

# NORDIC ENVIRONMENT

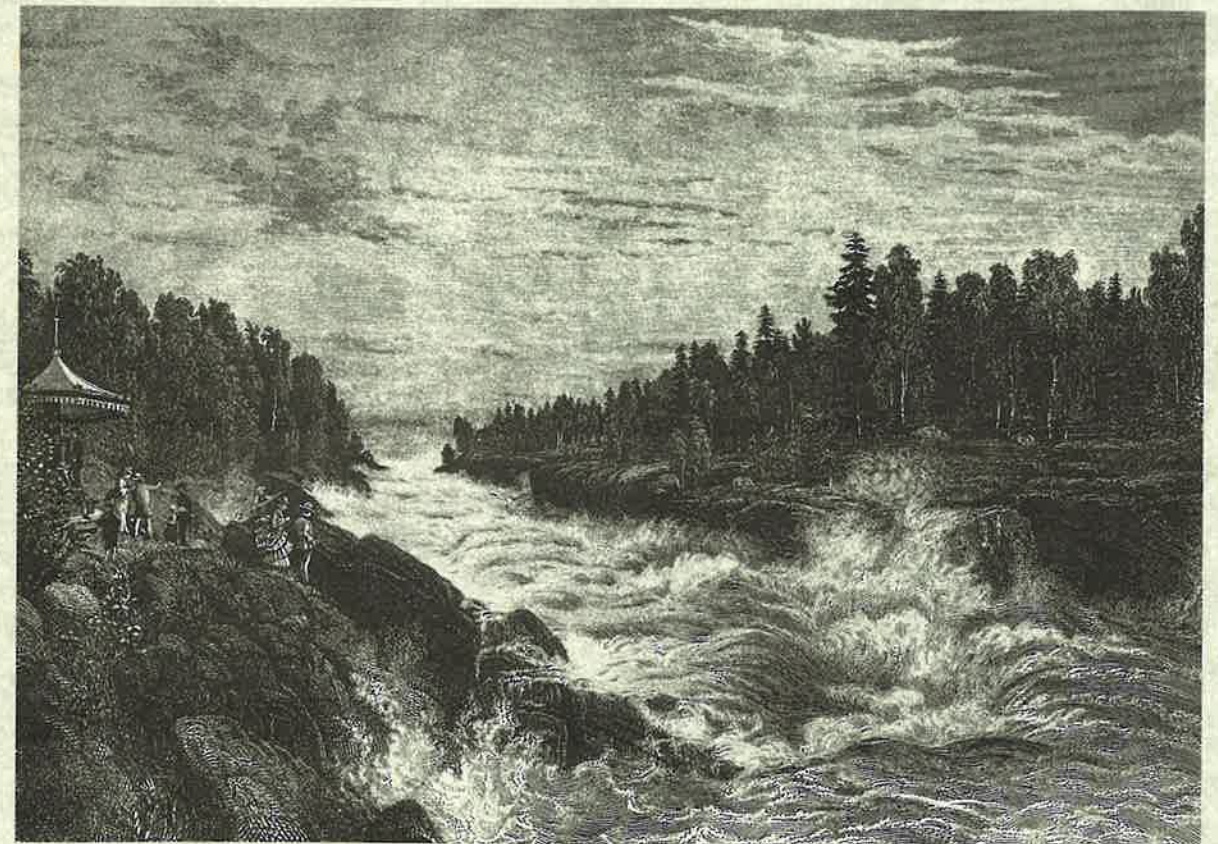
HISTORICAL AND CONTEMPORARY PERSPECTIVES

by

ARNOLD R. ALANEN

with

Berit C. Kaae and Salvör Jónsdóttir



NCCP  
NO. 4

Nordic  
Culture  
Curriculum  
Project

NCCP—the Nordic Culture Curriculum Project—is the acronym for a two-volume work planned by a North American committee of scholars. The primary volume is meant to make up a STUDENT READER in a form suitable for undergraduate instruction. The volume, which consists of a series of pamphlets, will provide short and authoritative introductions (in quarto size: ISSN 1977-2073) to various aspects of Scandinavian Life and Civilization. The pamphlets of the READER are written by scholars with expertise in the areas concerned and are subjected to a voluntary field testing by interested Scandinavianists at various universities. The series will also include a "Guide for Student Use." The companion volume, a TEACHERS' GUIDE (in octavo size: ISSN 1077-2073), will provide additional information for each of the pamphlets, possible student examinations and research topics, and updatable supplementary bibliographies for students and instructors.

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In 1952 The Nordic Council was established (it is now an 87-member parliament, consisting of delegates from Denmark, the Faeroe Islands, Finland, Greenland, Iceland, Norway, Sweden, and Åland), and in 1971 the Nordic Council of Ministers was formed as an instrument to coordinate cooperation between the governments of the Nordic countries. The Council has furnished the financial support necessary to start the NCCP series, which will initially make the following titles available:

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HISTORICAL AND CONTEMPORARY PERSPECTIVES

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The people of the five Nordic nations have long been noted for their understanding and appreciation of nature. Likewise, Nordic artists, writers, musicians, and architects have gained an international reputation for celebrating nature and incorporating environmental images into their creative work. Three lines from the *Kalevala*, the Finnish national epic, illustrate the ancient importance of themes featuring sun, sky, land, and water to people in this northern section of the world:

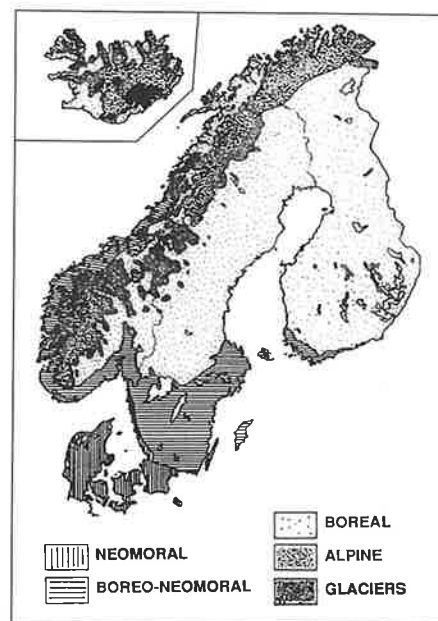
*Call out evenings, call out mornings, once at midday, too,  
for the delightfulness of my skies, for the pleasantness of my untilled lands,  
for the prosperity of my shores, for the fertility of my districts (Lönnrot 13).*

Of course, neither is the Nordic region immune to the forces that lead to environmental degradation, nor have its citizens always treated their natural and cultural resources with respect. The environmental problems faced by the Nordic nations may, nevertheless, appear rather insignificant and even minuscule when compared to other areas of the world. The reasons for this situation are numerous, but some factors are quite obvious: the region's low population growth rates, high standards of living, large amounts of accessible open space and surface water, well-educated citizenry, and governmental commitment to environmental protection measures.

Indeed, when focusing upon population issues alone—important factors to consider in any assessment of environmental quality—one finds that most of contemporary Norden is an exception to the situations found elsewhere in Europe. In 1995, the Nordic nations embraced just under 24 million people, or fewer than five percent of Europe's total population (excluding

Population Densities and Growth Rates

With the exception of Denmark, current population densities in the Nordic nations fall considerably under those of other European countries. As of 1995, the overall population density of 19 people per square kilometer of land in the Nordic region stands in marked contrast to the European figure of 108 people. The population density of Iceland (approaching 3 persons per square kilometer) is the lowest in Europe, followed by that of Norway (13) and Finland (15). Denmark (121 persons per square kilometer) is the only Nordic state that equals the densities of such other European countries as Poland and the Czech Republic; however, the figures for Belgium, Germany, the United Kingdom, and the Netherlands are considerably higher. Average population growth rates throughout the Nordic region are also very low. Because the overall growth rate of Norden is well under one percent per year, the total population of the region is increasing very slowly. Denmark's annual growth rate is so low that the nation has achieved virtual population stability; Iceland, however, now has a yearly population growth rate that slightly exceeds one percent per year. The self-governing Danish provinces of the Faeroe Islands and Greenland (Kalátdlit-Nunât in the Inuit language) also have annual growth rates that approach or exceed one percent.



Current vegetative zones in the Nordic region. Despite its northerly geographic location, Norden includes several distinctive vegetative areas. The *neomoral* zone of Denmark, southern Sweden, and the southwestern coast of Norway is primarily a deciduous forest similar to that of central Europe. North of the neomoral is the *boreo-neomoral* zone, a mixed forest area of coniferous and deciduous trees. The largest area is the *boreal* zone, the coniferous forest that includes most of Finland and much of Sweden and extends eastward as part of the Russian taiga; some currently treeless areas of Norway and Iceland are also termed boreal since human influence has eliminated the original vegetation. The naturally treeless mountain range of Norway and Sweden is identified as the *alpine* zone. Also shown are the glacial areas of Iceland and Norway.

Russia and the former European Soviet republics). Figures for the individual countries ranged from Iceland's very low figure of almost 267,000 citizens to the 8,770,000 people in Sweden. (For comparative data and figures, refer to Table 1 at the end of this document.)

Despite these favorable conditions, the nations of Norden still face a number of major and minor environmental concerns. During previous centuries, the limited environmental degradation that did occur was caused by local factors and conditions; now, however, industrial and nuclear pollution are transported and deposited across large regions by air and water. Since much of the pollution that impacts Scandinavia and Finland originates outside the region, the five nations (often acting jointly via the Nordic Council) have played a leading role in initiating and developing a number of international agreements and protocols to address these transboundary issues. Likewise, some of the environmental situations faced within the Nordic region itself—especially such as those associated with the protection of natural and cultural resources, with recycling, and with energy conservation—are among the most innovative in the world.

This document looks at the evolution of numerous environmental conditions in Norden or the Nordic states (Scandinavia will be used as a term only when Finland and Iceland are not included in the discussion). Following an overview of some historical examples, the majority of the discussion then features numerous contemporary environmental concerns and the solutions that have been developed or proposed to resolve them. In some instances the major responsibility for problems that affect most of the Nordic states, such as acid rain damage to lakes and soil and pollution of the Baltic and North Seas, originates elsewhere in Europe; in other cases, the issues are limited to the region itself or to a single Nordic country. This document obviously features the natural environment of Norden, but since cultural resource preservation is an important matter in all of the Nordic nations, programs that protect and manage the cultural heritage of the region are also discussed both in their historical and contemporary contexts.

The arena of environmental issues, problems, and politics is especially volatile and changeable, and new situations can emerge quickly. Given such an observation, it must be emphasized that the information presented in this document is current as of the mid-1990s, but new and unforeseen phenomena undoubtedly will affect environmental conditions throughout the Nordic region during subsequent years and decades.

## LANDSCAPE AND HISTORY

The Nordic environment consists of dynamic elements that have been in constant transformation over time due to climatic, ecological, and cultural processes. Nothing, however, did more to form the natural features of this far northern region of Europe than the numerous glaciers that moved over the region for thousands of years. Even as recently as 20,000 years ago, vast areas of the Nordic region were still covered under a massive ice sheet that reached several miles in thickness in some places.

When the glaciers of the last ice age started their northward retreat about 15,000 years ago, a landscape of tundra developed in their wake. As the climate grew warmer, herds of large animals—including musk oxen, bison, mammoths, and reindeer (the latter somewhat similar to the North American caribou)—moved into the region for the brief summer season, where they grazed on the arctic grasses, mosses, and lichens. Eventually, birches and pines appeared in present-day Denmark and far southern Sweden, followed by the arrival of beech trees and more deciduous species. In Finland and central Sweden, the first silver and white birches were evident some 10,000 years ago, predating the arrival of Scots pine by about 1,000 years. A noticeable increase in average temperatures 6,000 to 7,000 years ago led to the northward diffusion of small-leaved hazels, limes, oaks, and elms into southern Finland and Norway and along the Bothnian coastline of Sweden. It was only after the climate cooled down prior to 2000 BC that much of the vegetation of Finland, Norway, and Sweden was replaced by cold-tolerant spruces and conifers that invaded from the Russian taiga.



An illustration of a Stone Age cromlech near Haga, southern Sweden, 1870s. Such monoliths were built by Scandinavia's prehistoric peoples to serve as burial and grave sites. When observing these cromlechs and cairns in the late nineteenth century, an American traveler made the following melancholic remark: "Man comes, goes, and is forgotten; the tomb that is revered today by a whole people is desecrated by those who follow them in the wake of times" (Du Chaillu 292). The remains of similar sites still dot the landscape of Denmark and southern Sweden.

## From Stone Age to Viking Age

Small bands of hunters followed the mammals that moved northward into the Nordic region as early as 15,000 years ago, while fish and sea animals attracted other nomadic groups. (Later, wolverines, foxes, wolves, bears, hares, lynxes, and other species would arrive in the region.) The first people to populate Scandinavia lived along lakeshore settings in Denmark's Sjælland (Zealand) region and in the Skåne district of Sweden. The northern Norwegian coastline attracted hunters and fisherfolk (termed the Komsa culture) as early as 8,000 years ago; recent studies indicate that those early groups—the predecessors of today's Sámi or Lapp inhabitants—originated in northern Russia and moved westward to pursue the reindeer that inhabited the Arctic coastline. Present-day Finland also accommodated its first permanent inhabitants about 8,000 years ago.

## Early Settlements

The Stone Age (c. 7000-1500 BC) marks the time when small settlements were first formed in the Nordic region by people who grouped together for protection and to share in the activities associated with food production. Evidence of such settlements has been found in several areas of southern Scandinavia, including Langeland in Denmark and Södermanland in Sweden, and along the Oslo Fjord at Krakerøy. In northern Norway, Sweden, and Finland, Stone Age cultures developed significantly later and persisted for a longer period of time; one site in Arctic Norway (Karlebotn on the Varanger Fjord) was still in existence as late as 1250 BC.

### The Viking Colonization of Iceland and Greenland

Following the Viking discovery of Iceland during the mid-800s, the establishment of permanent settlements led, over the span of several centuries, to the deterioration of the island's fragile vegetative cover. Iceland's woodlands of birches and willows, which once covered one-fourth of the nation, were especially vulnerable. Initially the trees were cleared for timber, firewood, charcoal, farming, and grazing; but because of the cool climate and limited growing season, the replacement vegetation grew very slowly, and the coarse soils proved highly susceptible to wind and water erosion.

When the Viking colonization of Greenland commenced in 982, the settlers found valleys along the southern coastline that were covered with grass and sparse forests. Those settlements, however, disappeared by the 1400s, probably because of severe climatic conditions associated with the Little Ice Age.



Reconstructed Viking buildings at L'Anse aux Meadows, Newfoundland. Since many Viking colonies were situated in treeless areas that had rainy, cool climates, the building complexes reflected adaptations to local environmental conditions. The Viking colony in Newfoundland serves as an example: the walls of structures, especially those exposed to northerly winds, employed thick turf or layers of stone placed around an earthen core; entry doors often opened to the south or southeast; and the primary building was generally comprised of several compact, interconnected rooms used for different daily functions.

Although those early people exerted some impact upon local environments, a dramatic change occurred approximately 5,000 years ago when permanent agricultural settlements emerged in a few areas of coastal and southern Scandinavia. Those enclaves were the products of Stone Age cultures, but the traditional sources of food provided by hunting and fishing were then supplemented by the raising of some crops and domestic animals. It was also the period in which humans started to leave a permanent imprint, albeit limited, upon the landscape of the region. Slash and burn practices (also called *swidden*) were employed to carve clearings out of forests, with the openings being abandoned when their productivity was exhausted; livestock grazed on the cleared areas and were maintained in enclosures.

The Bronze Age (1500-500 BC) was a period of deteriorating climatic conditions in the Nordic region. Nonetheless, it is believed that advances in agriculture continued throughout the period, followed by even further expansion in farming and the intensification of settlement activities during the Iron Age (500 BC-AD 800).

In Danish Sjælland and Jylland (Jutland), as well as southern Sweden, the dispersed Iron Age villages included cultivated land situated by the settlements (the infield), while woodlands and common grazing areas were located farther away (the outfield). The infield was divided into long narrow strips that allowed each family unit to have a share of the various crops on both good and bad soils and to have generally equal access to meadow, grassland, and forest. As the population increased, more land was farmed, and fields were divided into smaller and smaller strips. It was also during the Iron Age that the benefits of fertilizer were recognized as cattle manure was applied to the fields. In Norway, where individual farms were more common than villages, forests were burned to create clearings, and low stone walls were constructed around their perimeters.

By the end of the Iron Age (c. AD 800), larger settlements were evident in southern Scandinavia. Grøntoft, a village in Danish Jylland, illustrates how people adapted to the environment in which they lived. Enclosed by a wall or palisade, Grøntoft included several longhouses that accommodated both humans and cattle; when local resources were depleted, the village was moved to a new site, a practice that allowed it to exist for close to 300 years.

During the Viking Age (AD 800-1050), the settlement frontier advanced northward and into the interior of Scandinavia; in addition, the Vikings' trading and pillaging forays extended well beyond Scandinavia's borders. Because of local population pressures, a number of Viking agricultural enclaves and settlements were established in some conquered areas. Permanent colonies emerged in Iceland and on the Shetland and Faeroe Islands, whereas temporary settlements developed as far west as Greenland and Newfoundland in North America.

### The Pre-Industrial Era, 1050-1850

During the early Middle Ages somewhat more pressure was placed upon the environment of Norden than formerly, but only in isolated areas and in limited amounts. When cattle and sheep were threatened by predators in Sweden, for example, local peasants were required to participate in regular hunts for bear, wolf, lynx, marten, and fox.

Certain waterways in the Nordic region were used to power grist mills as early as the 1200s, whereas sawmills appeared two hundred years later. A Swedish law regulating the construction of mills and other structures along waterways was implemented in 1734 and was also enforced in Finland—where it was not superseded until 1902.

By the 1500s and 1600s, tall pine trees were cut and used in Sweden and Finland for the masts of sailing ships; tar was derived from pine stumps, and potash was distilled from birchwood. Because the pines proved so valuable, a law passed in 1647 decreed that trees suitable for ships' masts were part of the Swedish royal domain. (Oak trees were so prized for shipbuilding purposes that they virtually disappeared from many areas of the Nordic region.) By the mid-1600s, though virtually all of Sweden was still covered by vast forests, the demands for timber often exceeded the new growth that occurred by natural regeneration. One century later, all unsettled land within the Swedish realm was declared to belong to "God and the Crown"; that decree led to the development of the state-owned forests that still exist in both Sweden and Finland.

The recognition that Denmark's forests were over-harvested and over-grazed was evident by the late 1700s. In 1805, when forests covered only two percent of the country, the nation's first Forestry Act was passed. The act called for the construction of stone walls around the best forest stands and also placed a ban on the grazing of animals in forests. The law established the principle of *fredsskov*—the obligation to keep designated areas forested forever, by replanting such areas after harvesting. As many historical landscape features were disappearing with increasing frequency, a romantic appreciation for the Danish landscape emerged. In 1820, several artists and scientists recommended that conservation efforts be implemented in Denmark; their recommendations were followed by the designation of the nation's first scientific area: a peat bog.

While most of the environmental change that occurred in the Nordic region prior to the 1850s was limited to local areas, some impacts were visible on a regional scale. As revealed by the ensuing case studies, which feature the Danish heath and the burnbeating of forests in Finland, such activities were linked to the agricultural requirements of an expanding population.

### Early Iron and Copper Production in Sweden

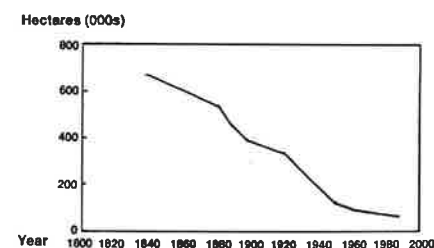
Iron production extends back to prehistoric times in parts of Scandinavia, but the most significant activities commenced about AD 1200 in the Bergslagen region of central Sweden. By 1830, some 600 iron furnaces and foundries, employing 8,000 people, were situated in Sweden, with Bergslagen being responsible for 85 percent of all production. Today, the waste heaps dumped on nearby land areas as long as eight hundred years ago continue to serve as localized sources of pollution. Sweden's nearby Falu mine, once the largest producer of copper in the world, has had similar impact. When famed Swedish botanist Karl Linnaeus visited the site during the eighteenth century, he reported that nearby vegetation had been damaged by the smelter.



Blacksmith's hut and tinning shed in the former foundry village of Fagervik, Finland. The demand for charcoal in Sweden's industrial areas often contributed to the exhaustion of nearby forests. Between the 1500s and 1800s, iron ore from Bergslagen was shipped to other areas of Sweden for smelting and, beginning in 1646, even to settlements situated as far away as Fagervik, Finland, where forests were available. Manufacturing ended at Fagervik in 1902; today it is a museum that serves as one of Finland's best-preserved early industrial enclaves.



The Jylland heath in 1800. At the beginning of the nineteenth century, the heath covered approximately 1,975,000 acres (800,000 hectares) of land in Jylland alone, or about forty percent of the entire peninsula. There also were close to 245,000 acres (100,000 hectares) of heath bogs and moors and 155,000 acres (63,000 hectares) of dune areas.



Decline of the Jylland heath, 1822-1990.

### The Heath: Early Environmental Change in Denmark

Denmark's natural landscape, more than that of any other Nordic country, has been transformed into a cultural landscape that reveals only traces of its original character. The Danish heath is certainly one of the region's earliest examples of extensive environmental modification, and it serves as a clear example of how human activities have changed the appearance of the country over time.

The origins of this landscape transformation may be traced back some 5,700 years, when the grazing of domestic animals in the forests of western Jylland created areas under a tree canopy that were devoid of any vegetation. Soon the heather plant began to spread throughout the sandy soils of the region.

As population pressures became more evident, the growing of crops was attempted on the heath. The overutilization of the coarse, sandy soils led to the washing out of vital nutrients and the forming of a hard layer below ground (*allaget*). Since only very hardy plants, such as heather, could grow in those areas, grazing became the dominant land use, which only contributed further to the destruction of the tree cover.

After some time, a local culture developed in western Jylland that was based on maintaining a delicate balance between a limited hay supply and the dominant heather. Heather was used in many ways—as a building material, as a heating source, and as fodder. The ashes from burned heather even supplied fertilizer for the few agricultural plots that the farmers developed.

Since farmers who resided on the heath were extremely poor and isolated, the Danish government made several efforts to settle vast areas of the region. In the 1760s, a plan was prepared to accommodate 10,000 German colonists in large geometrically designed villages. About 300 families from a fertile wheat region of Germany arrived, but ten years later only 60 families remained (all of whom were trying to grow potatoes). The plan had failed because of a failure to understand the nature of the heath and its limited resources.

During the late 1700s, a number of land reforms (referred to as the Enclosure Movement) changed the overall pattern of ownership in the region and throughout Denmark. Many farms were dispersed from villages into the countryside on comprehensive tracts of land. Nevertheless, the heath continued to demonstrate limited potential and was primarily used for sheep grazing purposes, which once again kept the area from being reforested. Only the poorest and outcast members of society found a home on the heath.

The heath was virtually a forgotten region of Denmark until the early to mid-1800s. At that time Denmark was in a state of crisis due to military defeats, the loss of large land territories (such as Norway in 1814), and numerous financial difficulties. In searching for a renewed national identity, attention was given to Denmark's past. The extensive

heath, with its mysterious cairns and burial mounds, was viewed as a relict of former glory, and writings about the heath by Steen Stensen Blicher (1782-1848) and other authors brought increased attention to the area.

In 1864, Denmark lost a large portion of southern Jylland to Germany; the Danes also faced political and social unrest, continued financial problems, and major structural changes in agriculture. Since the lost farmlands were some of the most fertile areas of Denmark, the reclamation of the heath was viewed as a common task that would unite the troubled country. It was in such a context that Enrico Dalgas (1828-94) founded the Danish Heath Society (*Danske Hedeselskab*) in 1866 to reclaim the lost lands within the country by improving the heath. The reclamation effort, however, was driven more by ideology than the direct need for farm products, since inexpensive wheat soon began to arrive from the United States. Mobilizing both public and private support, the Heath Society initiated a major reclamation effort. Ideological support was combined with scientific analyses of the physical environment and was supported by new technological advances. The hard nutrient layer below the surface was broken up, limestone was applied, shelter belts were planted to protect the soils from the strong westerly winds, wetlands were drained, dry areas were irrigated, and hardy crops, such as potatoes, were planted. Slowly, small parcels of the heath were reclaimed as farmland or forest.

Reclaiming the heath was not easy, since much effort was required to undertake and complete the task. Supplementary income provided by the planting projects, however, allowed local farmers to better their conditions, and infrastructure improvements facilitated the sale of agricultural products. Around the dawn of the twentieth century, the Heath Society had lost its grass-roots' character and evolved into an efficient, semipublic institution that was driven by technical and economic interests rather than by social concerns. The heath was disappearing quickly, and only the most marginal areas remained.

The heath had advanced slowly because of agricultural practices and overutilization for thousands of years. The extensive heath area had developed its own flora and fauna, which was now diminishing along with its unique social culture. The folk tales and superstitions linked to those barren lands, along with the landscape beauty of the purple expanses during the flowering season, were disappearing.

As reclamation activities progressed, many artists and poets—among them Jeppe Aakjær (1866-1930), Hans Christian Andersen (1805-75), and Steen Steensen Blicher—praised the unique character of the heath and worked for its protection. Though Enrico Dalgas had viewed the reclamation of the heath as supporting local communities through the improvement of living standards, Aakjær believed that reclamation only directed attention away from the real issue of social justice. He advocated that the remaining heath be



The extent of the Jylland heath as it appeared about 1940. By that time, the area of the heath had declined to 640,000 acres (259,000 hectares) of land. Only 173,000 acres (70,000 hectares) of heath remained by the mid-1990s.



Randbøl Hede, one of the few remaining areas of heath in Jylland. The site is located west of Vejle.



A reclamation stone in Kongenshus Memorial Park (Kongenshus Mindepark), just southwest of Viborg in Jylland. During the 1950s, when very little of the Danish heath remained, one area was turned into a park to preserve its history and to document the efforts that had been pursued to reclaim the heath. Several stones—each representing a parish—have been erected in the park. Each stone includes a poem, written in dialect, and circular diagrams that indicate how much of the heath was reclaimed between 1850 and 1950.



Burnbeating in Iisalmi, the Finnish Province of Savo. The 1873 engraving of eastern Finland was based upon a painting by Finnish artist Berndt Lindholm (1841-1914).

protected and opened to the public—something which was finally achieved in 1950.

Ironically, the protection of the heath at least partially accelerated its disappearance. When agricultural uses were ended by conservation practices, pioneer trees slowly invaded the heath and the vegetation changed. Now, close management is needed to maintain these historical areas. Sheep grazing, mechanical harvesting, and occasional burning are used, but it has been found that the areas are quite unstable because the nutrients found in air pollution help to fertilize the soils. In some areas, recent efforts have sought to convert farmland back into heath, but the success of those activities has been limited. It now may be necessary to accept the heath as an early historical land-use artifact.

#### Burnbeating in Eastern Finland and Elsewhere

For centuries, various forms of burnbeating or shifting cultivation were used throughout much of Norden to clear land, but the practice was employed most extensively and rigorously in eastern Finland. Indeed, the people of eastern Finland (*Karjalaiset* and *Savolaiset*) eventually would extend their influence into areas of Sweden, Norway, and even Colonial America.

When compared to other areas of Europe, most of Finland may be considered little more than marginal for farming purposes; but conditions in the eastern regions of Savo and Karelia, situated at the very margin of Europe's agricultural frontier, are even more precarious. The soils are thin and stony, and the entire region is linked together by a massive system of lakes and marshes. Farming activities in such a difficult region have always demanded a significant amount of effort by local agrarians.

It was in such an environment that eastern Finns developed their two primary systems of burnbeating: *huuhta* and *kaski*. By the eleventh or twelfth centuries, *huuhta* was employed in Karelia when inhabitants cut down or girdled coniferous trees that were then burned; the larger boulders and tree stumps were removed, and the surface was plowed with a wooden, hooklike tool. Rye was then planted in the ashes. The period between cutting and burning allowed the decaying material to be converted into nutrients, while burning reduced the acidity of the soil and permitted the rye to utilize the nitrogen. Ten- to twentyfold increases in rye production were reported—yields that virtually duplicate the output of modern-day farming—but new clearings had to be prepared regularly. Not only did this form of shifting cultivation require tremendous expenditures of labor, but it also demanded large areas of land: only one net hectare of tilled land was secured from thirty hectares of forest.

*Kaski*, the other primary form of burnbeating that the Finns utilized, was practiced in areas with deciduous trees. Often, those trees had replaced the conifers previously cleared by farmers who had engaged in *huuhta* cultivation. Rye, bar-

ley, oats, flax, and turnips were planted on newly cleared land, which could support cultivation for two to three years.

When combined with their hunting skills and highly mobile lifestyle, the practice of *huuhta* made the farmers of eastern Finland especially well suited for forest pioneering. Around 1400, the Karelian population was expanding to the point that significant amounts of additional land were needed for burnbeating. Soon Karelians were moving into the adjacent Savo region; and by 1550, Savo-Karelians had spread throughout much of interior Finland. In just three-quarters of a century, farming and settlement activities pushed forward almost two hundred miles. "Never before, anywhere in the world," one recent account observes, "had an agricultural frontier advanced so rapidly" (Jordan and Kaups 48).

From 1570 to 1650, following an invitation from Swedish King Gustaf Vasa, Finnish colonists emigrated in significant numbers to the interior reaches of Sweden to exploit the "useless forest." The Swedish Province of Värmland, which may have had 6,000-9,000 Finnish residents by the late 1600s, served as the destination point for the greatest number of arrivals. Finns also spilled over the Swedish border into the "Finns' Forest" (*Finnskog*) of southeastern Norway, where they established a viable ethnic identity.

Whereas Swedes and Norwegians had previously settled along the stream corridors and lakes of interior Scandinavia, the coniferous forests between the valleys still remained empty until the 1600s. The Finns moved quickly into those areas, establishing numerous enclaves where they hunted, grazed cattle, and planted and sold rye that had been claimed from burned clearings situated along rocky hillsides. The efficiency of the Finns, in claiming the virgin areas, in pursuing their hunting activities, in utilizing the meadow pastures, and in flooding the markets with rye, soon led to conflicts with the Swedish crown and other local farmers. In 1641, burnbeating was forbidden by royal decree in Sweden and was followed by the implementation of comprehensive forestry acts; but only mixed results were achieved for many years thereafter.

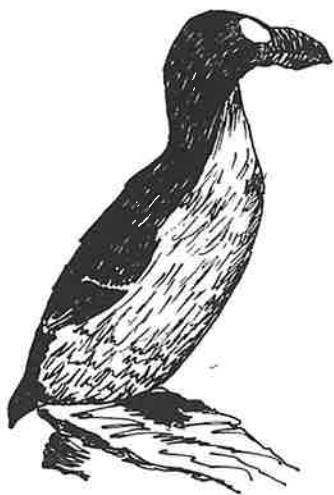
Slash and burn cultivation, when combined during the eighteenth and nineteenth centuries with the export from southern and central Finland of timber for shipbuilding purposes, contributed to some reduction in the Finnish forest cover. Nevertheless, British geographer William Mead has stated (98) that while burnbeating, charcoal burning, and pitch and tar manufacture affected Finland, as well as Sweden and Norway, "the absolute scale of human attack on timber was not so great as to be of national consequence." (A quite different situation characterized Denmark and Iceland.) The extent of the coniferous forest in the northern reaches of the Nordic region simply was so vast that the negative and permanent consequences of burnbeating and related activities were limited to specific areas and districts. Once new technologies for large-scale forestry were applied many years later, new woodland conservation policies, were, however, required.

#### Burnbeating in Colonial America

In 1638, some Finns from Sweden's Värmland district were both recruited and forced by the Swedish crown to settle New Sweden (*Nya Sverige*), the colony situated along the Delaware River in eastern North America. Though control of the small Swedish settlements was later assumed by the Dutch in 1655 and then by the British in 1664, the number of Finns generally exceeded the Swedish population throughout the entire period. Once again, the Finns were able to pursue burnbeating and shifting cultivation, but this time their endeavors occurred in the wilderness of America. A recent study (Jordan and Kaups) even argues that Finns played a major role in the emergence of the backwoods culture that was such an important factor in the subsequent development of the American frontier.

#### The Draining of Lake Hjälmaren

The extensive drainage of meadows, marshlands, and lakes for agricultural purposes was initiated in Sweden and Finland during the nineteenth century. One of the most far-reaching drainage efforts undertaken anywhere in Europe occurred at Lake Hjälmaren, a large body of water situated in central Sweden. Plans to regulate the lake were proposed in 1849, followed by the allocation of funds from the Swedish Parliament over several subsequent decades. The amount of arable land increased by 40 percent, and grain production grew noticeably, but the overall drainage effort proved four times more expensive than initially envisioned. Eventually, the continuous plowing of the former lake bottom contributed to the oxidation and shrinkage of the soil and the reappearance of high water. Since it was so difficult to control the water levels, all farming efforts had terminated by the 1960s.



The Saga of the Great Auk  
(*Alca impennis*).

The protection of some endangered animals and plants occurred in the Nordic region by the turn of the twentieth century, but such actions took place only after several species had been eliminated or placed under serious threat. The story of the Great Auk in Iceland demonstrates how the extinction of a species can occur.

After Iceland was settled during the Viking Age, the rich marine life surrounding the island provided important natural resources for the nation's people; in addition, the meat, eggs, and feathers provided by large sea bird colonies inhabiting the Icelandic region were of considerable importance to local populations. Among these species was the Great Auk, a heavily hunted species highly prized for its tasty and nutritious meat. The domain and breeding ground for the Auk stretched across the North Atlantic region from Canada's Newfoundland and Labrador to the British Isles. Though it was about 27 inches (70 centimeters) tall, the Great Auk had a wing span of only 25 inches (62 centimeters), and hatched but one egg per year. Since it could not fly, the Auk was easy prey for humans and served as an important source of food for early fishermen who journeyed from Europe to the banks of Newfoundland.

Sometime between 1800 and 1825, the Auk was hunted to extinction in North

## The Industrial Era, 1850s-1950s

When compared to previous centuries, the period from the 1850s to the 1950s was characterized by an increasing number of environmental problems, many of which were associated with population growth, industrialization, new technological developments, and the loss of plant and animal species.

Sweden's first public health ordinance, enacted in 1874, sought to reduce hazards associated with the disposal of municipal waste. By the 1890s, emissions from some urban factories were already so great that debates over air and water pollution occurred regularly in the Swedish Parliament during the 1902-08 interim. Opposition from industry, however, did not allow any protective measures to be adopted, and a status-quo situation generally prevailed until the environmental awakening of the 1960s.

In Denmark, water pollution contributed to conflicts among various interest groups as early as the mid-nineteenth century. Danish biologist Wesenberg Lund had pointed out already in 1915 that the aesthetic and productive attributes of many lakes were affected by the dumping of factory wastes; his observations, however, had little influence upon Danish society or politics.

The environmental regulations that did emerge in response to certain Nordic concerns during the latter nineteenth century were highlighted by programs that featured forest and nature conservation. Some of those programs placed the Nordic states at the forefront of international activities that featured environmental awareness. Activities associated with the protection of rural farm buildings in open-air museums, which were pioneered in Norden at the turn of the nineteenth and twentieth centuries, also served as a model for other nations that engaged in cultural resource preservation.

### Nature Protection

It was nature protection—accomplished primarily through the designation of national parks and the imposition of hunting and trapping regulations—that most clearly distinguished the environmental agenda of the Nordic nations during the late nineteenth and early twentieth centuries. Such measures became law once it was recognized that several outstanding natural and scenic areas were threatened or that a number of animal and plant species were endangered or already extinct. Norway, for example, became the first Nordic country to protect an animal species when its Parliament passed legislation to end the hunting and trapping of beaver in 1899. Elsewhere in Europe the animal already was extinct, and it had been virtually eliminated in Norway. Eventually the animal thrived to such an extent that Norway has been able to export beaver to other European countries, where the animals are being re-established in their former habitats.

One of the Nordic region's earliest landscape protection measures occurred in 1840 when the Imperial Senate of Finland issued a decree to curtail all logging and burning in the forests of Punkaharju—a unique and beautiful esker located in the eastern area of Russia's Grand Duchy—and to designate the geological feature a "Crown Park"; the Czar confirmed this action two years later. The Imatra Rapids of southeastern Finland also became a Crown Park in 1842, and the Aavasaksa fjell or peak of Lapland received similar designation in 1877. During the 1880s, famed explorer-scientist A. E. Nordenskiöld had issued a call for the designation of national parks in Finland, but throughout the remainder of the nineteenth century only a few scattered areas deemed important for tourism purposes and nature protection were acquired. It was not until 1912 that Finland's National Board of Forestry established its first forest nature reserve—Pyhä-Häkki (in Finnish, "holy pen"); four years later the Malla Strict Nature Reserve was established in the Province of Oulu. A 1917 request by a national scientific society for the implementation of a Nature Conservation Act was passed by the Finnish Senate in 1923. The law continues to remain in force, protecting several bird species, some animals, rare species of plants, and certain landscape features.

It was Sweden that led the Nordic and European nations in enacting legislation for the successful designation of national parks. During the late nineteenth century, Swedish scientists called for the protection of selected natural areas throughout the country, as did members of the nation's tourist association. In 1904, the Swedish Academy of Sciences established a Committee for the Protection of Nature and requested that this group develop proposals for national parks. In 1909, the same year that the Swedish Conservation Society (*Svenska naturskyddsforening*) was established, a national park law was enacted. (By then, Yellowstone in the United States had been designated as the world's first national park for several decades.) Between 1910 and 1921, eleven national parks were formed in Sweden; several included virgin forest and wilderness, but those areas were quite modest in size. Prior to 1942, another five national parks were added to the Swedish list.

The Norwegian Mountain Touring Association, founded in 1868, sought to make the country's mountains accessible to all citizens and to preserve waterfalls and establish national parks. In 1910, the Norwegian Parliament passed the nation's first Nature Protection Act, decreeing that "certain natural phenomena or places shall be preserved when it is necessary to protect wild plants or animals, geological and mineralogical formations, if such preservation is in scientific or historical interests." The primary purpose of the law was to give protected status to a number of very fine trees, some plant species, and a few small areas of the countryside such as Fokstumyra, a nature and bird sanctuary on Dovre Mountain. As early as 1914, however, the Norwegian Society for the Conservation of Nature (*Norges Naturvernforbund*) recognized that the 1910 law was too limited and initiated a call for the establishment of large wilderness

America, while a similar situation occurred on the Faeroe Islands in 1800, Greenland in 1815, and the British Isles in 1821. As the Great Auk became ever rarer and was limited to the Icelandic area only, demands for the bird increased, primarily as a precious collectors' item. Between 1831 and 1840, some ten birds were caught on the islands just southwest of Iceland and sold to collectors and natural history museums. The world's last two Great Auks were caught in 1844 on the island of Eldey; both specimens are now deposited in Copenhagen's zoological museum.



Punkaharju in eastern Finland. In 1842, Punkaharju became Finland's first Crown Park. The geological feature is an outstanding example of an esker—a long, narrow, winding ridge of sand and gravel that was deposited in the beds of streams that flowed through or beneath glaciers.



Hikers at Sulitelma, a mountain in Norwegian Lapland, 1870s. The nineteenth-century accounts by such foreign travelers as American Paul B. Du Chaillu made Norway's outstanding natural features familiar to people throughout the world.

#### The Origins of Forest Conservation in Sweden and Finland

As early as the 1500s and 1600s limited efforts were made to protect the forests of Sweden. Many of those laws were also carried out in Finland and continued to be enforced even after Swedish domination ended in 1809.

By the 1850s, forest exports from Sweden were demonstrating a marked increase, primarily because of major reductions in British tariff duties. As Sweden faced the depletion of its primeval forests, a central board was developed in 1859 to monitor the nation's public reserves. When it was clearly recognized that natural regeneration was inadequate to replace the harvested timber, national legislation passed in 1903 required that trees be replanted in areas where felling had occurred.

In addition to forestry laws enacted in Finland during the period of Swedish rule, a few measures were implemented after Russian Czarist domination commenced in 1809. The Finnish Forestry Act of 1886 sought to limit the wasteful use of forests and to develop fire protection measures, but exploitive tar production and the selective cutting of large trees rendered the law quite meaningless for many years. Once the economic value of timber resources for pulp and paper production was established during the late nineteenth century, however, protection and production measures received even greater legislative attention. The Finnish Forest Research Institute, established in the year that Finland achieved independence (1917), initiated the world's first nationwide forestry inventory. Since the time of the earliest inventory, conducted in 1922, such assessments have been instrumental in developing forest management techniques that are based on sustained yields and production. Finland's Private Forestry Act, passed in 1928, prohibited the devastation of forests on individual land holdings and provided regional and municipal forestry boards with powers to direct and oversee forest management.

areas. Nevertheless, it was not until 1962 that an area of the Rondane Mountains achieved designation as Norway's first national park.

In Denmark, the extensive drainage of wetlands commenced during the 1800s; by the end of the century, wildlife and habitat losses were so great that a number of species faced extinction. Concern over those losses led to the implementation of Denmark's initial hunting law in 1894. The Danish Conservation Society was founded in 1917, but its agenda was directed more toward recreational issues than to environmental concerns; nevertheless, the organization laid the foundation for the Nature Conservation Act, also passed in that year. That act established a unique principle for nature protection that is still important in Denmark. Instead of expending public funds to gain title to a few key areas, the law seeks to gain public access rights to private lands by providing the owners with monetary compensation.

#### The Right of Public Access

The "Right of Public Access" is an especially unique and important privilege with environmental overtones that has played a centuries-long role in Sweden, Finland, and Norway. This concept (termed *allmansrätten* in Sweden, *allmannsretten* in Norway, and *jokamiehen oikeus* in Finland) is unique to the world. Although the right of public access varies slightly from country to country, people are basically given permission to walk, ski, or cycle freely through the countryside regardless of property ownership; to swim and sunbathe along the shorelines of waterways; and to pick and collect berries, mushrooms, and small pieces of wood from the forest.

Public access rights may be traced back to the Middle Ages, when population numbers and densities in Sweden, Finland, and Norway were extremely low. When people traveled from one area to another, survival in such isolated settings required the liberty to use local forests for food and shelter. *Allmansrätten* is not defined by a legal framework in Sweden, although a special law implemented in 1952 limits the rights of individuals to build on the shorelines of lakes, seas, and streams so as to reserve the areas for bathing and other outdoor pursuits. Of the Nordic countries, Sweden has the most liberal public access traditions.

Since Finland was an integral part of the Swedish realm until 1809, public access rights also date back to the medieval period. Campers and hikers in Finland enjoy the same privileges as they do in Sweden, but landowners have somewhat more authority to limit certain activities. The Finnish concept of *jokamiehen oikeus*, for example, legally restricts movement through fields during the growing season and through the gardens and on the grounds of private homes.

In Norway, a comprehensive law for the ancient right of *allmannsretten* was enacted in 1957, primarily to resolve conflicts between farmers and recreationists. This law, the Outdoor Recreation Act, is unique to the Nordic countries in that it

distinguishes between two major types of land use: *innmark* and *utmark*. *Innmark*, or "in-land," includes areas that are employed to support human life, such as gardens, yards, cultivated fields, and pastures, whereas *utmark* refers to unused lands. Access is unrestricted on uncultivated land, but is regulated to some extent on cultivated land. Easily accessible information is distributed throughout Norway to educate people about their public access rights and responsibilities; when disagreements occur between the public and a landowner, the dispute is resolved by the Norwegian Outdoor Recreation Board or the Agricultural Board.

Since the number of natural areas in Denmark is relatively limited, the right of public access does not exist as it does elsewhere in Norden; nevertheless, a number of public and private lands may be utilized for recreational purposes. Access by foot is possible to all Danish public forests, beaches, dunes, and unfarmed public lands, as well as to all private forests larger than five hectares in size, and to private, unfenced, nonagricultural lands. Movement on private land can occur from 7 a.m. to sundown only, and the stays must take place more than 150 meters from buildings. Revisions to the Nature Protection Act have expanded recreational access and seek to minimize visitor-landowner conflicts.

In Iceland, where there are expansive areas of undeveloped but fragile land, a much more limited application of public access exists. Unrestricted camping and hiking, however, are permitted in areas that are uncultivated, less ecologically sensitive, and not restricted by legal constraints. A 700-year-old law also allows anyone to pick as many berries as she or he can eat on the spot.

#### Cultural Resource Preservation

Other than Iceland, all of the Nordic nations were preserving examples of folk architecture and culture by the late 1800s and early 1900s. Notable buildings and artifacts associated with the royalty and church had been protected for centuries in the region, but the Nordic states led the world in preserving and explaining typical buildings and everyday artifacts.

In the 1870s, Artur Hazelius, a Swedish scholar and folklore enthusiast, expressed concern over the significant changes that industrialization was bringing to the nation's rural areas and countryside. Soon, Hazelius started collecting representative examples of crafts and daily items that featured the lifestyles of Sweden's "ordinary" people. The collections that Hazelius was gathering were first put on public view in Stockholm's Nordic Museum (*Nordiska Museet*) in 1873. In 1891, a number of rural buildings and farmsteads were moved from different regions of Sweden to the island of Djurgården, located close to the Nordic Museum. The new open-air museum, called Skansen ("Small Fort"), eventually included several old urban structures from a southern district of Stockholm.

In 1885, twelve years after Sweden's Nordic Museum opened, the Danish Folk Museum was developed in Copenhagen; it was



The right of public access allows residents of Sweden, Finland, and Norway to pick berries and mushrooms from the forest, pursue recreational activities in the countryside and mountainous areas, and utilize the shorelines of waterways for swimming and sunbathing.



Folk building at Skansen, the open-air museum in Stockholm. Following the emergence of Skansen in 1891, similar collections of folk buildings and artifacts were organized in Denmark, Norway, and Finland; later, open-air museums emerged in most European countries, as well as North America and Asia. Today, *skansen* is a term used by specialists throughout the world to describe the concept of preserving and interpreting historical cultures and environments in outdoor museum settings. North of Budapest, for example, 300 buildings from ten regions of Hungary are being assembled at "Skansen Folk Village."



A traditional kiln-house from the Færoe Islands, on display at Frilandsmuseet in Lyngby, Denmark. The building was used to dry the minimal amounts of barley formerly grown on the Færoes.



Rural building complex at Maihaugen, an open-air museum in Lillehammer, Norway, which opened in 1903. Maihaugen receives international attention for its displays and interpretation of folk culture from the region of nearby Gudbrandsdalen.



The source of the Imatra Rapids in Finland, as illustrated by artist Berndt Lindholm during the 1870s. In the 1920s, the large flow of water was reduced significantly by the construction of a hydroelectric plant. The facility was built even though Imatra had been decreed a Crown Park in 1842 and was regarded as one of northern Europe's most spectacular natural features. (Also see the illustration on the cover of this document.)

followed, in 1897, by the establishment of a small collection of rural buildings in the city's royal gardens. When the site proved too limited in size for expansion, The Open-Air Museum (*Frilandsmuseet*) was moved to a royal residence near Lyngby, a settlement situated outside of Copenhagen. Opened in 1901, the museum at Lyngby is noted for its recreation of cultural landscapes that closely reflect the settings in which the structures originally stood.

In 1894, the Norwegian Folk Museum (*Norsk Folkemuseum*) was established at Bygdøy, an area of royal land located near Oslo. An open-air museum opened in 1902, although the nucleus for such a facility was established already in the 1880s when a stave church in rural Gol was threatened with demolition. After King Oskar II had the building moved to Bygdøy, other examples of rural folk architecture were relocated in the royal domain. The open-air museum at Bygdøy now contains buildings and farmsteads from throughout Norway, including some of Europe's oldest wooden structures, and also displays several buildings from urban Christiania (now Oslo).

The National Museum of Finland, located in Helsinki, was organized in 1893. In 1909, an open-air museum was established at Seurasaari, a protected island on the periphery of Helsinki and noted for its outstanding displays of old trees and moss-covered, granite rock outcroppings. The buildings at Seurasaari Open-Air Museum (*Seurasaaren ulkomuseo*) come from throughout the country, ranging from southwestern Finland into far northern Lapland and even to a distant area of eastern Karelia that was lost to the Soviet Union in 1945.

In Iceland, it was not until 1957 that an outdoor folk museum, the Árbær's Collection (*Árbæjarsafn*), was developed near Reykjavik. Built around the old farm of Árbær, which dates back at least to 1464, the museum provides visitors with insights into Iceland's past. The museum also presents information on Reykjavik's cultural, architectural, and town-planning history.

#### The 1920s-50s Interim

Despite the promising start in natural and cultural resource protection that was demonstrated in Norden during the late nineteenth and early twentieth centuries, only a limited amount of environmental legislation was passed from the 1920s to the mid-1950s. Throughout that period, the Nordic governments generally gave greater attention to the expansion of social welfare, housing programs, and industrial development.

In Norway, drastic modifications in the scenic and environmental qualities of many waterfalls occurred when the waterways were harnessed to power hydroelectric stations. Another telling example of such pro-development policies occurred in Finland when the Imatra Rapids were harnessed. The promising start in nature protection that had occurred during the second decade of the century failed to continue in Finland, and few new environmental proposals were considered. It was not until 1938, following the passage of the Act on the Establishment of

Nature Reserves on State-Owned Land, that four national parks and six nature reserves were established in Finland; unfortunately, three of the areas were lost during the early 1940s when Finland was forced to cede some of its eastern and southeastern land to the USSR. One law enacted during those years, Finland's Neighborhood Act, was unique because it responded to the problem of the malodorous gases emitted by chemical pulp and paper mills. The act gave home owners the right to appeal if they were affected by the noxious odors of such processing operations.

During the 1940s and 1950s, Ragnar Sernander, a Swedish plant scientist and long-time president of the country's Conservation Society, recommended that the nation's natural areas be protected purely for scientific reasons. Governmental agencies and bureaucrats, however, favored a more managerial approach to balance the demands of various interest groups. Thereafter, groups, such as the Conservation Society, were allowed to perform an official role in the formulation of environmental legislation, as in the debate that preceded enactment of a new Swedish Nature Protection Law in 1953.

In Denmark, a second Nature Conservation Act was passed in 1937. The primary objective of the act was to control urban sprawl and to establish setback lines for new building construction in coastal areas (100 meters) and forests (300 meters). During the 1950s, additional regulations were made in recognition of the need to establish more comprehensive tools for landscape analysis and planning to guide growth and development.

#### THE "NEW ENVIRONMENTALISM" IN THE NORDIC NATIONS THE 1960S TO THE PRESENT

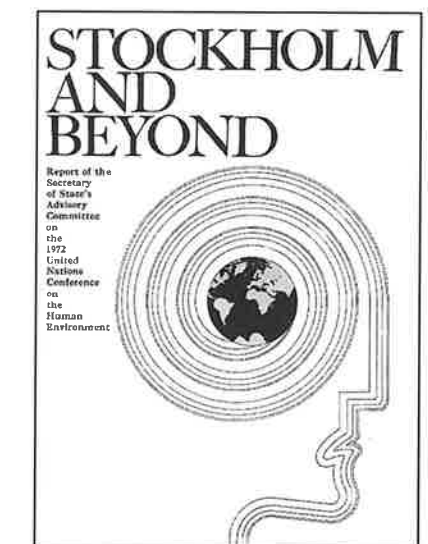
The 1960s are well known as the time when a growing sense of environmental awareness and action emerged throughout much of the Western World. The burgeoning movement, often termed the "new environmentalism," had significant consequences for the Nordic nations. In fact, the Nordic states often assumed a leading role in the international environmental movement, a position they have maintained to the present.

#### Nordic Contributions to International Awareness

As was true throughout much of the Western World, American scientist Rachel Carson's 1962 landmark book, *Silent Spring*, exerted an immediate impact upon Nordic scientists and decision makers. One year after the publication of *Silent Spring*, the Swedish Society for the Conservation of Nature organized a conference on the existence of hazardous materials in the environment; Carson's concerns over mercury pollution received special attention because the substance was widely used in the nation's pulp and paper industry. By 1967, much mercury use had been banned in Sweden, and plans were made to remove exist-

#### Environmental Commentary by Swedish Writers, Poets, and Scientists

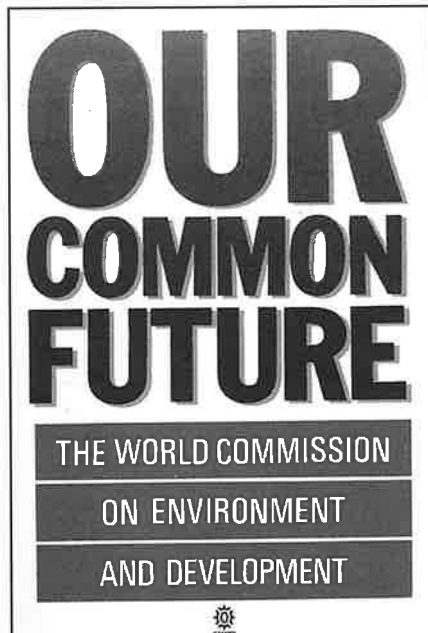
Several Swedish scientists and writers were among the first individuals anywhere to warn of the potentially harmful effects of chemicals upon the environment. The feminist writer Elin Wagner (1882-1949), in 1941, adopted an ecofeminist message in her book *Väckarklocka* (Alarm Clock), whereas agricultural chemist Georg Borgström (b. 1912), as well as poet Harry Martinson (1904-78), the Nobel laureate, published several books and articles during the 1950s that featured environmental scenarios. Borgström's protests about packaging and chemical applications in food production eventually led to his dismissal, in 1955, as head of the Swedish Institute for Food Preservation Research. A recent review claims that Borgström simply was too much a "public scientist" for the political culture of Sweden to accommodate at the time (Jamison et al.). Borgström subsequently moved to the United States, where he continued his career as a distinguished research scientist.



Cover of the report prepared by the US State Department as part of the American contribution to "Stockholm 72," the UN Conference on the Environment. It marks the first time that many nations developed comprehensive positions on environmental issues.



Norwegian Prime Minister Gro Harlem Brundtland, campaigning in Lillehammer, 1991. Before becoming prime minister, Brundtland served as Norway's first minister of the environment.



Cover of *Our Common Future*, the UN report published in 1987 by Oxford University Press. The "Brundtland Report" was hailed by the *Washington Post* as "one of the most ambitious and unusual programs ever devised for halting the deterioration of the world environment."

ing traces of the substance from lakes and rivers. The poisoning of birds, the contamination of fish, and the accelerated transformation of fresh water bodies into marshlike areas—as a result of an excessive input of nutrients, phosphorus, and nitrogen (termed eutrophication)—were issues that spawned several grass-roots efforts and organizations in Norden during the 1960s and 1970s.

The scientific evidence very quickly revealed that environmental degradation is caused by a complex web of interrelated factors that span national and continental boundaries. With the urging of governmental officials in the Nordic countries (primarily of those in Sweden), the United Nations recognized the importance of these problems in 1972 when the agency organized its first Conference on the Environment in Stockholm. With representatives from more than 130 nations in attendance, "Stockholm '72" stands out as a watershed event in the evolution of global environmental awareness. "Principle 1" of the Stockholm Declaration, for example, states that people have "the fundamental right to freedom, equality and adequate conditions of life, in an environment of a quality that permits a life of dignity and well-being." Many nations, including the Nordic group, subsequently decreed that people have a right to an adequate environment, and it is the obligation of the state to protect that environment.

Just over ten years later another major project was initiated when the United Nations World Commission on Environment and Development organized a comprehensive environmental study under the leadership of a prominent Norwegian politician: Gro Harlem Brundtland. Trained as a medical doctor, Brundtland (b. 1939) served as associate director of the Oslo School of Health Services from 1968 until 1974, when she was appointed Norway's minister of the environment. Elected to Parliament as a member of the Norwegian Labor party in 1977, Brundtland continued as minister of the environment until 1979. She was elected leader of the Labor party in 1981 and became prime minister in 1986. Since Brundtland was the only political leader in the world who had assumed the position of a prime minister after coping with the national and international politics of an environmental ministry, Brundtland was asked by the secretary general of the United Nations to chair and establish the World Commission in 1983. The Commission's report, *Our Common Future*, appeared in 1987. Charged with the tasks of re-examining problems associated with the environment and development, preparing realistic methods to achieve their solution, and seeing to it that development is used to ensure human progress without bankrupting the resources of future generations, the Commission emphasized one key concept throughout the report: *sustainable development*. Sustainable development, which now serves as a cornerstone for much of the environmental policy debate occurring throughout the world, refers to the maintenance and management of natural systems for the needs of present-day populations without compromising the ability of future generations to meet theirs.

## Regional and National Concerns: A Nordic Summary

During the 1960s and 1970s, when Nordic scientists and officials were heavily involved in international environmental programs, the five individual countries were passing legislation and developing agencies that addressed specific national concerns. Although the exact year a specific act was passed or an agency was established varied from nation to nation, the progression of environmental activities throughout Norden has followed a relatively similar course in each country.

### Sweden

Sweden serves as an especially appropriate example of a nation that quickly built an extensive administrative and institutional framework to meet its environmental policy objectives. The Nature Conservancy Act of 1965 placed a high priority on the protection of Sweden's wilderness lands, natural vegetation, and most wildlife. Unlike the western United States, where ranchers often are allowed to control predators, Swedish law protects some species by providing farmers with compensation for losses of domestic stock to wild animals.

In 1967, the Swedish Environmental Protection Agency was formed—the first such governmental organization in the world. The Swedish Environmental Protection Act of 1969 is considered the strongest and most far-reaching legislation enacted by any nation during the initial stages of the global environmental movement. In addition to the mercury problem, sewage disposal was among the issues addressed by the act. Although no more than one-half of Sweden's urban discharges were adequately treated in 1969, a marked improvement was registered within the next ten years; today, virtually all of Sweden's disposal systems are in compliance with the highest treatment standards provided anywhere in the world. The act also has been very instrumental in reducing the industrial effluents that contribute to air and water pollution.

### Denmark

Despite Denmark's adoption of some protective measures, one authoritative account has described its environmental awareness prior to 1969 as a period of "benign neglect." For example, the deterioration of the country's water systems had become so serious by 1949 that the Danish Parliament passed legislation to limit mechanical and organic pollution, but the law was hardly enforced because of inadequate funding. Such neglect, it has been noted, was caused by Denmark's rather late transformation from an agricultural into an industrial society. Because of the emphasis given to material and social welfare improvements following World War II, the quality of the natural environment experienced a decline: "Increased prosperity brought with it expanding towns, the proliferation of summer cottages, comprehensive road-building, and cars everywhere" (Jamison et al. 71).

The environmental critique that emerged in Denmark during the late 1960s, however, has been termed "extraordinary in

## Danish Environmental Innovations

During recent years, Denmark has emerged as a leader in pursuing national policies that encourage recycling and conservation. One notable example is the bottle sorting system: overall, an average glass container in Denmark is used 33 times before it is melted down—the highest return and reuse rate in the world.

Denmark is also acknowledged for its development of environmental technologies that have applicability elsewhere in the world. These accomplishments were recognized in 1994 when the European Union (EU) decided to place its Environmental Agency in Denmark and to designate a Dane as the first Commissioner for the Environment.

A recently created organization that makes Danish environmental technologies and programs available to an international clientele is "Green City Denmark," headquartered in the Jylland community of Herning. Green City actually stretches across a 80-mile (130-kilometer) band of Jylland that represents a cross-section of Denmark's farming districts, fishing areas, and manufacturing towns. Delegations, manufacturers, and politicians from throughout the world who visit Green City are able to observe numerous programs that feature water and waste systems, waste management and recycling, energy supply, green manufacturing and clean technology, agriculture, urban ecology, and traffic and long-distance transportation.



"Renewable Energy"—a Danish environmental message of the 1980s.



The Norwegian ecophilosopher, Arne Næss. Næss (b. 1912) has achieved international recognition as the acknowledged father of "deep ecology." While deep ecologists believe that all of the planet's life forms have intrinsic value and a right to exist and flourish, the deep ecology manifesto also states that humans will realize their optimal potential only when they feel compassion for all facets and aspects of the natural world. Deep ecologists, who distinguish themselves from so-called "shallow ecologists," believe that the latter limit themselves by focusing only upon such problems as pollution control and resource depletion. The concept of sustainable development, for example, is an oxymoron to deep ecologists. Arne Næss, a contemporary example of a Norwegian who is within a long tradition of nature appreciation, provides people everywhere with a philosophy that offers "a vision of a world in which we protect the environment as a part of ourselves, never in opposition to humanity" (Rothenberg *xiii*).

its radicalism." The following story (Jamison et al. 66), which illustrates the 1969 taking over of NOA, a long-standing natural history society at the University of Copenhagen, also describes the formation of NOAH—the first and most influential grass-roots environmental organization in Denmark.

We locked them all in. We were about twenty people. After we had locked the doors, we cut off the ventilation and started to poison them. It was pretty violent. We got up on the stage and talked about air pollution. We burnt garbage and tobacco in large quantities. We poured waste water from a nearby factory in an aquarium with goldfish who slowly died. On the side walls we showed films about cancer and pollution and we had a loudspeaker with a traffic alarm blasting. We sprayed water in the audience from Emdrup Lake. And we had taken along a wild duck which we covered with oil. "Come and save it," we screamed. "You talk about pollution. Why don't you do anything about it?" Finally we cut off its head to end its suffering, and we walked down along the first row of chairs so that all who were sitting there got blood on their clothes. After an hour we opened the doors and said that we wanted to start an environmental movement, and that the founding meeting was being held in the next room.

Thus, the "new environmentalism" was ushered into Denmark through the efforts of NOAH's rebellious university students. In 1971, following the election of a new social democratic government, Denmark became the first nation to form a Ministry for Environmental Protection. Though the earliest environmental legislation passed by Parliament in 1973 was termed by its sponsors as "the severest . . . in the world," NOAH and a number of other ecologically oriented organizations criticized the economic and political compromises that had occurred. Nevertheless, as the size of the ministry was expanded and more laws were passed, NOAH and related groups could no longer simply criticize the lack of activity on the environmental front; now they had to monitor and follow the government's actions. Several observers have noted that few countries currently devote more time to environmental politics than does Denmark.

#### Norway

The Norwegian government, by 1962, had initiated a nation-wide environmental campaign, using the slogan *Bruk Naturvett!* ("Use Nature Sense!"), calling for individual responsibility in protecting the environment and in removing litter. In 1970, the Nature Conservation Act of 1910 was modified to strengthen the laws that protect wild plant and animal species. When Norway established a Ministry of the Environment in 1972, the agency immediately initiated a program to identify and register sites in need of special protection and preservation. The Pollution Control Act of 1981 (amended in 1989) provides comprehensive legislation that deals with water, air, and noise pollution, and the wastes created by industrial, agricultural, and municipal activities.

A notable Norwegian organization that seeks to promote environmental justice is Bellona (named for the goddess of war in ancient Rome, who also sought justice). Formed in 1987, Bellona's youthful workers seek to demonstrate how industrial pollution is endangering Norway. Included among its targets has been Norsk Hydro, a major metallurgical and chemical company that was depositing highly toxic substances into the Oslo fjord. Bellona's staff members collected samples of the emissions and then staged a media event that forced the company to curtail its practices. The organization has also managed to prod the Ministry of the Environment to look more closely at the way industries in Norway deal with pollutant discharges.

#### Iceland

Because of its geographic remoteness, very small population numbers, and lack of industry, Iceland's environmental problems differ noticeably and have not been as serious as those experienced by the other Nordic nations. The erosion of Iceland's bare, fragile soils has served as the foremost environmental problem in the country for centuries. It was not until 1990, however, that Iceland established its Ministry of the Environment. Since it is such a new agency, the ministry is only beginning to evaluate the overall status of environmental situations in Iceland. In addition to national concerns, Icelanders have been involved in campaigns both to halt the dumping of chemicals and other substances into the North Atlantic Ocean and to restrict the movements of nuclear submarines.

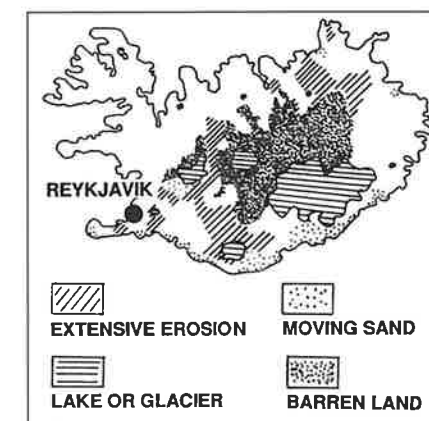
#### Finland

For decades, Finland's Neighborhood Act of 1920 and some additional laws associated with public health dealt, albeit partially, with the majority of air pollution problems in Finland—including the perennially unpleasant sulfur odors produced by pulp and paper mills. The nation's first comprehensive Air Pollution Control Act, passed in 1982, has promoted the development of additional new technologies that contribute to significant reductions in harmful emissions. Although Finnish mills emitted 55,000 metric tons of sulfur in 1986, this figure is expected eventually to decline to 3,000-7,000 tons annually.

The development of environmental legislation in Finland since the 1960s has been quite similar to that displayed by the other Nordic countries. Nevertheless, the Finnish case differs somewhat since the nation has no single, comprehensive environmental law—even though a number of acts with environmental protection provisions were passed by the Finnish Parliament during the 1960s. Since ten percent of Finland's surface area consists of inland riverways and 56,000 lakes that are larger than one hectare (about two and one-half acres) in size, the most important of those laws was the Water Act. The legislation was passed in response to the significant industrial expansion—especially pulp and wood processing—that severely affected Finland's waterways during the post-World War II years. Such action was deemed essential since the phosphate wastes pro-

#### Norway's "Inky Club"

During the 1980s, the Norwegian Society for Conservation of Nature initiated the "Inky Club" (named for an octopus), an organization of young environmental detectives. It has become the fastest growing environmental group in Norway and by the mid-1990s had some 17,000 members ranging from five to thirteen years of age. The children investigate environmental conditions in their neighborhoods, write newspaper articles, and contact industrial owners and politicians about pollution.



Soil erosion in Iceland. The forest cover of the Icelandic highlands was removed hundreds of years ago; ever since, the area has been used for the generally unrestricted grazing of sheep and horses, which has contributed to considerable soil erosion; but climatic changes, volcanic activity, and other natural catastrophes have resulted in further degradation. Close to two-thirds of the original soil and plant cover has been lost since the 900s.



Logs awaiting processing at a pulp and paper mill in northern Finland.

### Long-Distance Air-Pollution

In an attempt to protect local areas from sulfur dioxide damage, industrial factories in many districts of the world are often equipped with very tall smokestacks. This practice may reduce immediate impacts, but the pollutants are dispersed into the upper atmosphere, only to fall to earth far from the original source. Sulfur dioxides produced in Europe, for example, are typically distributed over a range of 930 to 1,865 miles (1,500 to 3,000 kilometers). The sources of pollution that fall on Norden are often described as "nitrogen from the west, sulfur from the east." The heavy automobile and truck traffic of Western Europe contributes directly to nitrogen oxide compounds that affect the Nordic region, while Norway also suffers directly from factory emissions produced in Great Britain. Most of the sulfuric compounds, as well as mercury and heavy metal deposits, are traced to the outmoded coal-fired power plants of Eastern Europe, Russia, and the former Soviet republics. Under certain meteorological conditions, the pollutants may even travel as many as 5,000 miles (8,000 kilometers); therefore, a small proportion of the emissions that affect the Nordic region occasionally arrive from the United States and Canada.

### Initial Evidence of Acid Rain in Norway

Acid rain may have been evident in Norway as early as 1881, when a geologist claimed that the gray snow falling on the country had been polluted by coal burned in Britain. In 1926, an inspector for Norway's freshwater fisheries reported that similar depositions had caused a sudden increase in deaths among recently hatched salmon. By the 1950s and 1960s, Norwegian researchers noted that some especially sensitive fish species, such as salmon, trout, and Arctic char, display higher fatality rates when slight changes in water chemistry are caused by acid rain.

duced by pulp and paper manufacturing, if not treated properly, contribute directly to eutrophication—the rapid transition of fresh water bodies into marshlike areas.

A Ministry of the Environment was not established in Finland until 1983. Since its creation, the ministry has given special emphasis to the consolidation and strengthening of environmental protection measures throughout Finland, including the coordination of efforts by local governments, industries, private households, other nations, and international agencies.

### Transboundary Environmental Problems The Nordic Dilemma

Prior to the 1960s, pollution problems in the Nordic region and elsewhere generally were regarded as local or national concerns. Once it was recognized that the pollutants generated in one nation often have a direct effect upon other countries and regions, the concept of "transboundary" impacts entered the environmental vocabulary. Nordic scientists were among the first investigators to recognize the global consequences of such transboundary phenomena.

### Acid Rain

The best known and most serious transboundary environmental issue encountered in the Nordic region is acid rain, a problem that may be traced to two especially harmful pollutants: sulfur dioxide and the oxides of nitrogen. The majority of sulfur dioxide is produced by heavy industries, primarily those that consume such fossil fuels as coal and oil, though metal smelters and petroleum refining operations are other sources. Nitrogen oxides are generated by automobiles, trucks, and buses, as well as by the burning of oil, coal, and natural gas. When emitted into the atmosphere, these high-flying pollutants combine with water vapor and oxygen in the presence of sunlight to form a mixture of sulfuric and nitric acids. Once this mixture settles on the earth in rain or snowfall, the acidity of lakes, streams, and soils is increased.

The research on acid rain is often difficult to interpret and may be contradictory; a few recent studies indicate that until their threshold levels are exceeded, some forests even experience a temporary benefit from increased nitrogen. Nevertheless, by the late 1960s and early 1970s, Nordic scientists determined that few nations of the world are more seriously harmed by acid rain than Sweden and Norway, where a tenfold increase in depositions had occurred since the late 1800s. Finland and Denmark are affected only to a somewhat lesser degree, while the situation in Iceland is not nearly as serious. Furthermore, an overwhelming proportion of the air pollutants that actually cause acid rain in Norden are not produced by those countries. That production is true of over 90 percent of the depositions that fall on Norway, of over 80 percent on Sweden, and nearly 75 percent on Finland. The pollutants that Denmark produces cause a somewhat larger amount of acid rain than it receives.

In southern and western Sweden, 50 to 75 percent of all lakes and rivers are severely acidified. Studies undertaken throughout the country during the 1980s revealed that 16,000 of the nation's 80,000 lakes were so badly polluted by acid rain that the most sensitive plant and fish species had been damaged or totally eliminated; altogether, it was determined that 4,500 of Sweden's lakes no longer have any fish. A similar situation occurred in over 5,000 square miles (13,000 square kilometers) of Norway's lakes. Salmon are now extinct in 25 of Norway's rivers, a fact that, some researchers state, may have destroyed the genetic diversity of the species forever.

Because of acidification, metals such as aluminum, iron, and manganese leach into lakes and rivers through the especially thin soils that characterize much of the Nordic region. Some of these metals are believed to coat the gills of fish, preventing them from utilizing the oxygen in the water. The increased solubility of toxic metals under acidic conditions also increases their availability to plants. Probably because of air pollution, the forests of the Nordic countries (and elsewhere in Europe) are more susceptible to stresses caused by droughts and other extreme weather conditions. In some cases the pollutants directly affect the needles and leaves of trees, whereas indirect impacts occur when acidification changes the composition of the soil or when nitrogen saturates it.

Some forested areas in Norden already indicate that they are reaching their nitrogen saturation levels. According to a 1990 survey, 16 to 19 percent of all coniferous trees in Sweden, Norway, Finland, and Denmark have experienced as much as 25 percent needle loss. Furthermore, sensitive species of mushrooms, lichens, fungi, and wild flowers are decreasing in numbers. Sulfur dioxide also contributes to the accelerated deterioration of historic monuments and buildings.

Since it was in the Nordic countries where the severity of acid rain damage was first documented, it is only natural that these nations have emerged as leaders in bringing about international agreements to control sulfur and nitrogen emissions. Sweden and Norway convinced the United Nations Economic Commission for Europe (UNECE) to initiate discussions on acid rain in 1972, discussions that culminated in the 1979 Geneva Convention on Long-Range Transboundary Air Pollution. (Besides the countries of Europe, the UNECE also includes the United States and Canada.) When many of the worst polluting nations—including the United States and the United Kingdom—chose not to sign protocols calling for specific reductions in sulfur dioxide emissions, the Nordic states led the way in recommending that all industrial countries of the world agree to a 30 percent decline within a specific number of years. The "30 Percent Club" received support at the 1985 UNECE conference held in Helsinki, when 1993 was targeted as the goal for such reductions. The Nordic countries quickly exceeded this goal.

By 1994, when 21 countries had ratified the Helsinki Protocol, annual sulfur dioxide emissions throughout Europe totaled 36 million metric tons—a reduction of 30 million tons since 1980.



Areas of Finland, Norway, and Sweden most vulnerable to acid rain damage. Because of the fragile land and water resource base that characterizes the region, acid rain has had and continues to have a serious effect upon several areas of the three countries.

### The Liming of Lakes and Forests

Since the mid-1970s, certain stop-gap measures—including the treatment of lakes with powdered limestone—have been employed to counteract the effects of acidification. More than 6,000 lakes in Sweden have been limed, while much smaller numbers have received similar treatment in Norway and Finland. Liming is also being conducted to a limited extent on some of the heavily acidified forest areas of Sweden and Finland. The liming of lakes and forests, however, is only a temporary and very expensive measure, rather than a permanent solution to this very difficult environmental problem.



Sulfur dioxide emissions produced in northwestern Russia and in Estonia, early 1990s. Northern Norway, Finland, and Sweden are affected by several extremely inefficient metal smelters in northwestern Russia, especially those located at Nikel, Zapolyami, and Monchegorsk on the Kola Peninsula. Overall, the three sites emit 700,000 metric tons of sulfur dioxide yearly—twice the amount produced throughout all of Finland. The drastic impacts that sulphur dioxide and heavy metals can exert on the environment are clearly demonstrated at Monchegorsk: the mining and smelter complex is surrounded by one of the largest areas of dead forest in the world.

Farther to the east of the Kola Peninsula is Novaya Zemlya, an Arctic island situated in the shallow waters of the Kara Sea. It has served as both a major nuclear testing site for the Soviet Union and a dumping ground for radioactive wastes and obsolete reactors. Russia's nuclear submarine fleet is also based at the site; by the year 2000, a total of 150 of these submarines may require disposal. There is concern that the large contaminated area in and around Novaya Zemlya, which now poses threats to all nearby life forms, may eventually expand to threaten northern Norway, Finland, and Sweden.

In 1994, a second UNECE agreement on sulfur dioxide was signed in Oslo. Once this agreement is ratified by at least 16 governments, attempts will be made to reduce the 1990 volumes for excessive sulfur at least 60 percent by 2010. To reach this goal, the costs in Europe alone are expected to total \$15 to \$18 billion (1995 US dollars).

Attempts to reduce the emissions of nitrogen oxides have proved even more difficult than the sulfur dioxide problem: little reduction in nitrogen oxides was achieved throughout Europe from 1980 to 1994. In 1988, a UNECE convention in Sofia, Bulgaria, was organized to address the emission of nitrogen oxides; a protocol was enacted in 1991, and 24 nations approved the agreement by 1994. The first step in the process called for the stabilization of 1994 emissions at the same levels that had been displayed in 1987, although a few countries did seek to achieve as much as a 30 percent reduction. Nevertheless, it is now recognized that few, if any, nations could realize such a decrease. Declines in industrial pollutants have occurred in recent years, but these reductions have been offset by the increased emissions of motor vehicles.

Definite progress has been made in combating acid rain in the Nordic region and elsewhere in Europe, but the Brundtland Report warns that the entire continent may be experiencing significant changes of an irreversible nature. Even if the acid rain dilemma is resolved, it will take decades to restore the environment to anything that even approaches the conditions which existed prior to the 1950s.

#### In the Wake of Chernobyl: Nuclear Power and Energy Sources

On 26 April 1986, the world's worst peacetime nuclear disaster occurred when an explosion and fire ripped through the Chernobyl power plant situated in Ukraine (then part of the Soviet Union). Most of the radioactivity escaped on the day of the explosion, but significant amounts were released over the subsequent ten days. Three days later, the radioactive cloud passed over southern Finland and central Sweden and Norway. Rain also fell over much of the area, which washed the contents of the cloud onto the earth. In only a few hours, these areas of Norden experienced greater depositions of cesium 137 than had been produced by all previous nuclear weapons tests conducted throughout the world. Also of immediate concern was the deposition of a significant amount of iodine 131, which contributed to a pronounced thyroid uptake in humans through the grass-cow-milk pathway.

The most serious danger posed by cesium 137 was the contamination of lichens and grasses and the animals that feed upon them: reindeer, cows, and sheep. Almost one-half million reindeer and 7,000 southern Sámi reindeer herders live in the area of Norway and Sweden that was affected, with a total of 70,000 people ultimately relying upon the herds for their livelihoods. Given the high radiation levels experienced in certain areas, as well as the high costs of alternative feed sources, a number of herders and their reindeer were forced to move to less productive forests where overgrazing already was evident.

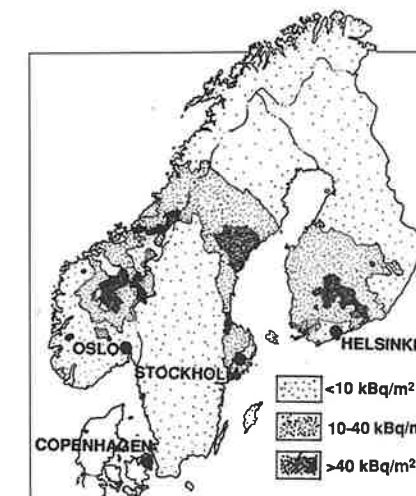
By late 1986, close to 85 percent of the reindeer meat in Sweden revealed contaminant levels that exceeded government standards, some by as much as 100 times. To assist the herders, the Swedish government purchased the contaminated meat and fed it to domesticated mink, or buried it in large pits. Finnish scientists are also experimenting with a high potassium and mineral food to prevent cesium 137 from being absorbed by the stomachs of the reindeer.

Besides reindeer herding, restrictions were placed upon fresh-water fishing, berry picking, and mushroom gathering in the affected areas. Although those restrictions were subsequently lifted, the long-term contamination of the reindeer-grazing areas raises an even more insidious question: the long-term health of the people who live in the radiated areas. It is estimated, at a minimum, that hundreds of people in the Nordic region may die from cancer at an earlier than average age because of the Chernobyl incident. Unfortunately, many questions concerning the health and well-being of these people will not be resolved until much more time has passed.

The political fallout of the Chernobyl incident was immediately felt in the parliaments of Sweden and Finland—the only two Nordic nations that rely on nuclear plants to supply a portion of their energy needs. Prior to the Chernobyl explosion, twelve nuclear power plants provided almost 50 percent of Sweden's energy needs, while 35 percent of Finland's requirements were met by four plants situated at two sites. In a public referendum that followed the Chernobyl accident, Sweden's citizens voted to begin a phase-out of nuclear power in 1995-96, with total elimination scheduled for 2010. (Sweden would thus become the first country to accomplish such a phase-out.) This ambitious timetable, however, may have to be delayed because of plans to limit the output of traditional power plants to reduce carbon dioxide emissions and a parliamentary decision not to exploit four untapped rivers for their hydroelectric potential.

In Finland, a country with very high energy demands because of its cold climate and energy-intensive industries, discussions about whether or not to build a fifth power plant were delayed in the immediate aftermath of the Chernobyl incident. Even though a long-time alternative source of energy—natural gas from Russia—is now considered possibly unreliable and unpredictable, the Finnish Parliament, in 1994, voted not to build the fifth plant. The Finns are also concerned about other Chernobyl-type nuclear plants in Sosnovy Bor, Russia (proximate to St. Petersburg), and Ignalina, Latvia.

No nuclear power plants have been developed in Denmark, even though the country—prior to the oil crisis of the early 1970s—was more dependent upon energy imports than any other Nordic state. Potential sites for nuclear plants in Denmark were being studied in 1973, but a new environmental group, the Organization for Information about Nuclear Power (OOA), was formed to oppose such actions. The organization not only opposed nuclear power because of possible technological problems, but also pointed to the social, strategic, moral, and ecological factors that would affect every Dane. Ultimately, the



Radioactive cesium in the soils of Norway, Sweden, and Finland following the 1986 Chernobyl explosion. The radioactivity was measured in becquerels—one spontaneous nuclear transition per second.



Sámi summer camp in Norway. Thousands of reindeer herders were affected by Chernobyl's radioactive fallout.

#### Energy Conservation Systems

The Nordic nations have been leaders in developing technologies for cogeneration or combined energy production—the use of waste heat from electrical power generation. In Helsinki a majority of buildings that could employ heat from conservation were already doing so by 1989.

District heating systems—pressurized water circulating in pipes from a central boiler to consumers—are used throughout Norden. Denmark's European Institute for Environmental Energy (EIEE) offers international training for people who wish to learn about district heating systems. Of the more than 1,000 district heating companies being formed in Poland, 80 percent are assisted by Danish experts.



One of the waterfalls that may be viewed along the railway between Flåm and Myrdal in western Norway. Such features continue to delight tourists, but over the decades the flows displayed by a number of other waterfalls have been reduced as fast-flowing rivers are utilized to power hydroelectric facilities.



A high temperature geothermal energy-harnessing station, located east of Reykjavik, Iceland. Though geothermal energy is "clean," experience demonstrates that using it as a heat source may lead to the despoiling of nearby land surfaces, to the disappearance of visible hot spring activity, to the development of ground and surface water pollution, to noise problems, and to land subsidence.

antinuclear opposition succeeded in convincing Danish decision-makers that conservation and alternative energy sources could be employed to satisfy future needs.

By practicing conservation measures and developing alternative energy sources, Danish energy imports were reduced by one-half from 1979 to 1989—the largest relative decline displayed by any European nation. To accomplish that feat, Denmark led the way in developing a number of energy-related programs. Indeed, no other nation has done more to develop large-scale biogas generating plants that convert waste products into energy; several power stations are now fueled by urban garbage and waste, along with straw and wood chips. Denmark's "wind farms" also generate more than one-half of all the wind power currently produced in Europe, and Danish engineers are investigating methods that can capture the off-shore tidal energy of seas and oceans.

Norway and Iceland have never given serious consideration to the development of nuclear power plants because of the natural resources each nation possesses. Norway has sufficient North Sea oil reserves to allow the country to export petroleum, but another energy source continues to meet virtually all of its electricity needs: hydroelectric power. The same is true of Iceland, where hydroelectric power supplies nearly 95 percent of the nation's electricity. (Iceland has the highest per capita consumption of electricity in Europe.) Another source, geothermal energy, is used to heat 85 percent of the homes in Iceland, and overall, meets 30 percent of the country's energy needs.

After dams and reservoirs are constructed to produce hydropower, however, a number of negative phenomena may occur: rivers change course, natural landscapes are modified or destroyed, waterfalls dry up, the ecological and biological balance of waterways is disrupted, fish stocks decline, land is submerged under reservoirs, and future land-use patterns are affected by power houses, high-voltage pylons, and electrical lines—all having a serious visual impact. The Norwegian Ministry of the Environment even stated that the nation's hydroelectric system might already be considered overdeveloped: "Uniquely precious resources have been destroyed by hydroelectric development," which, noted the Ministry (69) in 1992, "supplies us with electricity. . . sold at an abnormally low price."

Because of Norway's and Iceland's far-flung settlement patterns, the power line systems are quite long. In Iceland, some 6,000 miles (9,650 kilometers) of electric lines are strung across the countryside. When Iceland's National Power Company (NPC) opened its largest power plant in the southern highlands in 1969, a number of new service roads made previously undeveloped areas accessible to the public. An even larger plant is now being planned for eastern Iceland. The route for these power lines will pass over many environmentally sensitive areas, as will the roads that are planned to stimulate tourism and other forms of development.

The expansion of Iceland's energy production reflects the nation's recent efforts to become a metal producer—one of the few economic sectors that has attracted foreign investment to

the country. Before an ore such as bauxite can be converted into aluminum, for example, huge quantities of energy need to be employed in the smelting process. During the 1980s, Iceland entered into negotiations with an American firm, intending to utilize hydroelectricity to power a new aluminum smelter. A dramatic drop in the worldwide price for metals led to the cancellation of these plans—but only after Iceland had invested heavily in the project. Since then, the country has sought other outlets for its power, including investigations into the possibility of exporting electricity to Britain by means of a submarine cable. Even if the proposal eventually proves feasible, years will pass before it can be implemented; meanwhile, Iceland is faced with the unenviable task of repaying foreign loans secured to finance its envisioned hydroelectric developments.

#### Pollution of the Baltic and North Seas

The Baltic Sea is a major Nordic resource but one of the most heavily polluted water bodies in Europe. The Baltic is especially vulnerable to the effects of pollution because it is epicontinental (situated on a continent rather than between continents), nontidal, brackish (only somewhat salty), cold climatically, and very shallow. It is no more than 330 feet (100 meters) deep, whereas some areas of the Mediterranean Sea approach 6,560 feet (2,000 meters). In addition, the Baltic is very sensitive to pollution because of its restricted water exchange with the Atlantic Ocean.

Although brackish waters provide habitat for relatively few fish species, those that do exist in the Baltic traditionally have been found in large numbers. Fishing has been an important economic activity for people residing along the coastlines, but some species of fish, such as cod, have experienced great declines since the 1970s. Overfishing has contributed to a portion of these losses, but the most important cause is the discharge of pollutants linked to river runoff, which arrives from a wide-ranging region of Europe. Because of high concentrations of dioxines in their bodies, some herring, salmon, and shellfish from the Baltic are not considered fit for human consumption.

The Baltic drainage basin covers 686,000 square miles (1,721,00 square kilometers) and extends southward to the Tatra Mountains, situated along the border between Poland and the Slovakian and Czech Republics, and northward to the Arctic Ocean; the basin includes portions of 13 countries, more than 70 million people, and numerous large cities, factories, and mines. Some of the rivers that drain into the Baltic originate in the heavily industrialized district between Krakow, Poland, and Berlin, Germany. Western Russia and the three Baltic states of Estonia, Latvia, and Lithuania also contribute large amounts of pollution to the eastern rim of the sea. Those pollution sources include discharges from Estonia's River Narva and the environmental toxins contributed by Russia's River Neva, which may be traced to huge amounts of untreated sewage from St. Petersburg and to the emissions produced by wood processing factories around Lake Lagoda. Overall, the Baltic currently receives four times more nitrogen and eight times more phosphorus than



The Baltic Sea and the Scan-Link bridges. Plans have been made to construct a system of bridges and tunnels that will connect Denmark, Sweden, and continental Europe. Proponents contend that the system, termed Scan-Link, will lead to significant economic gains, but opponents argue that very serious environmental costs will occur. The bridge that spans the Great Belt (Store Bælt) between Sjælland and Fyn is scheduled to open to trains in 1996 and to vehicles in 1997; the Øresund bridge-and-tunnel to connect Copenhagen and Malmö is planned to open in 1997 and 1998; and a bridge over the Fehmern Sound between Denmark and Germany may be built in the future.

Environmentalists express concern that the structures will endanger the Baltic's ecosystem. Salt water comes into the Baltic from the Atlantic in the form of regular pulses, with oxygen disappearing from the deeper reaches of the sea during the intervals; the arrival of heavy salt water then restores the balance. The Øresund bridge might well affect this exchange, but some experts suggest that dredging will allow the water flow to be maintained. Environmentalists also state that Scan-Link will contribute to a decline in rail and ferry activity and a gain in vehicular traffic, leading, of course, to greater energy consumption and increased fuel emissions.



SCAN LINK NO THANKS



A Danish dairy farm near Vejle in eastern Jylland. Intensive agricultural practices in Denmark contribute to a host of pollution problems that the other Nordic countries encounter on a much smaller scale.



The aluminum smelter at Årdal, located at the head of the Årdal Fjord in western Norway. Bauxite, the mineral used to manufacture aluminum, is not found in Norway or the Nordic region. Nevertheless, it is economically feasible to ship the material thousands of miles from other countries to processing plants in Norway where cheap hydroelectric power is available. The manufacturing process, however, results in the release of sulfur dioxides and heavy metal particles into the air, but the high levels of polycyclic aromatic hydrocarbons (PAH) discharged into the waters of the Årdal Fjord are a more troubling problem. A similar situation occurs at another aluminium smelter in Sunndalsøra, Norway, where PAH affects the Sunndal Fjord.

in 1900. Also, in 1979 and 1981, respectively, 6,000 and 10,000 metric tons of oil spread over a portion of the Swedish and Finnish coastlines after tanker accidents had occurred. Even more insidious, however, are the much larger volumes of oil that regularly enter the Baltic from shipping, industries, and cities.

While the highly contaminated byproducts of industry are responsible for much Baltic Sea pollution, agriculture makes an equal, if not greater, contribution to the problem. Intensive agricultural practices in Denmark (as well as Estonia, Latvia, and Lithuania) contributed to as much as a sixfold increase in the Baltic's fertilizer levels during the 1980s. Despite very strong measures by the Danes to curtail pollution associated with agricultural production, the World Health Organization recently determined that eight percent of the country's groundwater has levels of nitrates—a byproduct of fertilizer—that exceed the agency's maximum standards. Overall, some 457,000 acres (185,000 hectares) of Denmark are seriously contaminated. Agricultural pesticides (as well as those employed in forestry in Finland and Sweden) contribute to further contamination of the Baltic. As a leading agricultural producer, Denmark's problems with farm-related pollution are unique to the Nordic states, for 65 percent of the nation's land area is devoted to cropland, compared to Finland's 8 percent, Sweden's 7 percent, Norway's 3 percent, and Iceland's less than 1 percent.

The North Sea displays a range of pollution problems that are both similar to, and different from, those encountered in the Baltic. From 1960 to 1990 alone, it is estimated that the input of nutrients into the North Sea more than doubled. During the 1970s and 1980s, massive blooms of algae began to appear with greater frequency in areas of the North Sea. These "plankton blooms" or "red tides" occur when large quantities of harmful nutrients enter the sea by way of sewage, agricultural run-off, and atmospheric depositions. One massive bloom in 1988 resulted in displays of strange behavior among rainbow trout living along a section of Sweden's western coastline. Most of the fish died within two days, while similar behavioral phenomena were being observed all the way to southern Norway. The affected area, which covered 30,000 square miles (75,000 square kilometers) of the North Sea, caused massive deaths within fish farms and among a number of wild species; to date, this one incident of the "red tide" is the most extensive damage ever caused by algal blooms anywhere in the world.

Offshore oil drilling in the North Sea also poses threats to the environment, including the regular emission of pollutants into the atmosphere, and potential disasters that range from tanker spills to oil platform blowouts. The most serious event to date, the 1977 blowout of the Bravo platform on Norway's Ekofisk oil field, resulted in the uncontrolled discharge of 22,000 metric tons of petroleum over 1,600 square miles (4,000 square kilometers) of the North Sea. Since Norwegian offshore oil drilling was just in its infancy in 1977, both the oil company and the government were poorly equipped to

handle the blowout. Fortunately, favorable winds and currents kept the oil slick in the central North Sea, where there were relatively low concentrations of bird and fish life. Norway has subsequently made considerable improvements in developing mechanisms to cope with future oil spills, but severe weather conditions and high waves make North Sea oil cleanups difficult ventures in any case.

## National Environmental Issues

The remainder of this document features several issues that are confined primarily to the Nordic region or to a specific nation. They include forest management in Finland and Sweden; the designation and protection of threatened natural and cultural resources in all five Nordic countries; environmental protection and tourism, especially in Denmark and Iceland; the whaling dilemma posed by Norway and Iceland; the "Green Olympics" in Norway; green political parties; ecological practices in architecture and planning; the environmental agenda of the Nordic Council; and citizen attitudes toward the environment.

### Forest Management

Overall, no other area of present-day Europe is as heavily forested as the Nordic region. Nevertheless, very little true virgin forest remains in the region—even though the total area of forested land is greater than it has been for at least a century. In Finland and Sweden, where the management of forests for their economic value is virtually a national religion, reforestation policies and the reclamation of abandoned farms have led to the development of woodlands that cover almost three-fourths of the two nations. About 25 percent of Norway, but only 12 percent of Denmark and 1 percent of Iceland are forested.

The management of the Nordic coniferous forest of today, however, differs considerably from that in evidence even as recently as the 1940s. Formerly, when selective felling was employed to harvest trees, only the largest specimens were removed; that strategy allowed the original species composition to be maintained over time. Since the end of World War II, large-scale machinery has been employed to clear-cut the forests of the Nordic region. Although the cleared areas are replanted with trees, the stands often are of uniform height, size, and composition.

Species-rich wetland forests are especially vulnerable in the Nordic countries. Nowhere is this more evident than in Finland, where one of the world's largest programs of wetland drainage has taken place since the early twentieth century and where landowners continue to be paid to drain marshes and plant trees. Overall, about two-thirds of Finland's wetlands have now been drained, an area that represents one-third of all the drained forests in the world. Finnish members of such conservation groups as Greenpeace and the World Wildlife Fund have fought to curtail wetland drainage and reduce the amount of forested



Peat harvesting by Parkano, western Finland. Although the drainage of mires and bogs is the primary reason for the loss of wetlands in Finland, other areas are affected by peat cutting. Some 180 square miles (470 square kilometers) of Finland's peatlands are currently exploited, with an additional 1,930 square miles (5,000 square kilometers) considered suitable for harvesting. Conservationists are concerned because large-scale extraction permanently destroys bogs and mires. Peat is used for fuel and as a soil conditioner.



Roadless areas of Norden larger than 385 square miles (1,000 square kilometers). Other than some sections of Russia, these areas of Norden are the only places in Europe where wilderness still exists.

#### A Linear National Park in Sweden

Vasaloppet, a 55 mile- (90 kilometer-) long ski racecourse, extending from Sälen to Mora, was recently designated a Swedish national park. The course is named in honor of Gustav Vasa, the sixteenth-century rebel who, when being pursued by the Danes, sought help in Mora. After his pleas were refused, Vasa turned toward Norway to secure assistance. The people of Mora later regretted their decision and sent two men on skis to intercept Vasa. They reached him in Sälen, and the three men skied back to Mora. After leading an army that secured Sweden's freedom from Denmark in 1523, Vasa was then named king of the newly liberated country.

The Vasa course is one of the world's most popular ski races, annually attracting as many as 16,000 participants who follow Gustav Vasa's challenging path across hills and low mountains. The area, protected during the winter only, is no more than six to nine meters wide but serves as Sweden's longest national park.



Centuries-old Scots pines (*Pinus sylvestris*) in Finland's Pyhä-Häkki National Park. Pyhä-Häkki was protected as the country's first forest nature reserve in 1912, and received national park designation in 1956. It is the most outstanding example of a virgin or primeval forest in southern Finland; besides the stately stands of pines, Pyhä-Häkki also includes tracts of spruce trees, treeless mires, and Sphagnum bogs.

area subjected to clear-cutting. In addition, proposals are being made to practice "forestry using natural methods" (Wahlström et al. 40). This approach leaves trees of different ages in areas subjected to harvesting and permits only natural methods of regeneration.

Many critics, however, contend that the most important issue in current Finnish (and Swedish) forest practice is that of "forest cultivation." Although proponents contend that current forestry practices are sustainable, environmentalists point out that as cultivated plantations supplant the genetically rich old forests, biological diversity is rapidly declining.

#### National Parks, Wilderness, and Protected Areas

Currently, approximately 6 percent of the land area of Denmark, Finland, Norway, and Sweden receives some form of statutory protection, whereas the figure for Iceland approaches 9 percent. When considering wilderness areas, one finds the Nordic region to be the only district of Europe outside of Russia where wilderness—relatively large sectors of land that have little or no evidence of human development—still exists. Because of its remote and treeless central highlands, Iceland has more surface area designated as wilderness (29 percent) than any other European nation, while Norway's isolated mountain zones constitute a somewhat more limited area (17 percent) of that country. Smaller sections of Finland (9 percent) and Sweden (5 percent) are classified as wilderness. No wilderness exists in Denmark. (By way of comparison, 65 percent of Canada and only 5 percent of the United States are designated as wilderness.)

After Sweden became the first Nordic state to pass national park legislation in 1909, the government protected 11 areas prior to 1920, and selected another five sites between 1920 and 1942. In 1992, when the number had expanded to 22, the Swedish Environmental Protection Agency put forth a plan calling for 20 more national parks. In addition, Sweden has almost 1,400 nature reserves and protected zones, including several large mountain areas and four major unexploited rivers in the northern section of the country.

Once the Finnish National Board of Forestry established Pyhä-Häkki Nature Reserve in 1912, the number of national parks and protected areas in Finland grew slowly; furthermore several important natural areas were lost to the Soviet Union after 1945. In 1976, a second program to establish national parks in Finland was launched; by 1995, there were 30 such areas. An additional 20 nature parks are reserved strictly for scientific purposes, and numerous state and privately-owned nature conservation areas exist throughout the country.

Efforts to protect the old-growth forests of Finland during the 1980s received widespread support from the nation's citizens. In 1988, when a petition calling for greater nature and wilderness protection was circulated, 220,000 Finns signed it—in one of the most significant displays of such broad citizen support ever exhibited in the country. In 1991 the Finnish wilderness Act was passed. Its enactment resulted in the protection of several areas in Lapland, where almost one-fourth of its

total area now receives some form of statutory protection. Two-thirds of the forested area may not be subjected to cutting; and only "natural methods" of harvesting may be used in the remaining one-third.

Finnish environmentalists believe that old-growth forests in Lapland and elsewhere should not be managed for their economic benefits alone but must remain intact because of the intrinsic values they represent. The situation is somewhat similar to the controversy that has raged over the future of old-growth forests in the Pacific Northwest region of the United States for many years. Should the last remnants of virgin forest be cut so as to preserve the economic stability of an area for a few more years? Or should such areas be preserved to promote biodiversity, to provide habitats for endangered species, and to give future generations an opportunity to experience nature in its primeval state? As in the United States and elsewhere, Finnish environmentalists have chained themselves to trees and placed themselves in front of bulldozers to protect resources and publicize their efforts.

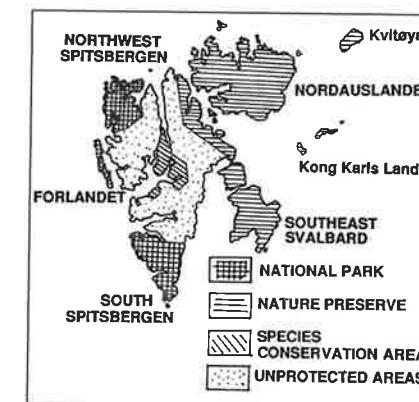
In 1991, one of Finland's most important landscapes was protected when Koli National Park was created by parliamentary action. Koli was identified as a Crown Park as early as 1907 to prevent the clear-cutting of its forests; but a ski slope opened in 1938, and dismal-looking cottages and tourist facilities emerged on the fringe of the area during the post-war era. When proposals for the building of a large lookout hotel and the expansion of cottages and downhill skiing were unveiled during the late 1980s, a pro-Koli movement was spawned among Finnish nature conservationists. Their efforts resulted in the identification of several scientifically important sites in the area, the termination of the proposed tourist development, and the establishment of Koli National Park. Efforts are now being made to purchase or exchange land to extend the park's boundaries.

In Norway, the narrow gorges and deep valleys of Rondane were designated in 1962 as the nation's first national park. One year later, the isolated mountain peaks and glaciers of the Borgefjell region were included as a national park. In 1968, two small national parks—Gutulia and Ormtjernkampen—were established to protect their stands of virgin spruce trees. Following passage of the 1970 Nature Protection Act, the number of Norwegian national parks grew quickly. In 1971 and 1972, eight additional areas were established throughout the country; and by 1992, the number had increased to 20. Most are found in mountainous areas and forests with low productivity, including Rago National Park in northern Norway, which joins three Swedish national parks in one of the Nordic region's most isolated areas. In 1986, the Norwegian government unveiled a long-range plan for the establishment of 25 new national parks, the expansion of several existing parks, and the designation of additional protected landscape areas and nature preserves.

Norway's 1970 Nature Protection Act, which did much more than provide authority to establish national parks and nature reserves, began with the following words:



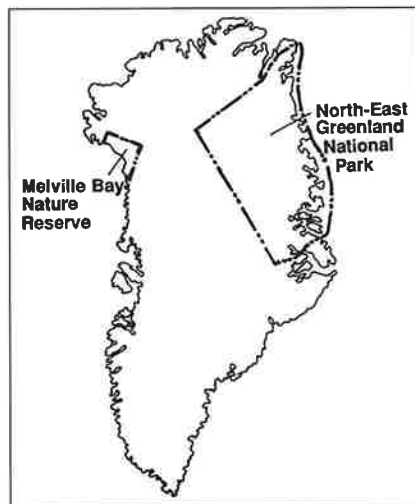
Koli, located in far east-central Finland, was designated a national park in 1991; it includes a white quartzite ridge that affords a dramatic panorama of Lake Pielinen and its adjacent forested area. Since the late nineteenth century, Koli has served as one of Finland's most important symbolic landscapes, attracting a number of noted Finnish painters, photographers, and writers and even inspiring some of the musical compositions of Jean Sibelius. These artists, according to a recent account, viewed Koli "as an ultimate outpost of Western civilization and as a melancholic 'ruined' landscape" (Häyrynen 14).



National parks and major protected areas on the Svalbard archipelago, Arctic Norway. In addition to the six percent of mainland Norway that is protected by the government, more than a half of Svalbard's surface area is included in a number of reserves. Some 14,500 square miles (37,500 square kilometers) of Svalbard embraces three national parks, three nature reserves, three plant conservation areas, and fifteen bird sanctuaries.

### The Conflict at Alta

One of Norway's most important and highly publicized environmental conflicts occurred in 1981 after plans were announced to construct a hydroelectric project along the Alta-Guovdageaidnu River in Finnmark. The facility posed danger to local plants and animals, salmon fishing, reindeer herding, and the rights of the indigenous Sámi who inhabit the area. The Sámi, along with Norwegian conservationists, participated in a series of demonstrations to oppose the project, including a hunger strike in Oslo that attracted considerable media attention. The protests failed to curtail construction, but the activities and efforts undertaken by, and on behalf of, the Sámi led to an expansion of cultural awareness and rights among Norway's native peoples. Although the National Association of Norwegian Sámi (NSR) had been established in 1968 to unite the Sámi, to improve their existence, and to enforce a number of rights, the government did not take those proposals seriously until the Alta demonstrations.



Protected areas in Greenland. North-East Greenland National Park embraces some 270,000 square miles (700,000 square kilometers) of land—about one-third of the island. As the world's largest national park, it includes a significant portion of the Greenland ice pack and a long span of coastline where fishing and hunting are not allowed.

The environment is a national treasure which must be conserved. Environmental conservation means the use of resources guided by recognition of the close interconnections between humans and nature and the principle that nature's quality must be preserved for coming generations.

In essence, the legislation recognized the limits of resource exploitation and the impact that people have upon the environment. The vast majority of Norway's more than 1,000 protected areas are relatively small, but when combined with the national parks, they include about 6 percent of the nation's total surface area.

Iceland has two official national parks—Skaftafell and Jökulsárgljúfur—and a third site, Thingvellir (*Pingvellir*), which is often referred to as a national park. Thingvellir marks the site where Iceland's first parliamentary assembly met in 930. Protected in 1928, Thingvellir is believed by many Icelanders to be the country's holiest place.

Skaftafell, situated in southeastern Iceland, was long noted for its extreme isolation and inaccessibility; the district received national park designation in 1967. Until 1974, a glacial river and flood plain cut off access to one portion of Skaftafell, while the Vatnajökull glacial ice cap—the largest in Europe—provided another barrier. To get to the site from Reykjavik required a drive that circumvented three-fourths of the country. When the Skeiðará (*Skeiðará*) Bridge was completed in 1974, seven years after Skaftafell received designation as a national park, the journey was reduced to 285 miles (455 kilometers). Though the bridge made the 650 square-mile (1,700 square-kilometer) area much more accessible to Icelanders and tourists, hiking trails are limited only to the most scenic sections of the park. Skaftafell was followed in 1973 by the designation of Jökulsárgljúfur National Park, which was created to protect the largest canyon in Iceland and one of Europe's most impressive waterfalls.

In Denmark, no national parks have been developed to date, but numerous protected areas exist throughout the nation. In 1992, the Nature Conservation Act was revised and renamed the Nature Protection Act. Such protection now embraces all beaches, dune areas, and forests designated as *fredsskov* (areas kept forested forever). The protected areas include the following: all streams and a two-meter buffer zone along such waterways; all lakes and ponds larger than 0.1 hectare in size; and such uncultivated areas as heath, bogs, meadows, salt marshes, salty meadows, and dry grasslands that exceed an area of 0.25 hectare. Proposals for large construction projects or land-use changes that occur within a three-kilometer-wide coastal protection zone require permission from national level planning authorities before they can be implemented. Since Denmark is so much more densely populated than its Nordic neighbors, the act includes numerous measures to deal with land-use conflicts.

### Endangered Species

Primarily because of the clear-cutting practiced in the forests of Finland, Sweden, and Norway since World War II, many plant and animal species that live in such environments are now threatened or are already extinct; these species include numerous fungi, lichens, mosses, insects, invertebrates, mammals, and birds. In addition to habitat loss, excessive hunting has contributed to the demise of several large mammals that have inhabited the forested and mountainous areas of the Nordic region. Wolves and wolverines are protected in Sweden and Norway, but their future is as uncertain as it was thirty years ago; however, the status of these animals has improved somewhat in Finland (often because of an influx of them from Russia). While the Arctic fox is protected in all three countries, it remains an endangered species; the same is true of the lynx and white-backed woodpecker. The status of the moose, on the other hand, has improved to such an extent that, after facing virtual elimination in the nineteenth century, tens of thousands of the animals are now killed annually by hunters in Finland, Sweden, and Norway. Thousands of moose also die when they are hit by automobiles or trains.

Unregulated hunting virtually eliminated the grey seal population of the Baltic Sea by World War II. These animals are now protected in Sweden and Finland, but the impact of toxic pollutants (especially PCBs) is so severe that their numbers will probably never recover. The Saimaa seal of Finland, a freshwater species, also serves as a clear example of the adverse effects that toxic substances, the discharge of nutrients and organic wastes, and illegal hunting can exert on a vulnerable mammal. Thousands of these animals once inhabited Lake Saimaa and adjacent lakes, but now only some 100 specimens exist. The Saimaa seal is the only threatened species in Finland not found outside the nation's borders.

In Denmark, a recent count of extinct and threatened species revealed that of the 3,176 species that had existed between 1850 and 1988, a total of 353 had disappeared, 456 have entered the endangered ranks, 880 are regarded as vulnerable, and 1,146 are classified as rare. The vast majority of extinct species include lichens, mushrooms, vascular plants, and beetles. Also lost are 15 species of birds, but no mammals are included on the list. In Finland, a total of 138 species known to have existed fairly recently are now extinct, and 217 more are severely endangered. The vast majority are insects, but other life-forms have been lost or are endangered—including some mammals, birds, and fish.

### Whaling in Norway and Iceland: An Ethical Dilemma?

Despite the positive attention that the Nordic nations have garnered in coping with a range of environmental problems, one specific activity pursued by Norway, Iceland, and the Færoe Islands continues to create intensive questioning and even a negative backlash throughout the world: whaling.



For *Forest Nature in Finland*. Prints of this painting, by artist Seppo Leinonen (b. 1957), accompanied petitions calling for the protection of Finland's old-growth forests in 1988; a total of 220,000 Finns signed the petition.

### Forestry Practices and Nature Preserves in Russian Karelia

Finnish forestry experts are now advising resource managers in Russian Karelia, a region that adjoins the eastern border of Finland; in addition, environmentalists are banding together on both sides of the border to protect key natural and cultural resources in Karelia. Since conservationists are concerned that intensive logging will also have a severe impact upon wildlife and biodiversity, they are recommending that at least five percent of Karelia be maintained as national parks and nature preserves. By linking several of the Karelian areas to parks and preserves in Finland, the borderland area has the potential to serve as an extremely valuable genetic reserve for the flora and fauna of Europe's taiga region.



Finnish stamp (1994) depicting a wolverine. All of the Nordic nations regularly issue postage stamps that portray regionally threatened species.

#### HAVRO: Whale Research in Iceland

Because of the significant role that ocean resources play in the economic life of Iceland, the nation devotes considerable effort to marine research—including the monitoring and assessing of whale stocks. In 1986, Iceland's Marine Research Institute (HAVRO) initiated more than 30 projects that have focused upon the ecology of whales in the vicinity of the island nation. To conduct the research, however, requires the killing of some whales. To date, the findings show that whales appear more sensitive to environmental fluctuations than previously believed and that, over time, a variability occurs in their growth rates and age of sexual maturity.

To the director of HAVRO, a total ban on whaling is not feasible in a world that faces increasing food shortages and poverty. The member nations of the IWC, he has claimed, need to exhibit a greater tolerance "toward the traditions, culture, and ethics of the communities involved in the exploitation of whales" (Sigurjónsson 36).



Greenpeace exhibit constructed on the campus of the University of Wisconsin-Madison, 1994, to protest Norway's resumption of whaling. The demonstration occurred during a visit by Prime Minister Brundtland. The misspelled sign reads: "Norway: Don't Kill Whales."

Iceland and Norway have engaged in whaling activities for hundreds of years. Much modern-day technology used in whaling, such as the harpoon cannon and factory ship, was developed in Norway. Both Iceland and Norway, however, have also played an important role in international efforts to monitor whale stocks in the North Atlantic and other oceans of the world. Between 1915 and 1936, Iceland even took unilateral action to ban the taking of these mammals because of concerns that the worldwide inventory was being depleted too rapidly. In 1946, Iceland and Norway joined with several other nations to create the International Whaling Commission (IWC), an organization that was formed to regulate the hunting of twelve species of great whales and the smaller minke whale. Although the Commission's protocol limited the number of whales that could be killed, the situation of the large mammals had grown so precarious by 1972 that participants attending the United Nations Conference on the Environment held in Stockholm overwhelmingly backed a US-sponsored resolution to place an immediate moratorium on all commercial whaling. The IWC did not approve the recommendation, but as more non-whaling nations joined the organization, the members were successful in passing a 1982 resolution that called for the banning of all commercial whaling by 1986.

Norway (along with Japan, Peru, and the USSR) defied the edict but finally agreed to curtail whaling in 1988. When Iceland refused to follow the moratorium, the United States recommended that an embargo be placed on imports of fish from the Nordic nation. Following that recommendation, Iceland threatened to harass or perhaps even expel the US military from its NATO Air Force Base at Keflavik. The Reagan administration (1981-88) acquiesced, and the two nations signed bilateral agreements that would have allowed Iceland to engage in "scientific" whaling. Almost immediately, however, Iceland's fish products were boycotted by American conservationists, whereupon the nation pledged a halt to its whaling activities.

In 1993, Norway announced plans to allow the taking of 296 minke whales during the year, including 136 for "research" purposes. This action was taken following the results of a study claiming that a sufficient number of minke whales lived in the North Atlantic (114,000) and Antarctic regions (760,000) to allow resumption of the hunt. Jan Henry T. Olsen, Norway's minister of fisheries, justified the decision as an example of the sovereign right of a nation to utilize its natural resources in a scientific manner: "For a country which to a large extent bases its economy on the utilization of its natural resources," he reported, "it is very important to uphold the principle that such resources should be utilized when done on a sustainable basis" (*News of Norway* 2).

When the United States threatened to levy sanctions against Norway, Prime Minister Brundtland, in September 1993, traveled to Washington, where she sought to convince President Bill Clinton and the US Congress that such restrictions should not be enforced. Shortly thereafter, Clinton reported to Congress, stating that he had chosen not to impose trade sanctions upon Norway but hoped to arrive at a mutually acceptable solution in

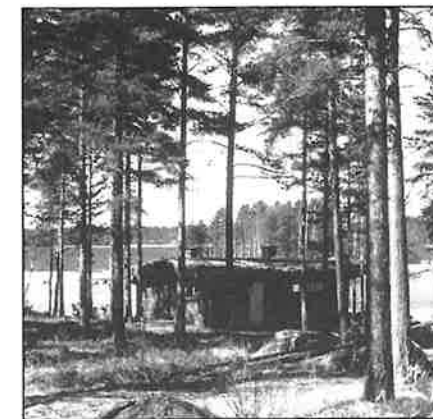
the future. Though their lobbying efforts proved successful, Norwegian officials recognize that whaling is an issue that has both scientific and emotional dimensions. Numerous environmental and animal rights organizations, such as Greenpeace and the Animal Welfare Institute, immediately called for a boycott of Norwegian fish, cheese, clothing, sonar equipment, and attendance at the 1994 Winter Olympics in Lillehammer.

Opposition to whaling has also been expressed by many Norwegians, but the majority of the nation's population appears to support the rights of coastal residents who wish to continue a traditional form of economic activity. The opponents of whaling, who are situated throughout the world, are deeply concerned that, if Norway is successful in defying the moratorium, Iceland, Japan, and other nations will resume their whale hunts on an even larger scale. Another factor is the moral dilemma that whaling poses. Even if sufficient stocks do exist to support some hunting activities, many people consider whales to be very intelligent animals displaying rather remarkable abilities: the traveling of long distances to reach their feeding and breeding grounds, the communicating with one another in a seemingly sophisticated manner, and the expressing of great concern and even love for other whales. (Greenpeace identifies whales as the "humans of the ocean.") Many experts contend that the eventual demise of whales will be caused by the impacts of pollution—not by hunting; nevertheless, whaling, on ethical grounds alone, may prove to be the most controversial and problematic environmental issue that Norway and Iceland encounter in the future.

#### Tourism and the Environment

Tourism, an activity that has numerous environmental implications, is expanding throughout the Nordic region. Among the most obvious examples of tourism is the increase in the number of seasonal homes that appear along the coastlines of lakes, rivers, streams, and seas, and in the mountains. Domestic tourists obviously play the primary role in each individual nation, but international visitors also find the unspoiled environment of the Nordic region especially attractive. While problems exist in every country, a few examples from Denmark and Iceland exhibit the wide range of issues that must be considered when a country addresses the benefits and pitfalls of contemporary tourism.

The highlands of Iceland have served as grazing areas for centuries, but in recent years the region has emerged as a popular tourist destination. The use of automobiles, buses, horses, and all-terrain vehicles in areas that previously were very difficult to reach has been growing. These forms of transportation pose especially serious risks to the soil and vegetative cover and augment the chance of further erosion of the delicate upland soils. Likewise, the construction of huts in the highlands has increased; many of these structures have been built without permission or with few planning and design standards. An effort is being made to control tourist traffic by limiting entry only



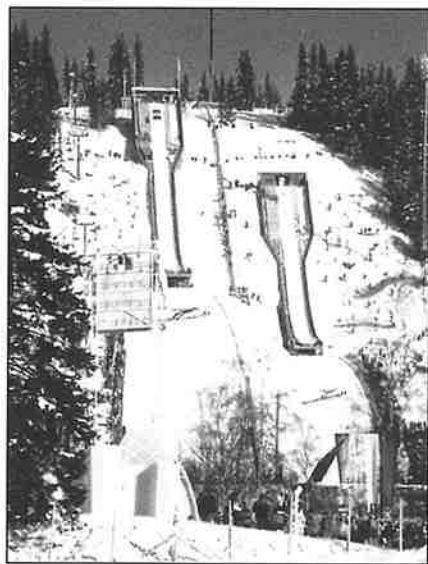
A sauna located on the shoreline of a Finnish lake. More than 400,000 seasonal homes now exist along Finland's waterways, and large numbers of holiday residences are also found throughout the most scenic areas of the other Nordic nations. Finland's shoreline regulations, however, are noted as being the least restrictive in the region. To many Finns the opportunity to use one's stretch of shoreline in any way he or she chooses is virtually regarded as a sacred right. After a national shoreland protection program was passed in late 1990, for example, thousands of Finnish landowners protested. Wilderness protection had received widespread support from the Finnish populace only a few years earlier, whereas in this case the critics complained that the government was "being too green rather than not green enough" (Wahlström et al. 41).



Winter tourism in Lapland. Formerly, the Sámi used reindeer and sleighs for virtually all of their wintertime travel needs, but now they are employed primarily to entertain tourists. The snowmobile has become the common mode of conveyance during the winter season.



Springtime skiing at Þórsmörk, southern Iceland. The skiers are passing through a valley that is popular with hikers during the summer months.



The 90- and 120-meter ski jumps at Lillehammer, constructed for the 1994 Winter Olympic Games.

to a few places, which are maintained under the supervision of the Nature Conservation Council; this organization is cooperating actively with the Icelandic Tourist Board and the Soil Conservation Service to find and implement practical solutions to the multitude of problems that accompany tourist development.

Denmark, where tourists registered an estimated 52.5 million overnight stays in 1992, is the Nordic country that hosts the largest number of visitors. Of the international tourists who travel to Denmark, Germans, Swedes, and Norwegians predominate. The largest number of tourists are attracted to the 4,600 miles (7,500 kilometers) of Danish coastline, which continues to remain in a relatively pristine state. Unlike many other popular tourist countries, stringent planning regulations have kept two-thirds of the coasts free of any development, while the remaining one-third is used for seasonal homes. The landscape and beaches of Denmark are generally quite resistant to the pressures of tourism, but the dunes and a few other natural areas have been damaged in some heavily used sections. Tourism has also been found to affect ground water supplies and the quality of streams and lakes. Some summer houses leak household waste water into the underground aquifers, and the increased use of ground water in certain areas is causing streams and springs to dry out during hot summer periods.

The need for tourism planning has been recognized by the European Union, the Danish government, and many local planning authorities. In 1993, Denmark appointed its first Minister of Tourism. Adequate planning mechanisms are needed if the anticipated doubling in tourist numbers over the next ten years is to be accommodated. Questions requiring attention in Denmark and the other Nordic countries include the following: how can the mistakes of many other countries be avoided; how can tourism be developed as a sustainable activity that enhances the quality of life in local communities without causing social conflicts; and how can sensitive natural areas and the environment withstand increased tourist use?

#### The "Green" Winter Olympics

From the standpoint of size and visibility, few mega-events in the Nordic region exceed the Winter Olympic Games that took place in Lillehammer, Norway, from February 12 through 27, 1994. While the Olympics provide opportunities for elite athletes to compete against one another every four years, the Games also embrace a number of additional objectives. Various nations, regions, and places throughout the world seek to attract the Olympics both because of perceived increases in tourism and economic development and for the opportunities that are offered to showcase national and local cultural and scenic attributes to millions of television viewers.

The 1994 Winter Games also added a new dimension to the Olympic masthead: environmental awareness. Previous Olympic proposals and developments gave very little attention to the impacts that the Games exert upon the environment, whereas the Norwegian proposal to the International Olympic Committee (IOC), presented by Prime Minister Brundtland in 1988, stated

that the Games would adopt a "low impact" theme. The underlying premise of the Norwegian proposal was the emphasis it gave to what were termed the "Compact Games"—that is, the assurance that all Olympic venues would occur in or close to Lillehammer.

Some of the environmentally friendly standards for the Olympics were quite basic in their intent and application. Those standards included the use of such energy-saving measures as double-paned windows and heat-recovery systems in new arenas; the retrieving and recycling of bullets fired during the biathlon competitions; and the use of potato-starch plates for meals and snacks, which could later be used as hog feed. (It was even stated that hungry Olympic attendees could eat the plates after they had finished their meals!)

More important were the design and planning recommendations made by a team formed of architects, landscape architects, and planners to review the major project proposals for the Olympics. Included in the list of criteria were recommendations regarding the need to emphasize environmental protection, aesthetic quality, the unified design treatment of sites and structures, and respect for Norwegian design traditions. Cobalt blue and white were adopted as the primary colors for the design palette since they represent the Norwegian winter sky and snow, while the choice of additional hues was based upon seasonal color changes represented in the countryside.

Rather than constructing the 90- and 120-meter ski jumps atop a low mountain, where they would stand out as sentinels against the skyline, the facilities were nestled into the slope in a tear-drop-shaped setting. The cross-country and biathlon trails were designed to conform to local terrain features, but the most successful blending of landscape and structures occurred at the bobsled and luge run, where many sections of the facility are barely discernible to the eye. An Olympic ice hall constructed in Hamar, a town located a short distance from Lillehammer, employed a roof line designed in the form of an inverted Viking ship, while another hall in nearby Gjøvik was carved into a mountain. These two structures received the greatest amount of television coverage beamed throughout the world during the winter of 1994.

The IOC was quick to claim that the 1994 Winter Olympics set a new environmental standard for subsequent Games. In fact, the successful bid of Salt Lake City for the 2002 Winter Olympics also emphasized the "compactness" of the venues and facilities that will be associated with the Utah city and its immediate environs. Given the lack of attention that such issues received prior to the 1994 Olympics, the Winter Games in Norway will be judged a success if they have indeed caused the IOC to become more cognizant of the environmental consequences associated with events of such scale and magnitude.

#### Cultural Resources, Landscapes, and Townscapes

For more than a century Nordic architects, landscape architects, and town planners have received considerable renown for



Pictograms used to identify competitions and events at the 1994 Winter Olympic Games in Lillehammer. Graphic artist Sarah Rosenbaum based the whimsical figures upon 4,000-year-old rock carvings found on the island of Rødøy—including the world's oldest known depiction of a skier. Rosenbaum's figures emphasize the respect that Norwegians give to their history and to nature. In 1992, she received a gold medal from the Art Directors Club of Europe for her Olympic designs.



The Old Town, Gamla Stan, situated in the center of Stockholm. Dating back to the Middle Ages, Gamla Stan is now preserved as an architectural and cultural monument.



The satellite community of Tapiola, Finland, located just northwest of Helsinki. Begun during the early 1950s, Tapiola quickly emerged as one of the world's best-known "new towns" of the post-World War II period. Most observers who viewed the community during its formative years were impressed by the architectural qualities of Tapiola, but the protection of nature and landscape received greatest attention. Tapiola now functions as one of several regional commercial centers that serve the Helsinki metropolitan area.

the attention they have given to nature protection and environmental issues. Today, environmentalists throughout the world increasingly recognize that a direct relationship exists between the ecological health of the countryside and well-planned and well-developed urban areas.

Few cities have received more attention for long-term metropolitan planning than has Stockholm. Unlike most American cities, which sprawl outward in a generally haphazard manner, Stockholm's development has been carefully regulated for close to a century. Already by the early 1900s, municipal officials had launched a program to purchase large estates that lay well beyond Stockholm's existing boundaries. That land was then "banked" or reserved until it was needed for development.

Between 1945 and 1975 alone, three-fourths of the new housing constructed in Stockholm occurred on such municipally owned land. Much of the development took place in planned communities or satellite cities separated from Stockholm by greenbelts, with the movement of people between the satellites and downtown being facilitated by an efficient subway system. As Stockholm has grown northward and southward from its original island core, the Old Town (Gamla Stan) has been preserved as an architectural and historical monument to the past.

The evolution of the other Nordic capitals has followed a relatively similar course, although each of the cities (including Stockholm) face growing problems of traffic congestion. Nevertheless, it is still possible to ski, virtually uninterrupted, from downtown Oslo, Helsinki, and Stockholm to the open countryside. As in Stockholm, much of the population growth in the other Nordic capitals has been accommodated in planned satellite communities.

Attention is also being given to the protection of certain agricultural and cultural landscapes in Norden, where hundreds and even thousands of acres of land are involved. One early example of cultural landscape preservation occurred at Ångsö National Park in the Stockholm archipelago. When the area was designated a national park in 1909 to protect its pastures, meadows, and herbs, the tenant farmer on the site had to leave. Although Ångsö was considered a rare example of the original Nordic landscape, the "natural" features quickly reverted to brush and trees. Only later, after it was recognized that agricultural practices had contributed to the development of what actually was a cultural landscape, were grazing and haymaking activities resumed.

As former agricultural land and management practices have been abandoned throughout much of the Nordic region, the processes that occurred at Ångsö are evident on a much broader scale. Since the mid-1940s, the pasture and meadow areas of Finland, Norway, and Sweden have declined by more than one-half. It is now recognized that, in addition to pristine areas and environments, agricultural landscapes merit preservation.

The Swedish government, in 1983, led the way in developing legislation to protect representative areas of the countryside as cultural landscapes. About 23,500 acres (9,500 hectares) of

agricultural and cultivated grazing land had been protected by 1992. Sweden's Maintenance of Farmland Act also ensures that the biological factors comprising such cultural landscapes will be protected, maintained, and managed through time. Since 1986, the Swedish government has offered financial incentives to farmers who not only pursue nature conservation but also continue to practice traditional haymaking and harvesting.

The agricultural landscapes of the Nordic countries are certain to undergo a profound change as European integration proceeds. For many decades, farming in Finland, Norway, and Sweden has been heavily subsidized for economic, social, cultural, and national security reasons. By joining the European Union, Finland and Sweden have agreed to conform to the common agricultural policies of other European nations; this agreement may result both in the abandonment of as many as one-third to one-half of all farms in the two countries and the massive reforestation of abandoned fields. Since Norway chose not to join the European Union, it is possible that its agricultural and cultural landscapes will not be so dramatically affected. Some farmers in all three countries, however, may find it possible to compete in the European market by limiting the quantities of chemicals that are used to raise agricultural products. Since farms in the major agricultural nations of Europe generally employ large amounts of fertilizers and chemicals, agrarians who demonstrate "cleaner" practices may find a ready market for their products.

Norway, Sweden, and Finland, since the late 1980s, have been active in identifying and nominating sites for consideration as UNESCO World Heritage properties. By mid-1995, twelve Nordic sites in Finland, Norway, and Sweden had been included on the United Nations' World Heritage listing. Such sites are considered only if they are so valuable and significant they merit international recognition and protection. Examples include the Great Wall of China; the Acropolis in Athens, Greece; Machu Picchu in the Andes Mountains in Peru; the Statue of Liberty in New York City; Independence Hall in Philadelphia; and the Viking site at L'Anse aux Meadows in Newfoundland.

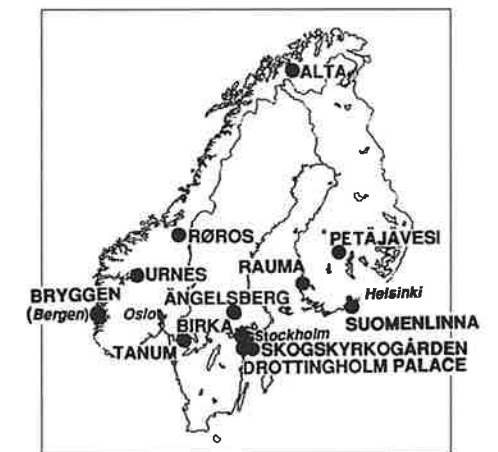
The four Norwegian World Heritage properties are the 6,000-year-old rock carvings found along the Alta fjord in Finnmark; Bryggen, a grouping of 58 wooden buildings on Bergen's harbor that date back to Hanseatic times; the twelfth-century stave church at Urness, one of the world's oldest wooden structures; and the former copper mining community of Røros, founded in the 1640s. Finland's three sites are the medieval wooden town of Rauma; a simple but elegant wooden church in Petäjävesi, built in the 1760s; and Suomenlinna or Sveaborg, a massive eighteenth-century island fortress guarding the way to Helsinki. The five Swedish resources include numerous Bronze Age rock carvings at Tanum in Bohuslän; the site of Birka, Sweden's oldest town, located on the island of Björkö in Lake Mälaren; the royal domain of Drottningholm Castle; the old foundry at Ångelsberg (modern spelling Engelsberg), situated in the historic iron-producing region of Bergslagen; and Skogskyrkogården, a forest cemetery in Stockholm designed by E. G.



Farms and field patterns in southern Finland. As recent members of the European Union, the farmers of Finland and Sweden will face extreme competition from the more agriculturally productive countries on the Continent. As farming is abandoned, cultural landscapes may be modified dramatically.



Goats grazing in a mountainous area of western Norway. By choosing not to join the European Union, Norway may be the only Nordic nation where traditional agricultural practices and landscapes are highly visible in the twenty-first century.



The twelve World Heritage sites in Finland, Norway, and Sweden, mid-1995. (Major cities are also shown for reference.)



The World Heritage site of Røros, Norway. Røros was designated a World Heritage site because the town plan and property boundaries reveal its mid-seventeenth-century origins; also exhibited are a number of remarkably well-preserved eighteenth- and nineteenth-century log structures. In addition, Røros displays the remnants of copper excavations, ore storage yards, slag heaps, and smelting works that contributed to a long history of air and water pollution problems.



The wooden village of Lyngør, Norway. Several wooden villages in Norden have received attention from preservationists who wish to protect representative examples of traditional architecture. In 1991, Lyngør was voted the best-preserved wooden village in Europe by a panel of experts who evaluated several sites. (Other high-ranking prospects included villages in Denmark and Finland.) Situated on four small southern coastal islands located about 150 miles (265 kilometers) southwest of Oslo, virtually all of Lyngør's buildings are covered with old-fashioned clapboard siding—a style that is termed *Sørlandet*, or Southland. Accessible only by boat, Lyngør allows no automobiles. Despite Lyngør's ambiance, the permanent population barely exceeds 100 residents, and its future existence as a viable community remains somewhat in doubt.

Asplund and Sigurd Lewerentz in 1915. No properties in Denmark or Iceland were on the World Heritage list as of the mid-1990s, but worthy nominations are under constant evaluation by UNESCO.

#### Green Politics in the Nordic Nations

The idea that green, or environmental, politics can play a major role in the political life of a nation emerged among a number of Western democracies during the 1970s. The world's first independent green parties were formed in Great Britain and New Zealand in 1972, whereas parliamentary Greens achieved initial success in Belgium in 1982.

Nordic Greens also initiated their organizational activities during the 1970s. In Finland a group of environmentalists came together in 1979 to stop the draining of a bird sanctuary in the southwestern part of the country. Over the next few years a number of environmental groups, working with counterculture activists and advocates for the disabled in the Helsinki region, formed a green movement. In 1983, two Greens were elected to the Finnish Parliament—an unprecedented event since they did not yet even belong to a formal political party. When the Greens increased their parliamentary representation by only two members in the 1987 election, the members decided to develop an official organization; one year later the Green League (*Vihreä Liitto*) joined the ranks of Finland's political parties. Among the most important items on the Finnish Greens' agenda was their goal to increase the participation of women in the party. In 1991, when ten Greens were elected to Parliament, five were women. Several political commentators have claimed that the high quality of the women in the Green party contributed significantly to the fact that 77 of the Parliament's members in 1991 were female (38.5%)—the highest proportion in the world. The number of Greens in Parliament dropped from ten to nine from 1991 to 1995, but one of their members was named Minister of the Environment in the new coalition government. At present, *Vihreä Liitto* is seeking to establish itself as the fourth largest political party in Finland.

The Swedish Green Party, *Miljöpartiet de Gröna*, was formed in 1981. Thereafter, the party's candidates received support in national elections, but none of their members was elected to Parliament until 1988. (In Sweden, a political party needs to receive at least four percent of the national vote to gain access to the national legislative body.) The 1988 elections, however, saw the Greens emerge as the first new Swedish political party in seventy years to enter Parliament. Besides the 20 Greens who served in the national government, other party representatives, between 1988 and 1991, were elected to all of Sweden's 25 county councils and to 260 of 284 local councils. Nevertheless, the Greens' national success was short-lived since their proportion of the parliamentary vote in 1991 fell below the four percent level. Three years later, however, the Greens received five percent of the national vote and elected 18 members to Parliament. The Green Party adamantly opposed Swedish membership in the European Union, and now calls for a future

referendum to determine if the citizens of Sweden still support direct participation in the European organization. In addition, Swedish Greens are concerned about the survival of rural populations and communities, children's welfare, the protection of natural and cultural resources from international buyers, and gender equity.

Denmark's Green party, *De Grønne*, was founded in late 1983. As of 1993, however, the Danish Greens had not yet succeeded in capturing the two percent of the total national vote that is required to enter Parliament. Some analysts contend that Denmark is already so "green" that a separate environmental party is not needed. Also, other Danish political parties, the Social Liberals in particular, often present themselves as strong environmentalists. Copenhagen's Greens have especially focused upon the volume of automobile traffic that affects their city. They have called for reductions in the number of vehicles by one-half during the 1990s and a requirement for all vehicles to have catalytic converters by the early twenty-first century.

As of 1995, no Greens had been elected to the Parliaments of Norway or Iceland. Again, the situation is rather similar to Denmark's in that other political parties have adopted portions of the environmental agenda. For example, Norway's Labor party, under Prime Minister Brundtland's leadership, voices an environmental message, although the Socialist Left party may represent green values even more strongly. In Iceland, the Women's Alliance advocates the strongest environmental agenda. Because of Iceland's very small population, however, it is difficult for a political party to build its platform solely on a strong environmental vision.

#### The Nordic Council and the Environment

The Nordic Council began to give attention to environmental issues immediately after the organization was established in 1952. Significant coordination of environmental protection measures commenced in 1978 when the Nordic Council of Ministers' Executive Committee for the Environment formed a permanent working committee: The Nature Conservation and Outdoor Life Group (*Naturvern- og Friluftslivsgruppen*), or NCOLG. In 1991, NCOLG was asked to prepare a proposal for a Nordic nature protection strategy. Their report, published in 1995, calls for the adoption, throughout the region, of several measures that have already been implemented by at least one Nordic nation. The report also marks the first time a comprehensive effort was made to translate the recommendations of the United Nations and other international bodies into a Nordic context.

Nature conservation is defined by NCOLG "as the conservation of nature and landscape via planning, preservation orders, nature-care measures, the restoration of damaged areas and the promotion of the sustainable utilization of natural resources" (Nordic Council of Ministers 9). Specifically, NCOLG lists eight points that need to be addressed in developing a strategy for the Nordic region:



Symbol of Sweden's Green Party

#### Employing Traditional Design Principles in Contemporary Nordic Architecture

For thousands of years the residents of Norden have sited and constructed their buildings in recognition of the resource and climatic constraints posed by their northern region. Many of these common or vernacular building traditions have subsequently been utilized by Nordic architects and landscape architects in developing design solutions for a variety of situations and conditions. Recently, some designers, such as those Norwegians who formed the Gaia Group in 1983, have been planning and constructing buildings based entirely upon ecological principles. Their "eco-cycle" houses, which are constantly attuned to the changing rhythms and cycles of nature and the local environment, utilize the outputs produced in one part of a residence elsewhere in the dwelling. Wood, stone, earth, recycled brick, and plant materials such as straw are employed to provide insulation and ventilation and to regulate humidity and moisture; furthermore, the indoor air is refreshed and used water is cleaned and recycled by the biological properties of plants.

Eventually, the eco-cycle houses will be linked to a larger "permaculture" that includes cultivation and the recycling of waste and water. Some small-scale Nordic enclaves already operate as permacultural systems, including several co-housing projects—residences developed by the inhabitants themselves to combine "the autonomy of private dwellings with the advantages of shared facilities and communal living" (Pearson 159).

In western Finland, Scottish-born architect D. George Woolston (a resident of Finland since 1970) is conducting detailed surveys of Ostrobothnian farmhouses built between 1700 and 1914. Working with volunteers recruited by Earthwatch, an international foundation (based in Massachusetts) that funds scientific fieldwork, Woolston is pursuing the first project of its kind in the Nordic region. He and his volunteers are documenting the basic characteristics of these structures, including their layout, which offers efficient heating and lighting in each room; their relationship to local landscapes and nearby buildings; and their materials, which are used in a healthful and ecologically sensitive manner. The intention of this work, Woolston notes, is not to create replicas of the buildings, but to learn how modern design can be improved.

#### Citizen Attitudes Toward the Environment

In 1992, twenty years after the Conference on the Environment was held in Stockholm, the United Nations convened a similar gathering of world leaders in Rio de Janeiro, Brazil. Called the "Earth Summit," the sessions demonstrated that during the two decades between Stockholm and Rio, concern for the environment had spread from the wealthy industrialized nations to all sections of the world.

To gather information on these environmental trends, the Gallup International Institute, in 1992, conducted a scientific survey of citizens in twenty-four different countries. The nations surveyed ranged from Nigeria in Africa to India and Japan in Asia, from Chile in South America to the United States and Canada in North America, and from Poland and Russia in Eastern Europe to Denmark, Finland, and Norway in the Nordic region. (Iceland and Sweden were not surveyed.) To measure environmental attitudes, all survey participants were asked to respond to sixty questions. By reviewing the results from a few key questions, it is possible to gain numerous insights to the similarities and dif-

- Nature conservation means all of nature; attention should be given not only to rare and endangered species, but also to ordinary species.
- Nature conservation should be concerned with all landscapes, including those used for production.
- Nature conservation should be considered only one facet of environmental conservation and planning—attention must also be given to the cultural concept of nature.
- Nature conservation should be integrated into all sectors of activity, including agriculture, fishing, transportation, and outdoor recreation.
- Nature conservation should include everyone.
- Nature conservation should benefit everyone by assuring a right of access to the out-of-doors.
- Nature conservation should be relevant as changes occur over time; long-term goals should be established to ensure that society exerts a favorable influence on the natural world.
- Nature conservation should be a global issue, ranging from local ecosystems to the entire biosphere.

Of special interest is the consideration that NCOLG gives to the protection of both natural and cultural values in the countryside. To accomplish the latter, the group advocates planning activities that give attention to villages and traditional/agricultural landscapes—despite the fact that considerable monetary resources are required to protect even the smallest areas.

#### CONCLUSION

When compared to many other areas of the world—especially those that are densely populated, have high population growth rates, or do not possess appreciable monetary wealth—the Nordic nations have environmental problems that appear rather minor and quite resolvable. Nevertheless, the countries of the Nordic region are not immune to a number of issues that have significant environmental dimensions, whether those issues be the clear-cutting of old-growth forests or the hunting of whales in the ocean.

The Nordic region demonstrates that the interdependencies that characterize all facets of an ever-shrinking world are also paralleled in the environmental arena. Much of the region is affected by activities in other countries that contribute to the degradation of the environment. Whether it be radioactive fallout that threatens human and animal health or the acid rain that causes bodies of water to die, the Nordic states obviously are in no position to place barriers between themselves and other nations.

In fact, Denmark, Finland, Iceland, Norway, and Sweden, whether acting individually or through the Nordic Council, are providing assistance to a number of nations (most in Eastern

Europe) that contribute to reductions in the environmental quality of the Nordic region. The Nordic Council has signed protocols and agreements with several countries that share, or border upon, a common resource, such as the Baltic Sea or the Arctic Ocean; Finland is offering its expertise and financial assistance to Estonia, Russian Karelia, and St. Petersburg to improve environmental quality; Norway, Finland, and Sweden are assisting the Russian government in reducing the serious sources of pollution that originate on the Kola peninsula; and Norway has entered into bilateral environmental agreements with the Czech Republic, Hungary, and Poland to monitor atmospheric pollution generated in those countries.

The Nordic approach—assisting nations that do not possess adequate resources to meet many of their most pressing needs, including environmental protection and pollution control—may very well serve as a model that can be applied elsewhere on the globe. As has been the case with regard to a number of social and economic issues, the Nordic nations may also provide the world with alternative policies and directions for the resolution of its various environmental problems.



The Nordic environmental label. In 1989, the Nordic Swan was adopted by the governments of Finland, Iceland, Norway, and Sweden to identify consumer products that are least hazardous. To determine which products are environmentally friendly, an independent agency in each nation makes tests and evaluations and advises manufacturers in their production and marketing activities. Similar efforts occur in many areas of the world, but the Nordic program marks the first international environmental labeling system. As of August 1995, more than 800 products in some 30 product groups had been certified to utilize the label in the Nordic region.

ferences that exist between and among the citizens of various nations. As might be expected, Danes, Finns, and Norwegians hold generally similar environmental attitudes. Nevertheless, some differences are evident in the degree of concern for certain issues. (See Table 2 at the end of this document.)

When citizens were asked to identify the most important problem facing their nation in 1992, a larger proportion of Finns (28%) listed the environment than did those of Denmark (13%), Norway (7%), and the United States (11%). Only the Netherlands (38%), Ireland (38%), and Mexico (29%) exceeded the figure displayed by Finland. The economy, however, was considered the most important national problem in the three Nordic countries—Norway (72%), Denmark (59%), and Finland (50%)—and in the United States (54%).

The quality of the environment in the respondents' own nation was considered to be "very good" by a larger proportion of Norwegians (16%) and Danes (15%) than Finns (4%) and Americans (3%). However, when those results were combined with the figures for respondents who considered their nation's environmental quality to be at least "fairly good," it became apparent that the vast majority of Nordic citizens—Norwegians (87%), Finns (85%), Danes (80%)—are positive in their evaluations; only slightly more than one-half (52%) of the Americans are similarly disposed.

When comparing environmental concerns with other issues that are important in their countries, respondents throughout the world listed a number of social problems. Citizen perception of crime and violence was one of the most telling issues concerning the quality of life in each country. In the Nordic nations, this issue is termed a "very serious" problem by a greater proportion of Norwegians (45%) than by Danes (40%) and Finns (23%). As might be expected, crime and violence are considered very serious problems in the United States (85%); the country's concern exceeds that of any other nation.

TABLE 1  
POPULATION AND LAND-USE CHARACTERISTICS, 1995

| Country        | Population  | Land Area<br>(Km <sup>2</sup> )* | Density<br>(People/Km <sup>2</sup> ) | Urban % | Average Pop-<br>ulation Increase<br>1990-95<br>(Annual %) |
|----------------|-------------|----------------------------------|--------------------------------------|---------|-----------------------------------------------------------|
| Denmark        | 5,190,000   | 43,000                           | 121                                  | 86      | 0.20                                                      |
| Finland        | 5,050,000   | 338,000                          | 15                                   | 60      | 0.26                                                      |
| Iceland        | 267,000     | 103,000                          | 2.6                                  | 57**    | 1.04                                                      |
| Norway         | 4,360,000   | 324,000                          | 13                                   | 77      | 0.51                                                      |
| Sweden         | 8,770,000   | 412,000                          | 21                                   | 85      | 0.48                                                      |
| Norden (Total) | 23,630,000  | 1,220,000                        | 19                                   | 78      | 0.45                                                      |
| United States  | 263,140,000 | 9,167,000                        | 29                                   | 76      | 1.03                                                      |

Sources: Derived from World Resources Institute, *World Resources, 1994-95* (New York: Oxford UP, 1994) and Statistical Bureau of Iceland.

\* Because of continuous land uplift (especially in Finland), land area figures may vary from one source to another.

\*\* Percentage of Icelanders residing in Reykjavík and its surroundings.

TABLE 2  
ENVIRONMENTAL ATTITUDES, 1992

|                                                                                                  | Percentage of People Responding to Each Question |       |            |           |
|--------------------------------------------------------------------------------------------------|--------------------------------------------------|-------|------------|-----------|
|                                                                                                  | Danes                                            | Finns | Norwegians | Americans |
| A. What is the most important problem facing your nation?                                        |                                                  |       |            |           |
| Environmental                                                                                    | 13%                                              | 28%   | 7%         | 11%       |
| Economic                                                                                         | 59%                                              | 50%   | 72%        | 54%       |
| All Others                                                                                       | 26%                                              | 20%   | 17%        | 30%       |
| Not Sure                                                                                         | 2%                                               | 2%    | 4%         | 5%        |
| B. Is it more important to protect the environment or to promote economic growth in your nation? |                                                  |       |            |           |
| Protect Environment                                                                              | 77%                                              | 72%   | 72%        | 58%       |
| Promote Economic Growth                                                                          | 9%                                               | 9%    | 14%        | 26%       |
| Equal Priority                                                                                   | 8%                                               | 15%   | 8%         | 8%        |
| Not Sure                                                                                         | 6%                                               | 4%    | 6%         | 8%        |
| C. What is the quality of the environment like in your own nation?                               |                                                  |       |            |           |
| Very Good                                                                                        | 15%                                              | 4%    | 16%        | 3%        |
| Fairly Good                                                                                      | 65%                                              | 81%   | 71%        | 49%       |
| Fairly Bad                                                                                       | 16%                                              | 12%   | 11%        | 35%       |
| Very Bad                                                                                         | 2%                                               | 1%    | 1%         | 10%       |
| Not Sure                                                                                         | 2%                                               | 2%    | 1%         | 3%        |
| D. How would you regard the seriousness of environmental issues in your nation?                  |                                                  |       |            |           |
| Very Serious                                                                                     | 26%                                              | 21%   | 40%        | 51%       |
| Somewhat Serious                                                                                 | 50%                                              | 52%   | 48%        | 40%       |
| Not Very Serious                                                                                 | 19%                                              | 24%   | 9%         | 6%        |
| Not At All Serious                                                                               | 3%                                               | 2%    | 2%         | 1%        |
| Not Sure                                                                                         | 2%                                               | 1%    | 1%         | 2%        |
| E. What is the impact of crime and violence upon your country?                                   |                                                  |       |            |           |
| Very Serious                                                                                     | 40%                                              | 23%   | 45%        | 85%       |
| Somewhat Serious                                                                                 | 48%                                              | 54%   | 46%        | 14%       |
| Not Very Serious                                                                                 | 10%                                              | 20%   | 7%         | 1%        |
| Not At All Serious                                                                               | 1%                                               | 2%    | 1%         | —         |
| Not Sure                                                                                         | 1%                                               | 1%    | 1%         | —         |

Source: Derived from Riley E. Dunlap, George H. Gallup, Jr., and Alec M. Gallup, *Health of the Planet: Results of a 1992 International Environmental Opinion Survey of Citizens in 24 Nations* (Princeton, NJ: George H. Gallup International Institute, 1993).

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Marla McEnaney prepared a number of illustrations for this publication, while Sally Domini's wordprocessing skills were employed to lay out the text. The comments of Dr. Maunu Häyrynen, who reviewed the manuscript in its draft form, were especially valuable, as were the insights supplied by Drs. Ari Lehtinen, Frankie Shackelford, Jole Shackelford, Martin Shafer, and Kirsti Sorsa. The reviewers, of course, should not be held responsible for any factual errors or misinterpretations in the text.