3.14 Data Management Status and Future Needs

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Introduction

This chapter summarizes the findings of the Science Panel regarding the status of the state's environmental data gathering and management capacity. It concludes with recommendations for a strategy to gather and manage environmental data targeted at the three perspectives of environmental health and the suite of indicators proposed by the Science Panel in this Report.

For the most part, environmental data gathering and management in Oregon is set up to measure point sources of pollution and other issues which the regulatory system was initially established to address. They are not well suited to measure today's pressing concerns about environmental or economic sustainability. Consequently, while some excellent data management programs are underway and there are ample data available on some issues, there are far too few data on many key indicators of environmental health and economic sustainability. Further, the state is spending substantial funds to gather environmental data, yet invests very little to manage and integrate them. Finally, and perhaps most important, few data assessment models exist to measure the different perspectives of environmental health which this Report sought to measure: the degree to which Oregonians are sustaining naturally functioning landscapes, and the capacity of the environment to sustainably produce goods and services. There are also insufficient data to measure the degree to which some environmental laws are being met. As a result, it was difficult to obtain, synthesize, and display environmental data in a manner that provides a comprehensive, integrated picture of the status and trends of Oregon's environment.

If the state wants to better understand environmental conditions and trends and develop better forecasting capacities, a framework is needed which clearly identifies the assessment strategies to be used and which prioritizes and systematically manages the data to be gathered to support the strategies. The strategies should be based on methods for measuring the sustainability of naturally functioning landscapes, the productive capacity of the environment , and the degree to which environmental laws are being met. As a starting point, the strategies should use the suite of resource specific indicators as well as the land use/land cover meta-indicator proposed in this section.

Why is the development of a systematic environmental data management strategy important? Perhaps the key reason is that piecemeal changes may not be sufficient to update and improve the existing system to effectively address today's concerns about environmental and economic sustainability. Improving the system must start with clarity about the information we seek from environmental data. Once the end goals are clear, the assessment models and data needed to provide this information can be identified. This will allow the state to better prioritize where it should invest money and resources.

Data gathering serves little purpose without application. If the public and decision makers want to allocate money and resources as efficiently as possible to be properly informed about the degree to which Oregonians are maintaining naturally functioning landscapes, sustaining the productive capacity of the environment, and meeting environmental laws, the state needs to adopt models which assess these issues and to selectively gather data appropriate to address them. This approach will provide a credible scientific platform for evaluating the results of programs and policies, for identifying and prioritizing problem areas, for making forecasts, for eliminating outdated programs and for identifying promising new policies and programs. It may also reduce duplication of effort and consequently lead to overall savings. Finally, a systematic environmental data strategy is important to support and enhance the work of the agencies that use the data as a basis for their work.

What would an environmental data management strategy include? The action plan should include achievable activities in each of the five key components of environmental data management:

- Conceptual model and overall framework
- Organization
- Data contents
- Human and financial resources
- Database aspects

These components are discussed in the recommendation section of this chapter.

It is important to note that data needs change over time as our measures of the environment and the models to project these measures change. Our needs for information and the models we construct will always run ahead of the data we have. We may therefore often be in a position of making policy decisions with insufficient data. These recommendations should therefore be viewed as a starting point and not the final solution to data management problems in Oregon.

Existing state of the data

In identifying, gathering, and attempting to utilize environmental data for the *State of the Environment Report*, the Science Panel found a number of strengths and limitations regarding the states current capacity to manage environmental data:

Strengths

- A number of programs are underway which have or are intended to improve environmental data gathering and management including the Oregon Plan for Salmon and Watersheds, the Department of Forestry's First Approximation Report , and others. Much can be learned from these efforts.
- Most state agencies have satisfactory technological capacities; most have functional (if not state-of-the-art) systems and increasing technical capacities.
- Most state agencies seem to have personnel familiar with the data and related computer equipment, although the number of staff with the ability to work with data vary widely.
- There is a growing awareness of the need to develop more consistent and better means to gather, manage, integrate and share environmental data.
- There are a number of data bases that provide useful information on specific components of the state of the environment in Oregon (see Table 3.14-1).
- Agencies and individuals are aware of the need to improve the management of environmental data, but few can pinpoint the exact problems, their causes or potential solutions.
- In some cases there are sufficient data to address certain issues and measure specific resources (i.e. chemical aspects of water quality).

Limitations

- Environmental data management in Oregon today can best be described as decentralized, without coordination or clear sense of overall purpose. Decentralization has many advantages such as encouraging creativity. Nevertheless, some level of coordination is necessary to clarify the overall purpose and goals of data management (such as, what is it we want to know from the data?) and therefore to clarify the models to be used to assess data. It can also ensure that environmental data can be used by more than one person, program or agency and can be combined with data from other databases. Once clear goals and models and an overall strategy to implement them are developed, the right balance can emerge between coordination and decentralization.
- As a result of decentralization, there is no entity in the state responsible for coordinating the management of environmental data between agencies or different levels of government, no entity responsible for integrating data using state of the art GIS instruments, and no entity charged with maintaining accountability. Cooperation between some public agencies and between public and private data sources is weak, and there is no system to analyze privately generated data for scientific accuracy. No common network or standardized code system exists for environmental data within any level of government that would provide the basis for using common parameters (indicators). There is no accountability mechanism to ensure that information is applied to the analysis of environmental conditions and is supportive of adaptive management. The State GIS Service Center has been resurrected with a budget for a full time librarian and research assistant, and agency directors have signed an MOA pledging support for the process and agreement to participate on an Oregon Geographic Information Committee. This could be a positive step, but little progress seems to have resulted yet. The State Library in Salem should also be considered as a possible location for a central data organizing authority.
- There is no system to link all data bases to a common network to support the sharing of data between programs or agencies or to combine them across data-bases and fields of expertise. For example, to understand aquatic ecosystem health, it will be important to integrate divergent information such as the trends in the number and distribution of aquatic invertebrates, trends in the composition and distribution of fish communities, trends in riparian and wetland health, and the presence of invasive species. The state currently has limited capacity to accomplish this. In addition, current limitations of sampling and data

aggregation fail to adequately recognize linkages between water quality and other environmental factors in Urban areas. A greater number of indicators would provide a more accurate picture of water quality and more sampling stations would serve to increase the amount of data available.

- There is a limited ability and few incentives to share data between programs, agencies and different levels of government. Because each agency and program determines its own data priorities, a number of agencies gather similar data. While the Science Panel eventually was able to obtain most of the data it sought, and many agencies and programs were very helpful, it was often a difficult, time-consuming problem to identify the agency personnel who managed specific data sources, and in a few cases, difficult to get permission to use publicly generated data in this Report.
- There are few data that provide an integrated picture of the condition of naturally functioning landscapes and the productive capacity of the environment. The contents and structure of data bases are very traditional and generally limited by legal mandates or individual program needs. This has led to a preponderance of information and data on certain issues (such as chemical parameters of water quality) and far too little on others, especially ecological processes, habitat and biodiversity issues, and the capacity to sustain productive outputs. For example, there are no comprehensive, long term or regional data assessments on riparian, rangeland, groundwater, and native fish conditions. Data for assessing water quality in Oregon's marine and estuarine environment are sparse. NOAA's National Estuarine Eutrophication Survey found that 10 of 12 Oregon estuaries surveyed could not be assessed because data were lacking. Uniform statewide 1: 24000 stream network and detailed road network coverages are needed to assess fish passage needs and landslide hazards, but with a few exceptions (such as the Umpqua basin) have not been generated.
- Most agencies focus on gathering data and developing data bases to store information yet data management staff are rarely hired nor is sufficient training provided. The Oregon Natural Heritage Program and H.J. Andrews Experimental Forest are possibly the only agencies in Oregon with full time environmental data managers. Training programs are typically focused on individual software tools and their use. Very little training is available on the integration, production, and use of environmental data. The focus on data collection rather than data stewardship leads to inefficiencies, lost information, limited standards, and the inability to assess or project trends.
- Much of the data that exist are limited by the number, placement and lack of long term information from monitoring stations. For example, there is a lack of consistent measurement from existing streamflow gauges and there is a need to expand gauging stations. More water quality sampling stations would serve to increase the amount of data available. In particular, there are inadequate sites to adequately characterize water quality in the Cascades and Columbia Plateau ecoregions. There is a need for enhanced spatial and temporal monitoring of estuaries and of marine conditions. Despite a major state focus on salmonid restoration, there is a lack of statewide comprehensive monitoring program to systematically track the status of representative, widely distributed fish species. The same is true of riparian and wetland conditions, key elements of aquatic ecosystem health. The state also lacks complete air quality data sets.
- As a consequence of the above, few models exist and few data are generated to help us understand the degree to which we are sustaining naturally functioning landscapes, the productive capacity of the environment, or in some cases even the extent to which we are meeting environmental laws. Few models exist and few data are gathered that can describe and compare the normal range of variability of our landscapes and ecological systems (reference conditions) with current conditions; to assess cumulative impacts; the sources of problems; alternative processes, materials or substances that could reduce or eliminate problems; the social and economic consequences of environmental problems; or the effectiveness of environmental policies and programs. For example, there is no statewide historical information on riparian vegetation or groundwater supplies. There is also a lack of data about trends in and connectivity of freshwater wetlands. The Oregon Water Quality Index is designed to reflect water quality as a beneficial use to humans, and may not reflect impairment of habitat or its effects on aquatic species. There is no statewide assessment for all freshwater fish species. There are limited data available on historic changes in freshwater inflow to estuaries and on water quality in estuaries. There is also a lack of empirical studies to gain increased understanding of the dynamics and interactions among members of plant and animal communities that inhabit kelp beds in estuaries.
- Due to the issues outlined above, there is very little ability for working with environmental data statewide to forecast future scenarios or risks regarding environmental and economic sustainability. For example, the panel is sanguine about making future projections about water supply and quality because insufficient data are being collected, much of the existing data are estimated rather than measured, definitions and reporting protocols have been changed, and there are data missing. This is particularly true in respect to the potential threat of global climate change. Data are also not available for making accurate

projections for wetland, riparian or fishery resource health. It will be very difficult to make annual estimates and future predictions of commercial and recreational use of kelp forests and their associated nearshore subtidal rocky reefs. Attempting to project a maximum sustainable yield in a dynamic and changing ocean environment is difficult due to an inadequate research base. Similar constraints exist within many other resources.

In sum, while a few excellent programs are underway, some important data sources exist and expertise is improving in many areas, Oregon's existing environmental data management capacity lacks a central organizing strategy and appropriate models for assessing environmental and economic sustainability, basic key information, a state sanctioned coordination system and repository, accountability mechanisms, a dedicated workforce, and a mechanism for improvement.

SOER Proposed Indicators and Data Needs

Due to these and other issues the Science Panel was able to use only a limited number of indicators in the Report. The panel was not able to obtain data on a number of important indicators that could provide an integrated and comprehensive perspective of environmental conditions (such as. riparian conditions, changes in eastside forest, rangeland and wetland conditions). In most cases, the panel was not able to develop models to integrate data and describe the degree to which we are achieving environmental or economic sustainability. The result is an incomplete picture of the status and trends of Oregon's environment and projections of future risks.

Table 3.14-1 summarizes the complete suite of indicators proposed by the Science Panel, the data sources that were available for use, and the data which were not available but which the may be needed to develop more accurate and comprehensive assessments of Oregon's environment. Note, this list is much more comprehensive than the 18 indicators proposed to the Oregon Progress Board in January, 2000. The 18 indicators were provided solely to meet the short term needs of the Progress Board. While the Science Panel believes they represent a significant improvement over past Progress Board environmental indicators, the panel emphasizes that it does not believe the health of Oregon's environment can be adequately measured by those 18 indicators alone. Indeed, the state may receive an A+ on those indicators and still find many aspects of the environment in poor health. As a result, the Science Panel recommends that the state adopt effective data assessment models and then focus its resources on gathering and integrating data related to all of the indicators proposed in this Report.

Approximately one quarter of the indicators proposed by the Science Panel had sufficient data, in useable form, to measure conditions effectively such as stream and river water quality and coastal forest old growth conditions). Data were available to measure about another quarter of the proposed indicators, but the data had to be tabulated and assessed in different ways to provide useful information. Finally, approximately half of the data the Science Panel believes are needed to measure the proposed indicators are either currently not being gathered or gathered in a manner that did not prove useful.

Recommendations

The following recommendations grew out of discussions during the two and one half years of work developing this Report. They were greatly informed by and indeed in many ways are built upon the innovative data management efforts underway within the Oregon Plan for Salmon and Watersheds, the Department of Forestry's First Approximation Report, The Oregon Natural Heritage Program and other efforts statewide. The recommendations are solely intended to help inform future discussions about environmental data gathering and management in Oregon.

1. Establish a Systematic Environmental Data Management Strategy.

To address the needs identified in this Report, Oregon's data management system must be updated to better measure the key issues of today and the foreseeable future: environmental and economic sustainability. To accomplish this, models should be developed to assess the degree to which Oregonians are sustaining naturally functioning landscapes, the productive capacity of the environment, and meeting environment laws. The specific data to be gathered to feed into the models can then be identified and prioritized. The suite of indicators proposed by the Science Panel in this Report provide a starting point for prioritizing the data to be gathered.

One way to think about the need for a framework which links data assessment models with raw data is summarized in the paragraph below, excerpted from Forest Management (Davis, et al. 2000):

To make a statement as to whether a plan or policy will sustain the values in which we are interested, we need at least seven items for each value:

1) Conditions or outcomes to be sustained (the indicators) (merchantable timber, old growth habitat, plant communities, salmon populations);

2) A time into the future over which these conditions or outcomes are to be sustained;

3) A measure for each condition or outcome (cubic feet of merchantable timber, acres of old growth, number of self reproducing plant species or a diversity index, a qualitative habitat index for fish);