



Chapter 2.

Introduction to Oregon's *State of the Environment Full Report*

The first chapter of this report is the *State of the Environment Report Statewide Summary*, which provides an overview of the status of Oregon's environment. The following section, the *State of the Environment Full Report*, provides more in-depth summaries of the status and health of Oregon's natural systems. The chapters in the Full Report are the work of individual Science Panel members, and represent the bulk of the effort that each scientist made to assess Oregon's environment. They are the building blocks of the report.

Although more detailed than the *Statewide Summary*, the resource chapters of the Full Report are still summaries of much more complex topics. The authors limited themselves to a discussion of four basic questions:

1. What defines the health of the resource, and what are the indicators of a healthy system?
2. What are the current conditions and trends?
3. What are the strengths? What are the threats or future risks?
4. What data are available and how complete are they?

Each author used these four questions to examine the state of key resources and natural systems in Oregon's environment.

Oregon's environmental heritage

Although people have lived here and used the region's natural resources for a very long time, human populations in Oregon began to expand during the middle of the 19th century with increasing impact on forests, rivers, and grasslands. Virtually all of the state's natural systems have been influenced in some way by human activities. It is impossible to return to a time when ecosystems were controlled entirely by natural processes. Today, Oregon's environment reflects a mixture of natural processes and human influences across a range of conditions, from areas defined by relatively natural structures and functions to areas completely dominated by human activities.

Early in Oregon's history, people saw the abundance of natural resources as something ready to be harvested, vast riches to be cut, plowed, or caught. Yet the intensity of harvest outpaced the land's natural ability to replenish itself, and as early as the 1920s, wheatlands in the Columbia Plateau were losing topsoil, grasslands in eastern Oregon were grazed bare, and the once-booming salmon industry was in decline.

In response, the state's resource management focused on improving the environment to produce more goods more reliably. Fast-growing trees, grasses, and fish supplanted native species in an attempt to provide predictable results from a managed environment. Rivers were harnessed to drain flooded valleys, irrigate the dry lands, and bring electric power to cities and industry. Such improvements paved the way for a dramatic increase in population and economic development.

By the 1960s it was again clear that parts of Oregon's environment were not healthy. Attention turned to the Willamette Valley, where increasing volumes of pollutants from growing industries and urban development poured into rivers, outpacing government efforts at sewage treatment.

This time Oregon's political leaders responded with a series of landmark initiatives to clean up Oregon's waterways and limit urban sprawl. Led by Governor Tom McCall, Oregon became a leader in the nation in land-use planning, reduction of waste, and land protection. But as Tom McCall said himself, "This great environmental triumph could prove to be a (futile) one if we don't keep the pressure on. It won't stay clean if we languish in the admiration of our own handiwork."

The quality of life made possible by a healthy environment continues to attract new people and industry to Oregon. Since 1990, Oregon's population has grown by 16 percent, averaging slightly more than 50,000 new residents per year. This brings new pressures to the state's environment. A quarter century after the passage of Oregon's land-use planning law, Governor John Kitzhaber and the Oregon Progress Board asked for a scientific assessment of the state of Oregon's environment. This report is the result of that request.

Challenges for the future

As the 21st century begins, the people of Oregon face new challenges in the management of natural resources. Past attempts to control the environment have had unanticipated costs. Natural occurrences such as fire, floods, and genetic diversity that seemed so unruly a half-century ago are now recognized as important aspects to maintaining the health of forests, rivers, and wildlife. Without these natural functions, we have found that forests may become diseased, wetlands disappear, and stocks of native fish decline.

The citizens of Oregon want assurances that the choices they make will keep their environment healthy enough to con-

tinue to produce goods and services into the future and provide a spectrum of environmental choices and experiences. Such assurances are difficult to make. The products provided from a healthy environment range from a sustainable supply of timber and forage to productive agricultural land and cities with clean air and water. These, too, may come with unanticipated costs. Urban growth areas designed to limit sprawl may also compromise the water quality and health of streams running through them. Increased wheat production that supports a vital regional economy and feeds the world may mean the steady loss of irreplaceable topsoil.

If the goods and services we derive from the environment cannot be sustained, the people of Oregon lose valuable resources. They not only lose timber, soil, and salmon. In a poorly functioning environment, people may need to pay for expensive technologies to replace natural processes that control pests, cleanse water, and filter waste.

In the next 25 years, Oregonians face the challenge of protecting currently healthy parts of the environment and restoring those that are degraded in order to maintain important ecosystem functions, sustain productivity, and meet the needs of a projected 34 percent increase in population. This will require knowledge not only about the parts of the environment currently at risk, but also about what actions might increase or reduce risk in the future.

If Oregonians are to understand their environment, and if they are to enact policies to protect their environment, they must have a way to measure the health of the environment. Oregon's *State of the Environment Report* will help Oregonians understand the health of the environment in terms of natural structure and function, and how the environment contributes to a sustainable production of goods and services.

Measuring the health of the environment

Oregonians share a desire to maintain a vibrant economy, livable communities, and high quality-of-life, but some may not realize the degree to which a healthy environment contributes to the attainment of these goals. While most Oregonians are very concerned about the condition of their forests, rivers, deserts, agricultural lands and coast, they may have different perspectives on what constitutes a healthy condition in each of these natural systems.

"Health" is a concept that makes sense to most people. It is clear that the health of an organism is related to its ability to function effectively, and to recover from disease or injury. The health of the environment is similar. And because the environment integrates a great variety of organisms, populations, and communities, the health of the environment can be measured in a variety of ways at different scales, different times, and different places.

People value different aspects of the environment, and therefore they have different perspectives on what it means to have a healthy environment. Some people consider the natural structure and function of the environment. Others consider its productivity. A few measure the health of the environment by the yardstick of environmental law. Therefore, in this report the Science Panel considers the health of the environment from three commonly-held perspectives:

- 1. A healthy environment has naturally functioning landscapes (with a range of structure and function much as would have occurred before intensive land use and conversion).**
- 2. A healthy environment can sustainably provide the goods and services that people desire.**
- 3. A healthy environment meets the requirements and overall goals of environmental laws (such as the Clean Air or Clean Water acts).**

Although these three perspectives may reflect different values of society, they work together to provide a more complete picture of what makes the environment healthy and keeps it productive. From the purifying effect and storage ability of naturally functioning watersheds to the natural predators that help control pests, the services provided by naturally functioning landscapes are essential to all other aspects of a healthy environment.

A further discussion of each of these perspectives follows:

1. A healthy environment has naturally functioning landscapes

Naturally functioning landscapes include several major elements. Among them:

- Key ecological processes: the fundamental processes—such as photosynthesis, decomposition, nutrient uptake and retention, water cycling, soil and habitat formation, reproduction, migration and dispersal—required to sustain organisms within the environment.
- Diversity of native communities: the numbers of appropriate native species (richness) and their relative abundance (evenness), and their links to the environment and key ecological processes.
- Distribution of populations and communities: the distribution of populations and communities that interact with the physical environment to maintain ecological processes
- Abundance of organisms: the range and number of organisms that are necessary to maintain populations across the landscape.

- Occurrence of natural disturbance and disease: the frequency and distribution of major forces of change such as fire, landslides, or diseases that shape populations and communities. These are essential for maintaining the fitness of organisms and communities but can become extremely detrimental when they occur outside the natural range of frequency, severity, or spatial extent.

To measure these elements in naturally functioning landscapes, scientists use: 1) existing examples of naturally functioning ecosystem components, called reference conditions; 2) field and laboratory studies that attempt to understand the interrelationships between ecosystem structure and function and goods and services of importance; and 3) first order principles, which are general concepts of ecosystem structure and function.

Using these tools, scientists are able to compare existing environmental conditions with a range of natural conditions from the past. Reference landscapes and reconstructed historical conditions provide a baseline to measure how much change has occurred through time. Such comparisons do not imply that we should turn back the clock 150 years, they simply help us measure the extent of change.

Comparison between current condition and the historical range of natural variability provides a way to measure current risk to the health of the environment. Landscapes that are greatly altered from their historical condition may be at greater risk of decreased function, lower productivity, and noncompliance with environmental law. The greater the difference between current and historical conditions, the greater the risk of problems such as catastrophic fire, disease, or species extinction. To reduce risk, natural systems may need to be restored to conditions closer to the historic range of natural variability. The degree of risk Oregonians are willing to accept is a decision that must be made within the political process. Understanding the level of risk to environmental function and productivity can help these policy decisions be made more explicitly.

Historical conditions provide a starting point for thinking about risk and planning restoration strategies, but even this baseline is complicated by the changing physical and biological context that will likely occur through climate change.

2. A healthy environment can sustainably provide the goods and services that people desire.

Understanding the structure and function of our landscapes helps us to measure the productive capacity of Oregon's environment—a key underpinning of our economic and social productivity.

Often, people are more interested in the capacity of the environment to produce benefits that can be seen or used than they are in the seemingly complex structure and function of elements in the environment. This may be particularly true for those landscapes that have been greatly changed from their natural condition—such as urban areas, agricultural lands, and timber plantations. The health of these areas may be measured by their long-term productive output and the potential off-site effects that may occur from the use of these lands.

Sustainable agriculture and livable cities are a major concern for Oregonians, as witnessed by the many initiatives recently engaged by communities across the state. Although urban and agricultural areas are fundamentally altered from their natural condition, they depend on many of the same functions that keep natural landscapes healthy, such as clean air, clean water, productive soils, and limited waste.

3. A healthy environment meets the requirements and overall goals of environmental laws.

Understanding the structure and function of our landscapes helps us address legal issues without waiting until systems are at serious risk. Environmental laws may be triggered when particular species, for example, are far reduced from their historical range. Usually this occurs after serious problems have already developed, and costly efforts are necessary to reverse the trend. Understanding how far current conditions and processes have deviated from the historical can help society make early adjustments and avoid regulatory requirements that later may lead to disruptive and costly corrections.

The concept of health

There is much discussion within the scientific literature about using the term “health” to describe the condition of the environment. The Science Panel acknowledges the on-going debate. However, given that the task was to evaluate the state of the environment for the people of Oregon, it is appropriate to use the concept of health to describe the conditions of the state's ecosystems. In this report, we use the word “health” to mean good conditions and believe that the application of the concept of health is a logical outgrowth of scientific principles, legal mandates, and the values expressed by society

Framework of the analysis

Selection of environmental issues and resources

To ensure that the Report addressed issues of importance to both the public and to science, initial opinions were sought from stakeholders and experts about the most critical environmental issues in Oregon. From a matrix of resources (e.g., water, soil, plants, animals) and ecosystems (e.g., forests, range-

land, ocean, riparian, urban), respondents were asked to identify the most important issues and most threatened ecosystems. This scoping matrix identified the environmental systems and resources that the Science Panel would assess as the basis of the report. The final list of systems and resources is a greater mixture of topics than would normally be found in a purely scientific paper.

Selection of environmental regions

Because Oregon is a big and diverse place, it was necessary to take a closer look at places where environmental conditions are relatively homogenous. The Science Panel selected the well-established hierarchical system of ecoregions used by the U.S. Environmental Protection Agency. Level IV of this system divides Oregon into eight ecoregions, which provided the right balance between fine detail and systematic overview for the Science Panel's analysis. These ecoregions are distinguished by physical characteristics such as elevation and precipitation, which in turn affects their characteristic native vegetation.

The State has organized the management of the Oregon Plan for Salmon and Watersheds around drainage basins. The overlap between ecoregions and drainage basins is irregular. Both ecoregions and drainage basins use characteristics of the landscape, rather than political borders, to subdivide areas for environmental study and management. Each approach provides a different perspective on the complexities of the environment. Gathering and analyzing data by ecoregion can provide insights into terrestrial vegetation, land use, and land cover, whereas gathering and analyzing data by watershed highlights gravity-driven issues such as water quality, sedimentation, and aquatic habitat. Both units of analysis provide a valid means to organize and assess environmental data. It is important to have more than one way to analyze something as complex as the environment. We all live in both an ecoregion and a drainage basin.

Development and review of the State of the Environment Report

The Oregon Progress Board authorized the *State of the Environment Report* (SOER) in 1998. Three groups make up the full SOER Committee: the Environmental Stewardship Committee representing multiple stakeholders who first proposed the report; an Advisory Group appointed by the Progress Board to ensure a diversity of Oregonians would be engaged in the

report's development; and the Science Panel, chaired by Dr. Paul Risser, who prepared the report and share full responsibility for its scientific content. (See: acknowledgements in the *SOER Statewide Summary*).

The Science Panel was chosen for their expertise in particular aspects of Oregon's environment. They volunteered their time and carried out the assessment independently. The *State of the Environment Report* benefited from periodic review by the full SOER Committee throughout its development. This ensured that the content of the report was meaningful to the public. The report was further strengthened by reviews at several stages by scientists and researchers outside the Science Panel. This ensured that the report was scientifically credible.

Linking Oregon's economy and environment

At the beginning of the project, there was intense discussion about whether the project should include social and economic indicators as well as environmental indicators. Some believed that unless social and economic indicators were involved from the outset, the environmental analysis would be unrealistic economically and unrelated to the pragmatic tests of feasibility. On the other hand, it was recognized that there was great value in having an independent scientific assessment of the environment without the analysis being influenced by immediate social and economic policy considerations.

The decision was made to focus the *State of the Environment Report* on an independent assessment of Oregon's environment, and the Science Panel was selected for its expertise on environmental topics. However, several steps were taken to ensure that the Report would eventually guide performance-based policies. First, the Science Panel met regularly with various stakeholder groups to ensure that the analysis would be useful in the context of Oregon's broad environmental, social and economic goals. Two resource economists were included on the Science Panel, and the Oregon Department of Employment contributed information on social and economic conditions statewide and by ecoregion. The Science Panel considered the health of the environment from three commonly-held perspectives, including an emphasis on the production of goods and services. And finally, the Science Panel selected indicators that were realistically measurable and meaningful to society as well as to science.

The result is this report, the first scientific assessment of the status of Oregon's environment.