

**FIGURE 1.2 The Regional Nature of Environmental Problems**

The regulation of salmon fishing in the Northwest involves several states and the Canadian province of British Columbia. These political entities regulate fishing seasons and the kind of gear that can be used.

Quebec. Problems associated with the use of this resource are regulated by the International Joint Commission. The International Joint Commission was established in 1909, when the Boundary Waters Treaty was signed between the United States and Canada. The treaty was established in part to provide that the “boundary waters and waters flowing across the boundary shall not be polluted on either side to the injury of health or property of the other.” The commission has been instrumental in identifying areas of concern and encouraging the cleanup of polluted sites that affect the quality of the Great Lakes and other boundary waters. In general, the two national governments and the state and provincial governments have listened to the commission’s advice and have responded by initiating cleanup activities and regulating the export of water from the region.

## THE GLOBAL NATURE OF ENVIRONMENTAL CONCERNS

As the human population has increased, the natural ecosystems of the Earth have been stressed. Recognition of this has led to international activities to address concerns about the Earth’s natural systems and how humans are affecting them.

### *The Earth Summit*

The first worldwide meeting of heads of state that was directed to a concern for the environment took place at the Earth Summit, formally known as the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992. One of the key outcomes of the conference was a series of policy statements on sustainable development that were identified as Agenda 21.



More than 178 governments at the 1992 conference adopted Agenda 21, the Rio Declaration on Environment and Development, and the Statement of Principles for the Sustainable Management of Forests to ensure effective follow-up of UNCED. The United Nations Commission on Sustainable Development was created in 1993 to monitor and report on implementation of the agreements. Follow-up conferences were held in 1997 and 2002 to assess progress.

### *Climate Change*

In 1997, representatives from 125 nations met in Kyoto, Japan, for the Third Conference of the United Nations Framework Convention on Climate Change. This conference, commonly referred to as the Kyoto Conference on Climate Change, resulted in commitments from the participating nations to reduce their overall emissions of six greenhouse gases (linked to global warming) by at least 5 percent below 1990 levels and to do so between the years 2008 and 2012. The Kyoto Protocol, as the agreement was called, was viewed by many as one of the most important steps to date in environmental protection and international diplomacy. It may be years before we will know if all countries that signed these agreements will meet their commitments to environmental improvement, but they have at least stated their intention to do so.

### *The Millennium Ecosystem Assessment*

In 2005, the Millennium Ecosystem Assessment was completed. It was initiated by the United Nations and included input from over 1360 experts from around the world. It looked at the services provided by ecosystems and evaluated the status of each service. Four broad areas of ecosystem services were identified: supporting services, provisioning services, regulating services, and cultural services. Supporting services include such ecosystem functions as: photosynthesis, soil formation, nutrient cycling, and water cycling. Provisioning services include resources provided by ecosystems such as: food, fiber, genetic resources, natural medicines, and freshwater. Regulating services include ecosystem activities that affect air quality, water flow, erosion control, water purification, climate control, disease regulation, pest regulation, pollination, and natural hazards. Cultural services include spiritual, religious, and aesthetic values, and the use of the natural world for recreation.

In general the report is quite negative. As the human population has grown we are putting pressure on the natural ecosystems of the world, and most are being negatively affected. Food production is one bright spot. Production of crops, livestock, and fish from aquaculture have increased. However, this is at the expense of the loss of soil from erosion, the conversion of natural ecosystems to managed agricultural systems, and overconsumption of water resources.

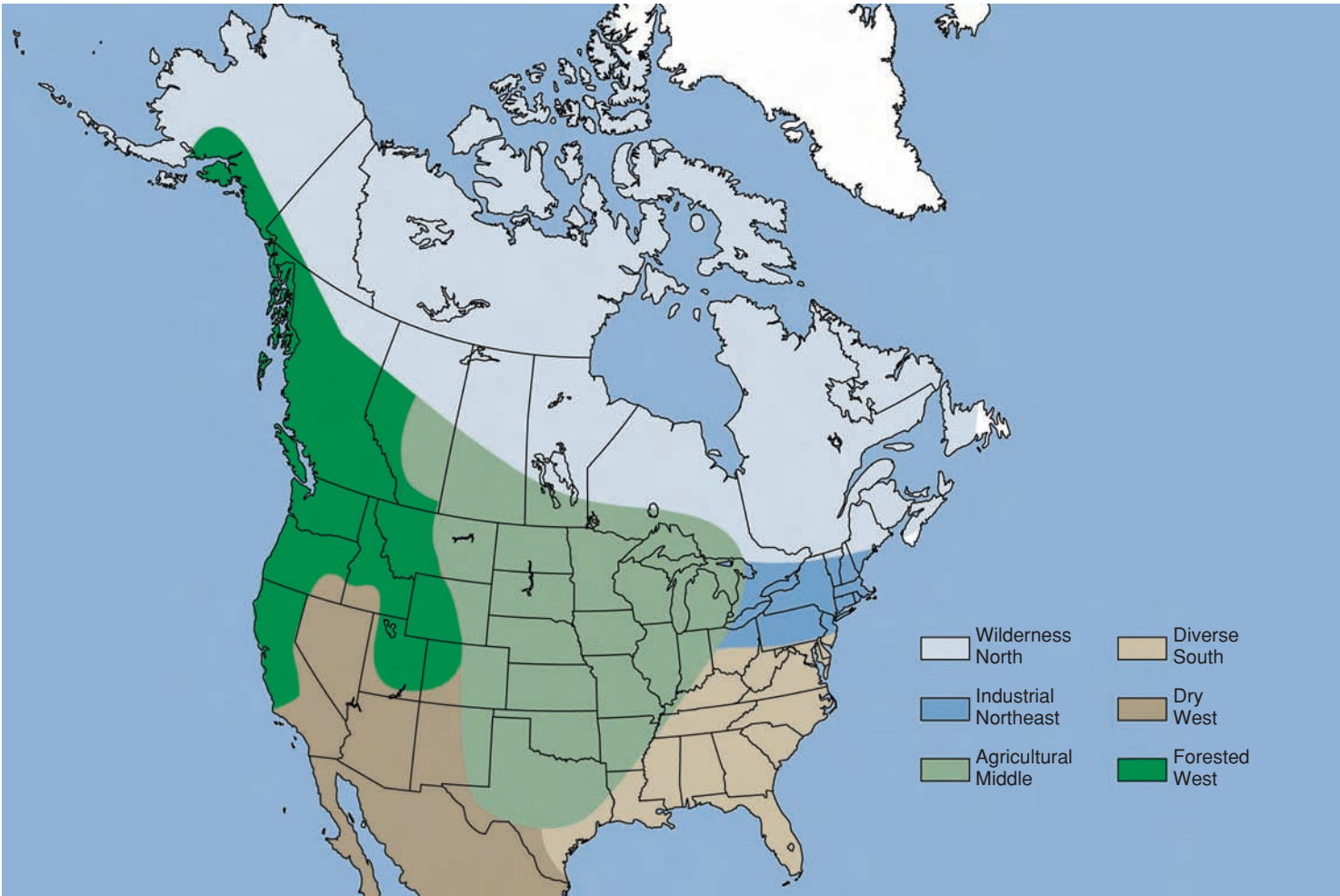
## REGIONAL ENVIRONMENTAL CONCERNS

To illustrate the interrelated nature of environmental issues, we will look at several regions of North America and highlight some of the key features and issues of each (See figure 1.3.). For example, protecting endangered species is a concern in many parts of the world. In the Pacific Northwest, for example, an endangered species known as the northern spotted owl depends on undisturbed mature forests for its survival. Development and logging may conflict with the survival of the owl. In most metropolitan areas, the problem of

endangered species is purely historical, since the construction of cities has destroyed the previously existing ecosystem. Here we present a number of regional vignettes to illustrate the complexity and interrelatedness of environmental issues. Each region has specific environmental issues that capture the attention of the people who live there.

### THE WILDERNESS NORTH

Much of Alaska and Northern Canada can be characterized as **wilderness**—areas with minimal human influence. Much of this land is owned by governments, not by individuals, so government policies have a large effect on what happens in these regions. These areas have important economic values in their trees, animals, scenery, and other natural resources. Exploitation of the region’s natural resources involves significant trade-offs. Usually, a portion of the natural world is altered permanently, but the area altered is so small that many people consider it insignificant. Because of the severe climate, northern wilderness areas tend to be very sensitive to insults and take a long time to repair damage



**FIGURE 1.3 Regions of North America** Because of natural features of the land and the uses people make of the land, different regions of North America face different kinds of environmental issues. In each region, people face a large number of specific issues, but certain kinds of issues are more important in some regions than others.



Walrus harvesting



A clear-cut forest



Grizzly bear fishing for salmon

**FIGURE 1.4 The Wilderness North** Protection of wilderness is a major issue in this region. The major points of conflict involve the government role in managing these lands and wildlife, the protection of the rights and beliefs of native people, and the desire of many to exploit the mineral and other resources of the region.

done by unwise exploitation. Mining, oil exploration, development of hydroelectric projects, and harvesting of timber all require roads and other human artifacts, involve the insertion of new technologies into native culture, and generate economic benefits.

In the past, many short-term political and economic decisions failed to look at long-term environmental implications. Today, however, people are concerned about these remaining wilderness areas. Politicians are more willing to look at the scientific and recreational values of wilderness as well as the economic value of exploitation.

Native people, who consider much of this region to be their land, have become increasingly sophisticated in negotiating with state, provincial, and federal governments to protect rights they feel they were granted in treaties. They are sensitive to changes in land use or government policy that would force changes in their traditional way of life.

Concerned citizens, business interests, and environmental activists have become increasingly sophisticated in influencing decisions made by government. The process of compromise is often difficult and does not always ensure wise decisions, but most governments now realize they must listen to the concerns of their citizens and balance economic benefits with social and cultural benefits. (See figure 1.4.)

## THE AGRICULTURAL MIDDLE

The middle of the North American continent is dominated by intensive agriculture. This means that the original, natural ecosystems have been replaced by managed agricultural enterprise. It is important to understand that this area was at one time wilderness. Today, you would need to search very hard to find regions of true wilderness in Iowa, Indiana, or southern Manitoba. Some special areas have been set aside to preserve fragments of the original natural plant and animal associations, but most of the land has been converted to agriculture wherever practical.

The economic value generated by this use of a rich soil resource is tremendous, and most of the land is privately owned. Governments cannot easily control what happens on these privately held lands. But governments indirectly encourage certain activities through departments of agriculture that encourage agricultural research, grant special subsidies to farmers in the form of guaranteed prices for their products and other special payments, and develop markets for products.

One of the major, nonpoint pollution sources (pollution that does not have an easily identified point of origin) is agriculture. Air pollution in the form of dust is an inevitable result of tilling the land. Soil erosion occurs when soil is exposed to wind and moving water and leads to siltation of rivers, impoundments, and lakes. Fertilizers and other agricultural chemicals blow or are washed from the areas where they are applied. Nutrients washed from the land enter rivers and lakes where they encourage the growth of algae, lowering water quality. The use of pesticides causes concern about human exposure, effects on wild animals that are accidentally exposed, and residues in foods produced.

Since many communities in this region rely on groundwater for drinking water, the use of fertilizers and pesticides, and their potential for entering the groundwater as a result of unwise or irresponsible use, is a consumer issue. In addition, many farmers use groundwater for irrigation, which lowers the water table and leaves less groundwater for other purposes.

In an effort to stay in business and preserve their way of life, farmers must use modern technology. Careful use of these tools can reduce their impact; irresponsible use causes increased erosion, water pollution, and risk to humans. (See figure 1.5.)

## THE DRY WEST

Where rainfall is inadequate to support agriculture, ranching and raising livestock are possible. This is true in much of the drier portions of western North America. Because much of the land is of low economic value, most is still the property of government, which encourages its use by providing water for livestock and irrigation at minimal cost, offering low-cost grazing rights, and encouraging mining and other development.

Many people believe that government agencies have seriously mismanaged these lands. They assert that the agencies are controlled by special interest groups and powerful politicians sensitive to the demands of ranchers, that they subsidize ranchers by charging too little for grazing rights, and that they allow destructive overgrazing because of the economic needs of ranchers. Ranchers argue that they require access to government-owned land, cannot afford significantly increased grazing fees, and that changing government policies would destroy a way of life that is important to the regional economy.





## THE GREATER YELLOWSTONE ECOSYSTEM

In 1872, the U.S. government established Yellowstone National Park as the world's first national park. It was a large area that protected unique natural features such as geysers, hot springs, rivers, lakes, and mountains. It was also a preserve for many kinds of wildlife such as grizzly bears, elk, moose, and bison. At the time it was established, the park was thought to be of adequate size to protect the scenic resources and the wildlife. Since that time, the lands surrounding the park have been converted to a variety of uses, including cattle grazing, timber production, hunting, and mining.

Fortunately, most of the lands surrounding Yellowstone National Park and the adjacent Grand Teton National Park are still under government control as national forests, national wildlife refuges, and other state, local, or federal entities. Some of the park wildlife, particularly the grizzly bear and bison, often wander across the park boundaries. The grizzly in particular needs large regions of wilderness to survive as a species.



Many people assert that it is essential that these lands be integrated into a Greater Yellowstone Ecosystem management plan encompassing about 7.3 million hectares (18 million acres). The plan is based on more natural boundaries than the original boundaries established in 1872. This would require changes in the way much of the land surrounding Yellowstone is being used. The trade-offs are significant. Logging, mining, hunting, and grazing would be stopped or significantly reduced. This would result in a loss of jobs in those industries. Proponents argue that additional jobs would be created in the tourist and related service industries. The advantages, they argue, would be equal to or greater than the economic losses caused by stopping current uses. Ultimately, government officials will make decisions regarding how this land will be used. Since there are competing interests, the decisions will represent a compromise.



Dust



Erosion

**FIGURE 1.5 The Agricultural Middle** The rich soil resource of this region has been converted to managed agricultural activity. The use of pesticides and fertilizer and exposure of the land to erosion cause concern about pollution of surface and groundwater. Most farmers still maintain that these practices are essential in modern agriculture and that they can be used safely and with minimal pollution.



Food production



Pesticide use



Water is an extremely valuable resource in this region. It is needed for municipal use and for agriculture. Many areas, particularly the river valleys, have fertile soils that can be used for intensive agriculture. Cash crops such as cotton, fruits, and vegetables can be grown if water is available for irrigation. Because water tends to evaporate from the soil rapidly, long-term use of irrigated lands often results in the buildup of salts in the soil, thus reducing fertility. Irrigation water flowing from fields is polluted by agricultural chemicals that make it unsuitable for other uses such as drinking. As cities in the region grow, an increasing conflict arises between urban dwellers who need water for drinking and other purposes, and ranchers and farmers who need the water for livestock and agriculture. Increased demand for water will result in shortages, and decisions will have to be made about who will ultimately get the water and at what price. If the urban areas get the water they want, some farmers and ranchers will go out of business. If the agricultural interests get the water, urban growth and development will have to be limited and expensive changes will have to be made to conserve domestic water use.

Because population density is low in most of this region, much of the land has a wilderness character. Increasingly, a conflict has developed between the economic management of the land for livestock production and the desire on the part of many to preserve the "wilderness." Designating an area as wilderness means that certain uses are no longer permitted. This offends individuals and groups who have traditionally used the area for grazing, hunting, and other pursuits. A long history of use and abuse of this land by overgrazing, modification to encourage plants valuable for livestock, and the introduction of grasses for livestock has significantly altered the region so that it cannot truly be called wilderness. The low pop-

ulation density does, however, provide a remoteness and natural character that many seek to preserve. (See figure 1.6.)

## THE FORESTED WEST

The coastal areas and mountain ranges of the western United States and Canada receive sufficient rainfall for coniferous forests to dominate as vegetation. Since most of these areas are not suitable for farmland, they have been maintained as forests with some grazing activity in the more open forests. Governments and large commercial timber companies own large sections of these lands. Government forest managers (U.S. Forest Service, Bureau of Land Management, Environment Canada, and various state and provincial departments) historically have sold timbercutting rights at a loss and are thought by many to be too interested in the production of forest products at the expense of other, less tangible values. In 1993, the U.S. Forest Service was directed to stop below-cost timber sales.

This policy change has become a major issue in the old-growth forests of the Pacific Northwest, where timber interests maintain that they must have access to government-owned forests in order to remain in business. Many of these areas have significant wilderness, scenic, and recreational value. Environmental interests point out that it makes no sense to complain about the destruction of tropical rainforests in South America while North America makes plans to cut large areas of previously uncut, temperate rainforest. Are the intangible values of preserving an ancient forest ecosystem as important as the economic values provided by timber and jobs?

Environmental interests are concerned about the consequences logging would have on organisms that require mature, old-growth forests for their survival. Grizzly bear habitat in Alaska and British Columbia could be altered significantly by logging; the northern



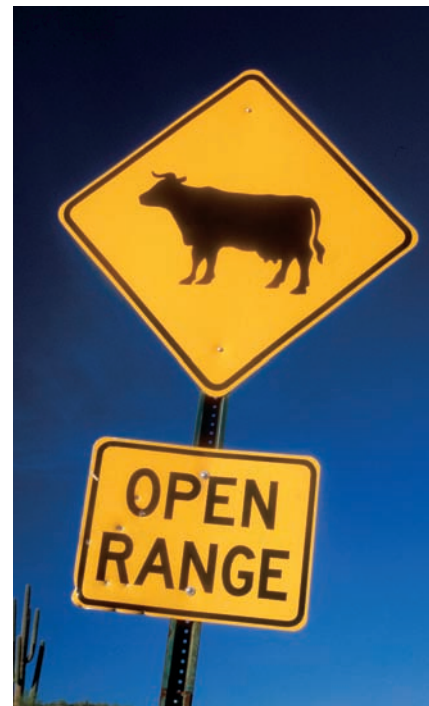
Grazing



Irrigation



Urban areas



Grazing on federal land

**FIGURE 1.6 The Dry West** Water is a key issue in this region. Both city dwellers and rural ranchers and farmers need water, and conflict results when there is not enough water to satisfy the desires of all. In addition, much of the land in this region is owned by the government. This raises concerns about how the government manages the land and how government policy affects the people of the region.



Forest Resources



Grizzly bear



Cut logs being hauled

**FIGURE 1.7 The Forested West** The cutting of forested areas for timber production destroys the previous ecosystem. Some see the trees as a valuable resource that provides jobs and building materials. Others see the forest ecosystem as a natural resource that should be preserved. In addition, government ownership of much of this land has generated considerable, political debate about what the appropriate use of the land should be.

spotted owl has become a symbol of the conflict between logging and preservation in Oregon and Washington; and preservation of coastal redwood forests has become an issue in northern California. (See figure 1.7.) The issue of government ownership of large areas of land and the policy of multiple uses of land is not new in the West.

## THE GREAT LAKES AND INDUSTRIAL NORTHEAST

While much of the West and Central regions of North America are characterized by low population densities and small towns, major portions of the Great Lakes and Northeast are dominated by large metropolitan complexes that generate social and resource needs that are difficult to satisfy. Many of these older cities were formed around industrial centers that have declined, leaving behind poverty, environmental problems in abandoned industrial sites, and difficulties with solid waste disposal, air quality, and land-use priorities. Interspersed among the major metropolitan areas are small towns, farmland, and forests.

One of the major resources of the region is water transport. The Great Lakes and eastern seacoast are extremely important to commerce; ships can travel throughout the area by way of the St. Lawrence Seaway and the Great Lakes through a series of locks and canals that bypass natural barriers. Because of the importance of shipping in this region, harbors have been constructed and waterways have been deepened by dredging. The waterways are maintained at considerable government expense.

One of the greatest problems associated with the industrial uses of the Great Lakes and East Coast is contamination of the water with toxic materials. In some cases, unthinking or unethical individuals have dumped toxins directly into the water. In other

cases, small, accidental spills or leaks over long periods of time have contaminated the sediments in harbors and bays.

A major concern about these pollutants is that they bioaccumulate (see chapter 14) in the food chain. The concentrations of some chemicals in the fat tissue of top predators, such as lake trout and fish-eating birds, can be a million times higher than the concentration in the water. Because of this, government agencies have issued consumption advisories for some fish and shellfish in contaminated areas. Since many kinds of fish can swim great distances, advisories for the Great Lakes warn against eating certain fish taken anywhere within the lakes, not just from the site of contamination. Similarly, Chesapeake Bay has been subjected to years of thoughtless pollution, resulting in reduced fish and shellfish populations and advisories against consuming some organisms taken from the bay.

Water always generates considerable recreational value. Consequently, conflicts arise between those who want to use the water for industrial and shipping purposes and those who wish to use it for recreation. Due to the fact that so much of the North American population is concentrated in this region, the economic value of recreational use is extremely high. Consumer pressure is great to clean up contaminated sites and prevent the pollution of new ones. Contaminated areas do not enhance tourism or quality of life.

Most of these older, large cities had no plan to shape their growth. As a result, open space for people is limited and urban dwellers have few opportunities to interact with the natural world. Children who grow up in these cities often do not know that milk comes from a cow—they have never seen, smelled, or touched a cow. Consequently, urban people have difficulty understanding the feeling rural people have for the land. These urban dwellers may never have an opportunity to experience wilderness. Their major environmental priorities are cleaning up contaminated sites, providing