It provides for regulations to be set up to establish financial incentives for environmentally sound land use and for the privatization of some state lands, but, like the Forest Code, it specifies that forestland cannot be privatized. Associated regulations have not yet been formulated.

Finally, the Law on Fauna (1995) protects wildlife. According to this law, all animal life and habitat is protected unless otherwise specified. The destruction of said animal life or habitat is prohibited without express permission from the government (licenses for hunting, fishing, etc.).

6.3.2 Fiscal Policy

6.3.2.1 Levies

As well as fines for not complying with all the legislation and regulations described above, under the Law on Environmental Protection (2001), there is a regulation on payment for environmental damage. According to this regulation, industries and individuals that cause excessive environmental damage are fined according to the extent to which they exceed norms for pollution of the soil, air, water, for noise pollution, light pollution, and other environmental damage. Payment of these fines does not exempt the offender from having to clean up the damage and to make adjustments to their operations so that future damage is avoided.

Under the 2003 Decree of the Government of the Russian Federation on Tariffs for Pollution of the Air and Surface

and Groundwater and Disposal of Industrial and Consumer Waste (O normativakh platy za vybrosy v atmosferyi vozdukh zagriazniayuschikh veschestv ctatsionarnymi I peredvizhnymi istochnikami, sbrosy zagriazniayuschikh veschestv v poverkhnostnye I podzemnye vodnye ob'ekty, razmeschenie otkhodov proizvodstva I potrebleniya), graduated taxes are levied for pollution of the air and water and for disposal of industrial waste. Sulfur dioxide and nitrates are included in the list of chemicals for which these taxes are levied.

6.3.2.2 Financial Incentives

Although there are at present no regulations providing financial incentives for environmentally responsible behaviour that might affect the forest.

6.4 Effectiveness of Russia's Policies

Although the Russian system of regulating activities that may affect the forest often aims at forest conservation and sustainable use, it seems to be relatively ineffective in meeting these goals. The high degree of regulation intrinsic to the system makes it overly costly and therefore problematic in today's financially strapped Russian Federation, since the government must carry out innumerable inspections to make sure that regulations are being followed. At present, the local forest authorities (leskhozi) responsible for seeing that the forest is protected and managed in a sustainable way do not have sufficient funds to carry out their functions and are therefore carrying out logging operations themselves (Ministry of Natural Resources of the Russian Federation 2002). The funds collected from leases, licenses, and other fees for the use of the forest are insufficient to cover the costs of forest protection and conservation (Schetnaya palata 2002). Even if these funds were sufficient to cover these costs, they are paid to the federal treasury rather than directly to the forest authorities,

and forest conservation may not always be of top priority at the federal level.

This problem is aggravated by the fact that it is often less costly for industrial users of the forest and other lands to risk being fined for noncompliance than to comply with all the government regulations, as admitted by the Ministry of Natural Resources itself. In 2002, the government inspected the practices of 60 000 of the 81 000 forest users and levied fines for 87 000 cases of noncompliance (Ministry of Natural Resources of the Russian Federation 2002). The Ministry admitted that almost none of the 140 000 land parcels inspected were being managed in full compliance with the laws and regulations of the land. Even the regulation on fines for ecological damage described in section 6.3.2.1 above is not very effective: in 2002, about 8.5 billion rubles in fines were levied, but only 5.2 billion were paid (Ministry of Natural Resources of the Russian Federation 2002).

Some of the problems with the Russian system are being addressed through proposed legislation. For example, a new Forest Code has been presented in the Russian Cabinet and Parliament and is expected to pass this spring (2004). Although it still regulates forest use very strictly, it differs from the 1997 Forest Code in several important ways, two of which may affect the ability of the state to encourage sustainable use of the forest: (1) it extends the possible length of a lease from a maximum of 49 to a maximum of 99 years, and (2) it provides lessees with the possibility to buy the land after 15 years of environmentally sound management. Both measures will presumably render it in the best interest of the user to manage the land responsibly for long-term use. However, these measures only encourage sustainable use of the trees themselves; they may not be effective in encouraging industrial users to

conserve species of no economic value, for example.

Proposed legislation to improve the regulation on fines for ecological damage may be more effective. Empowered by the 2001 Law on Environmental Protection, two new laws have been drafted to address this problem. Much like Finland's Environmental Damage Insurance Act, the Law on Compulsory Ecological Insurance and the Law on Compulsory Insurance for Dangerous Industries would require industries to pay into private insurance policies to cover ecological damage and failure to fulfill legal obligations for environmental protection, conservation, and restoration. This way, the state would be recompensed for ecological damage and noncompliance even if the offending party could not fulfill its obligations, and the insurance companies would provide a further impetus for ecologically responsible development and land use. Further proposed legislation would specify that a portion of the money levied by the state for use of the forest (rent from leases, license fees, etc.) go directly to the local forest authorities responsible for the health of the forest, thus ensuring that this sector is financed.

7 ALASKA

7.1 The Alaskan Forest in General

The only state in the US that contains boreal forest is Alaska, with 129 million acres of forest (~52 million ha) (United States Department of Agriculture Forest Service 2004) accounting for about 34% of the 375 million acres (~152 million ha) that make up the state (Hull and Leask 2000). Alaska's forest include an estimated 22 million acres (9 million ha) of coastal rainforest, and the rest is boreal or tundra and barren ground (United States Department of Agriculture Forest Service 2004, United States Geological Survey 1999). All the endangered species of the

state are either coastal or tundra species; there are no endangered forest species (United States Fish and Wildlife Service 2004).

Alaska is also the only state in the United States whose land is largely publicly owned (Fig. 1), although much of the resource extraction still occurs on state or private (including native) land. About 60% of the forest is owned by the federal government, managed, in descending order, as national parks by the Parks Service, national forests by the Forest Service (United States Department of Agriculture or USDA), national wildlife refuges by the Fish and Wildlife Department, and multiple-use forest by the Bureau of Land Management (Fig. 6).

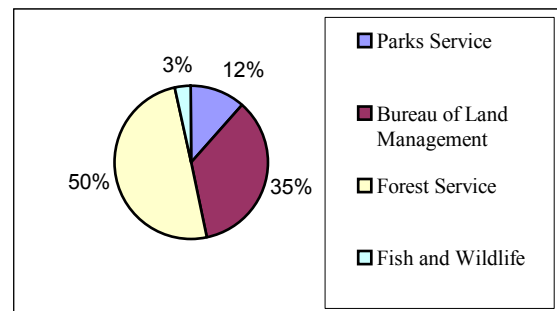


Figure 6. Management of federal forestland in Alaska. Source: Forest Health Protection, Alaska Region 2004.

Most of the land managed by the National Parks Service is tundra/barren, while a large part of the lands managed by Fish and Wildlife as wildlife refuges are also tundra/barren and the two national forests managed by the USDA Forest Service are rainforest (United States Geological Survey 1999 and Alaska Public Lands Information Centres 2004). Thus, most of Alaska's boreal forest is owned/managed by the state of Alaska, the Bureau of Land Management, and private/native landowners; therefore, I consider only those land management policies applicable to these three groups.

Forest products are low down on the list of Alaskan exports, topped by the seafood industry, minerals (especially zinc), oil and gas, and fertilizers (Division of International Trade and Market Development 2002). Japan is the top export market for forest products, as well as for seafood and energy. Other important export markets include Korea, Canada (although not for forest products), and Germany (Division of International Trade and Market Development 2002).

7.2 Uses of the Alaskan Forest

Alaska's forestland is used for logging, forestry, recreation, hunting and trapping, fishing, mining, and oil and gas exploration and extraction.

7.3 U.S. and Alaskan Regulation of Forest Use and Activities Affecting the Forest

7.3.1 Regulatory Policy

At the state level, forest management is regulated for public and private forests by the Alaska Forest Resources and Practices Act (2000), the Alaska Land Act (1998), the Fish and Game Act (1959), and various other Environmental Conservation statutes. Federal legislation of interest includes the Land Policy and Management Act (1976), the National Environmental Policy Act (1969), the Healthy Forest Restoration Act (2003), the Endangered Species Act (1972), the Clean Air Act (1970), the Clean Water Act (1977), the Insecticide, the Fungicide and Rodenticide Act (1996), the Pollution Protection Act (1990), the Resource Conservation and Recovery Act (1976), and the Liability Act (Superfund) (1980).

The Forest Resources and Practices Act (2000) is based on sustainable yield rather than sustainable management or development, although it does specify that the forest should be managed for multiple uses, as well as to maximize forest health by minimizing insect and disease outbreaks, managing fires, and ensuring reforestation. For private landowners, operators, and

timber owners, this legislation requires that a stand-level detailed plan of operations be submitted to the commissioner of natural resources at least 30 days before harvesting begins, and these plans are open to public scrutiny (Alaska Forest Resources and Practices Act 2000 and Alaska Forest Resources and Practices Regulations 2000). For state land, the Department of Natural Resources Division of Forestry must produce long-term management plans and short-term forest land use plans. The long-term plans are developed in conjunction with local governments and the public to provide long-term strategies for state land based on the principles of multiple use and sustained yield. They must consider the physical, economic, and social factors affecting the area and the present and potential future uses of the land (Alaska Land Act 1998). The short-term plans provide a site-specific description of proposed logging for each timber sale greater than 10 acres (~4.05 ha) in a state forest, including a description of the harvest and silvicultural methods, access, and multiple-use provisions for the specific area in question, and an evaluation of the immediate and long-term effects of the proposed harvesting (Alaska Land Act 1998).

Under the Alaska Land Act (1998), the state can sell timber rights to specific parcels of forestland, can sell land, and can lease land for grazing and other agricultural purposes of for exploration or exploitation of oil and gas, coal, phosphates, sodium, sulphur, potassium, shallow natural gas, and geothermal resources. Sales and leases are carried out by auction, sealed bids, or lottery; in the former two cases, the sale or lease goes to the higher bidder. A plan for sales and leases must be drawn up every 5 years and is open to public scrutiny.

Although state regulation focuses on sustained yield and exploitation of natural

resources, it also legislates for the protection of anadromous fish, since this is an important industry. For example, according to the Fish and Game Act (1959), regardless of land ownership, the authorities may require the construction of fishways and other devices to facilitate passage of anadromous fish through streams and rivers. Any development on or use of waterways classified as important for such fish must be approved by the appropriate authorities.

Various other Alaska Environmental Conservation statutes set standards for water pollution (AS 46.03.60), waste disposal (AS 46.03.100), hazardous waste (AS 46.03.299), use of pesticides and broadcast chemical (AS 46.03.320), etc. In general, state statutes prohibit pollution of the air, water, or soil, and the use of pesticides in such a way that they may result in such pollution. Permits are required for waste disposal. The statutes follow the polluter pays principle, requiring those responsible for environmental pollution or for exceeding regulated norms to pay for clean-up operations (AS 46.03.780).

Finally, the state has a protectionist policy towards its forest products. According to the Public Contract Act (1949), any project financed by the state must use Alaskan forest products if at all possible.

Federal forests must also be managed in keeping with the Alaska state legislation described above. Most of the resource extraction occurring on federal lands occurs on lands managed by the Bureau of Land Management, which are largely regulated under the federal Land Policy and Management Act (1976). Under this act, federal lands must be managed for multiple uses (including recreation) and under the principle of sustainable yield, while providing for the conservation of ecological, environmental, air, and water resources; of habitat for the flora and fauna;

and of “areas of critical environmental concern”. The Bureau may lease out land and sell licenses and permits for its use. In Alaska, the Department of Defense is entitled to use these lands for military purposes, provided they limit environmental impact and carry out any necessary decontamination resulting from its activities. Under the National Environmental Policy Act (1969), environmental assessments and environmental impact statements (considering alternatives to the proposed activities) must be prepared and made available for public scrutiny before any government agency carries out any activity that may affect the environment, although the recent Healthy Forest Restoration Act (2003) authorizes the Bureau of Land Management and Forest Service to abbreviate these environmental analyses in considering reduction of hazardous fuels (biomass) in forestland. The Healthy Forest Restoration Act also states that large trees should be retained whenever possible.

There are also many federal laws and regulations that may affect the forest, regardless of ownership. One such law is laid out by the Endangered Species Act (1972), which is designed to conserve threatened and endangered species by conserving the ecosystems upon which they depend, whether these are on private or public land. It authorizes the Fish and Wildlife Service (Department of the Interior) and the National Marine Fisheries Service (Commerce Department) to establish recovery programs for endangered species, and requires that other government agencies consult Fish and Wildlife before beginning any project that may affect such species or their habitat. It also prohibits the damage of any listed species or its habitat on private or public land.

The production and disposal of pollution and waste are regulated under several federal laws. The Clean Air Act

(1970) empowers the United States Environmental Protection Agency (EPA) to regulate air emissions. The Clean Water Act (1977) empowers the EPA to implement pollution control programs, including setting industrial wastewater standards. Among other things, according to this act, it is prohibited to discharge any pollutant from a point source into navigable waters without a permit. This act also requires states to develop and implement a list of 'Best Management Practices' (BMPs) to minimize industrial water pollution. Under the Federal Insecticide, Fungicide and Rodenticide Act (1996), all those using pesticides must be certified to do so, and all pesticides must be registered; these measures are designed to give the EPA the power to assure that pesticide pollution is limited. The EPA may refuse to register the use of any pesticide deemed to cause undue harm to the environment or to any threatened or endangered species or their habitat. The Pollution Protection Act (1990) empowers the EPA to set standards to reduce source pollution. The Resource Conservation and Recovery Act (1976) gives the EPA the authority to set standards for the generation, treatment, storage, transportation, and disposal of hazardous waste. The 1984 amendments of this act require that land disposal of hazardous waste be phased out. The Liability Act (Superfund) (1980) authorizes the EPA to clean up hazardous waste sites, collecting funding for these clean-ups from responsible parties if possible.

7.3.2 Fiscal Policy

7.3.2.1 Levies

Several fiscal policies are in place to limit pollution in the United States. For example, the Internal Revenue Code (1986) imposes a special tax on the sale of vehicles that exceed specific values for fuel efficiency ("gas guzzlers tax"). There is also a petroleum tax, the revenue of which goes

into the Hazardous Substance Superfund and the Oil Spill Liability Trust Fund for clean-up operations (Internal Revenue Code 1986).

7.3.2.2 Financial Incentives

Long-term forest stewardship plans for private land are voluntary but are associated with financial assistance mandated by the federal Cooperative Forestry Assistance Act (1978). To be eligible for assistance, landowners must have these plans prepared with the help of the Federal Forest Service's Forest Stewardship Program and must make them available to the public and to the appropriate government agencies. These plans are designed to provide a mechanism whereby landowners, timber owners, and operators can obtain public input on their proposed operations and benefit from key local knowledge and early notice of potential problems (Alaska Forest Resources and Practices Act 2000).

The Alaska Clean Water Fund set up by state statute 46.03.032 sets aside specific moneys for wastewater treatment, management and conservation of estuaries, and controlling water pollution. Some of this money may be given as grants to municipalities for water treatment facilities.

Under the federal Healthy Forest Restoration Act (2003), federal grants may be given to "improve the commercial value of forest biomass". This presumably refers to grants to encourage reforestation and other silvicultural practices. This Act also sets up a technical assistance program to protect water quality and a watershed cost-share program for communities, non-profit groups, and private landowners who propose to carry out watershed forestry projects (planting trees to improve water quality, etc.), with \$15 million/year set aside for such uses between 2004 and 2008. Finally, it sets up the Healthy Forests Reserve Program. Under this program, up to 2

million acres of rare forest ecosystems or endangered species habitat may be eligible for cost-sharing programs to help private landowners carry out conservation initiatives. These programs would fund 50-100% for conservation easements and implementation of approved conservation measures.

The Tax Simplification Act (1986) provides two provisions to subsidize reforestation on private lands. These are the Reforestation Tax Credit and the Reforestation Amortization. The tax credit allows for a tax deduction of 10% of any reforestation costs up to \$10 000 USD. In addition, the amortization program allows for 95% of the reforestation costs to be amortized over a period of 8 years. In addition, the internal Revenue Code provides financial incentives (tax breaks) for those who buy qualified clean-fuel vehicles.

The United States Environmental Protection Agency also runs several grant and cost-sharing programs, including the Wetland Development Grant Program. This program provides financial assistance for the protection or enhancement of wetlands. State, local, and tribal governments are eligible for assistance.

Finally, the United States has also set up several systems of tradeable emissions permits to limit pollution. Most notable in terms of its possible effect on Alaska's boreal forest is the SO₂ allowance trading program. This program was set up in 1990 to help reduce acid rain. Under this program, existing companies were given free allowances based on current rates of emissions. Some allowances are auctioned to accommodate new companies. The program set a cap on the number of allowances granted. Allowances can be traded or banked for future use, but companies must have allowances equal to or greater than their emissions in any one year. If the latter qualification is not met, a charge

of \$2000 per ton is levied by the Environmental Protection Agency and the company must offset the excess in the following year. The program aims to decrease overall emissions in two phases by 10 million tons from the 1980 level by 2010 (Norregaard and Reppelin-Hill 2000).

7.4 Effectiveness of U.S. and Alaskan Policies

There is evidence that the federal SO₂ allowance trading program is effective in reducing emission of sulfur dioxide. The program met its interim goal to reduce sulfur dioxide emissions by 5 million tons by 2000 (Norregaard and Reppelin-Hill 2000), which has presumably led to reductions in acid rain. However, there is no specific information available on how well this program functions in Alaska and therefore on its effectiveness in reducing the effect of acid rain in the boreal forest. Unfortunately, there is also no information available on which to base a judgment of the effectiveness of the rest of the policies described above in providing for the sustainable development and conservation of Alaska's boreal forest.

8. BEST PRACTICES AND THEIR APPLICABILITY TO THE CANADIAN SITUATION

Although it is difficult to assess the effectiveness of government policies in promoting conservation and sustainable development, I have selected several practices that seem to be effective, at least on paper. These are Norway's Forest Trust Fund program, green taxes on waste and emission such as those in place in the Scandinavian countries, tradeable emissions permits such as those in place in the United States, and obligatory damage insurance programs such as those in place in Finland and Sweden and proposed in Russia. Some of these programs might be effective in Canada.

Norway's Forest Trust Fund program, as described in section 3.3.3.2 above, guarantees a fund for the sustainable management of each specific parcel of forestland in the country, as well as providing the municipal, county, and federal forest authorities with a steady income to subsidize programs that encourage sustainable management. This is partly a levy, in that landowners are required to put money into their individual trust funds each year and the interest from these trust funds goes to the authorities, but it is also an incentive, as these deposits are tax deductible and a portion of the funds withdrawn for use is also deductible. These trust funds are an innovative way to encourage forest owners and forest authorities to invest in the future of the forest.

Unfortunately, as effective as this program may seem in the Norwegian context, it could not work in the same way in Canada. In Norway, the system can work because (a) most of the forestland is under private ownership and therefore managed by one individual or family over the long term, and (b) the municipal and county forest boards provide landowners with the local support network necessary to administer and provide guidance in the use of the trust fund money. In Canada, most of the forestland is public (managed by the provinces), subject to leases or timber sales, and the local support network is lacking.

On the other hand, a system of green taxes such as those in place in the Scandinavian countries may be effective in discouraging environmentally damaging behaviour, and may also be applicable to the Canadian situation. Green taxes are taxes on waste, emissions, energy use, and other substances and activities that cause environmental damage (Organization for Economic Cooperation and Development 1999). The sulfur dioxide taxes imposed by

all three Scandinavian countries are a good example. Canada already imposes some green taxes, such as a tax on pesticides (Organization for Economic Cooperation and Development 2001), but it might be able to increase the green tax load.

Similarly, the United States has had some success in reducing emissions through its tradeable emissions permits, such as the national SO₂ allowance trading program described in section 7.3.2.2 above, and such programs might work in Canada as well. This program provides permits for sulfur dioxide emissions that can be traded or banked for future use. The program has been successful in reducing emissions up to this point, as have similar regional programs (Norregaard and Reppelin-Hill 2000).

The environmental damage insurance requirement imposed by Finnish and Swedish regulation, and possibly soon to be imposed by the Russian Federation, is another innovative measure, and one that might be applicable to the Canadian situation. According to these regulations, specific industries whose activities are likely to cause damage to the environment are required to pay into private environmental damage insurance policies. In the context of a "polluter pays" system, environmental insurance requirements use a market mechanism to encourage possible polluters to act in environmentally responsible ways. These programs are often used to insure against catastrophic environmental damage, but they could also be used to insure against other forms of environmental impact.

However, in considering any possible measures to promote environmentally responsible behaviour on the part of Canadian industry, it is crucial to consider Canada within the context of the North American Free Trade Agreement, with the United States as its main trading partner. For example, the danger of levying green taxes is that, in a global economy,

heavy tax burdens may put businesses at a disadvantage (Norregaard and Reppelin-Hill 2000). In Europe, many countries are imposing such taxes (Organization for Economic Cooperation and Development 2001). However, in the North American context, with the U.S. being the dominant force in NAFTA, green tax burdens in excess of those imposed in the U.S. may cause undue harm to Canadian businesses. Requiring that potentially polluting Canadian industries purchase environmental damage insurance would place a further burden on these industries. The protectionist policies of the U.S. may further exacerbate the problem, since tariffs such as those placed on softwood lumber already put Canadian industry at a disadvantage. Imposition of heavy green taxes and environmental damage insurance requirements would have to be balanced by tax reform in other areas.

9. CONCLUSION

Each of the jurisdictions described above has a slightly different system in place to regulate use of the boreal forest and its resources and to promote conservation and sustainable development. In the Scandinavian countries, where most of the industrial forest is privately owned, regulations are tempered with incentive programs and green taxes and systems of local support exist to aid landowners in managing their forestland in an environmentally and economically sustainable manner. In Russia, where, as in Canada, almost all of the forest is owned by the state, the current system is so highly regulated as to be impractical under the current economic conditions. However, pending legislation in this system may render it more similar to the Scandinavian systems; most notably, these changes would allow for the privatization of some of the forestland. In Alaska, the system is

intermediate: with the industrial forestland split between state, private/native, and federal ownership, some forest use is regulated (more so on federal and state lands), but incentive, green tax, and a tradeable emissions programs are also in place.

Despite the differences in land tenure systems, examples from each of these jurisdictions may be used to inform conservation and sustainable development policy in Canada. Innovative programs that might help the Canadian government in promoting conservation and sustainable development of the boreal forest include the Swedish and Finnish environmental damage insurance programs, the Scandinavian green tax programs, and the U.S. tradeable emissions program. However, a much more detailed study of the effectiveness of such programs and the potential applicability to the Canadian system must be carried out before serious policy recommendations can be made.

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APPENDIX 1: LIST AND AVAILABILITY OF LEGISLATION AND REGULATIONS

NORWAY:

- Act of Allodial Rights (1974)
- Act Relating to Motor Traffic on Uncultivated Land and in Watercourses (1977)
- Act Relating to Salmonids and Freshwater Fish (1992)
- Concession Act (1975)
- Constitution of Norway (1814)
- Forest and Forest Protection Act (1965, amended most recently in 1997)
- Land Act (1995)
- Nature Conservation Act (1970)
- Outdoor Recreation Act (1957)
- Planning and Building Act (1985, amended in 1990)
- Pollution Control Act (1981, amended in 1996)
- Wildlife Act (1981)

Most Norwegian legislation is available online in English at <http://www.lovdatab.no/info/ueng.html>.

FINLAND:

- Act on Compensation for Environmental Damage (1994)
- Act on Environmental Impact Assessment Procedure (1994)
- Act on Financing of Sustainable Forest Management (1997)
- Act on Forest Centers and the Forestry Development Center Tapio (1995)
- Act on Forest Management Associations (1999)
- Environmental Damage Insurance Act (1998)
- Environmental Protection Act (2000)
- Environmental Protection Decree (2000)
- Forest Act (1996)
- Forest and Parks Services Act (1993)
- Forest Insect and Fungi Damage Prevention Act (1991)
- Land Use and Building Act (1999)
- Land Use and Building Decree (1999)
- Nature Conservation Act (1996)
- Nature Conservation Decree (1997)
- Waste Oil Charge Act (1986)
- Waste Tax Act (1987)

Most Finnish legislation is available online in English at <http://www.finlex.fi/english/laws/index.php>

SWEDEN:

- Act on Environmental Charges on Emissions of Nitrogen Oxides in Energy Production (1990) Available in English at <http://www.internat.environ.se/>
- Environmental Code (1998) Available in English at <http://www.internat.environ.se/>

- Forestry Act (1993) Available in English at <http://www.svo.se/minskog/templates/Page.asp?id=11303>
- Swedish Constitution (1991) Available in English at <http://www.riksdagen.se/english/work/constitution.asp>

RUSSIA:

- Decree of the Government of the Russian Federation on Tariffs for Pollution of the Air and Surface and Groundwater and Disposal of Industrial and Consumer Waste (2003)
- Forest Code (1997)
- Land Code (2001)
- Law on Environmental Expertise (1995)
- Law on Environmental Protection (2001)
- Law on Fauna (1995)
- Law on Waste (1998)
- Forest Lease Regulations (1998)
- Regulation on Transfer of Land
- Water Code (1995)

Russian legislation is available online in Russian at <http://www.ecobez.narod.ru/ecolaw.html>

ALASKA/U.S.A:

State of Alaska:

- Fish and Game Act (1959)
- Forest Resources and Practices Act (2000)
- Forest Resources and Practices Regulations (2000)
- Land Act (1998)
- Public Contract Act (1949)
- Various Environmental Conservation statutes

Alaskan legislation is available at <http://www.legis.state.ak.us/folhome.htm> and <http://touchngo.com/lglcntr/akstats/Statutes.htm>

Federal:

- Clean Air Act (1970)
- Clean Water Act (1977)
- Cooperative Forestry Assistance Act (1978)
- Endangered Species Act (1972)
- Healthy Forest Restoration Act (2003)
- Insecticide, Fungicide and Rodenticide Act (1996)
- Internal Revenue Code (1986)
- Land Policy and Management Act (1976)
- Liability Act (Superfund) (1980)
- National Environmental Policy Act (1969)
- Pollution Protection Act (1990)
- Resource Conservation and Recovery Act (1976)
- Tax Simplification Act (1986)

United States legislation is available at <http://www.epa.gov/region5/defs/html/esa.htm> and <http://www.fourmilab.ch/ustax/www/t26.html>

APPENDIX 2: LIST AND AVAILABILITY OF INTERNATIONAL CONVENTIONS AND PROTOCOLS DISCUSSED

Convention	Associated Protocols	Webpage of Secretariat
Framework Convention on Climate Change (1992)	-Kyoto Protocol (1992)	http://www.unfccc.org
Convention on Biological Diversity (1992)	-Cartagena Protocol on Biosafety (2000)	http://www.biodiv.org
Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat (1971)		http://www.ramsar.org
Convention for the Protection of the World Cultural and Natural Heritage (World Heritage Convention) (1972)		http://www.unesco.org/whc
Convention on International Trade in Endangered Species (CITES) (1973)		http://www.cites.org
Ozone Layer Convention (Vienna Convention) (1985)	-Montreal Protocol on Substances that Deplete the Ozone Layer (1987)	http://www.unep.org/ozone
Stockholm Convention on Persistent Organic Pollutants (2001)		http://www.pops.int
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1989)		http://www.basel.int
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (1998)		http://www.pic.int

Geneva Convention on Long-Range
Transboundary Air Pollution (1979)

-Protocol on Long-term Financing of the
Cooperative Programme for Monitoring and
Evaluation of the Long-range Transmission of
Air Pollutants in Europe (1984)

-Protocol on the Reduction of Sulphur Emissions
or their Transboundary Fluxes by at least 30 per
cent (1985)

-Protocol concerning the Control of Nitrogen
Oxides or their Transboundary Fluxes (1988)

-Protocol concerning the Control of Emissions of
Volatile Organic Compounds or their
Transboundary Fluxes (1991)

-Protocol on Further Reduction of Sulphur
Emissions (1994)

-Protocol on Heavy Metals (1998)

-Protocol on Persistent Organic Pollutants (1998)

-Protocol to Abate Acidification, Eutrophication
and Ground-level Ozone (1999)

<http://www.unece.org/env/lrtap/>