The Challenge

By 2050, an additional 1.7 million people are expected to live in the Willamette River Basin, bringing the total to around 4 million (Fig. 4). That's equivalent to adding three more cities the size of Portland or 13 the size of Eugene. Population growth rates in the WRB are outpacing both state and national rates.

The high quality of life and quality of the environment are major factors in attracting people to the region. When asked to rank their desired outcomes for the future, residents of the basin identified as their top four: (1) good air and water quality, (2) sufficient supplies of water to support communities, industry, fish, and wildlife, (3) maintaining the unique character and livability of communities, and (4) significant amount of open space, natural areas, fish and wildlife habitat, and public parklands.[18]

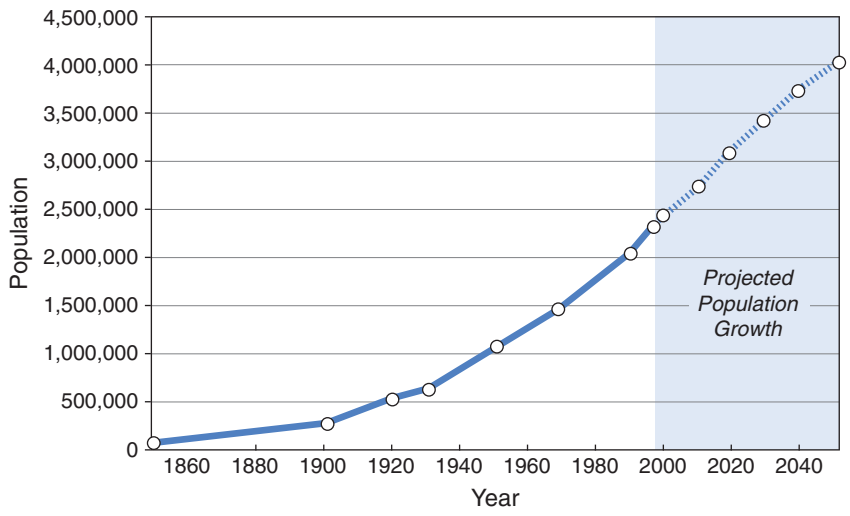

Figure 4. *Willamette Basin population (Source: Portland State University Center for Population Research and Census and State of Oregon Department of Administrative Services).*

The key challenge will be to accommodate the expected population growth while sustaining and improving the features of the basin that we value. Already at least 1400 miles of streams in the basin do not meet water quality standards, largely because of runoff associated with human use of the land.[19] Seventeen plant and animal species in the basin are listed under the federal Endangered Species Act, including the Northern Spotted Owl, spring Chinook salmon, and upper Willamette River steelhead.[20]

People in the basin have risen to similar challenges in the past. Strict controls on pollution discharges to the Willamette River in the late 1960s, and subsequent improvements in water quality, led to national recognition of Oregon's water pollution policies. In 1972, the Willamette Valley Environmental Protection and Development Planning Council, formed by then Governor Tom McCall, produced a landmark report titled The Willamette Valley: Choices for the Future, by Lawrence Halprin and Associates. Within a year after the report was published, Oregon passed the nation's first statewide land use planning and growth management program. The foundation of the program is a set of 19 statewide planning goals (see page 72), which include preservation of agricultural, forestry, and natural resource lands and establishment of urban growth boundaries to separate rural areas from those designated for future urban development. Every city and county is required to develop a local comprehensive plan consistent with these goals. The Oregon Forest Practices Act, first passed in 1971, was the first law of its kind to set standards for successful reforestation; it limits clear-cut sizes and requires riparian buffers to protect fish-bearing streams and retention of trees for wildlife habitat. The Northwest Forest Plan requires even more extensive efforts to protect fish and wildlife on federally managed forestlands. Perhaps more so than elsewhere in the U.S., Oregon citizens have demonstrated a willingness to act to protect the environment and the region's quality of life, and have a history of policies and regulations consistent with those priorities.

Continued population growth will exacerbate the competition for limited land, water, and other natural resources. Conflicts and problems are becoming more pervasive. To meet this challenge requires an understanding of the relationships among people, land, water, and other life in the basin, and consideration of the cumulative effects of decisions made across different land and water uses (forestry, agriculture, urban), ownerships (federal, state, other public, and private lands), and political jurisdictions (city, county, state).

The Response

Recognizing the need for an integrated strategy for development and conservation, Governor John Kitzhaber initiated several basinwide planning efforts. The Willamette Valley Livability Forum (WVLF) was created in 1996 to develop and promote a shared vision for enhancing the livability of the Willamette River Basin. Members of the Forum were selected to represent the cross-section of the basin's interests, including private citizens, business and industry, non-profit organizations, educational institutions, and state, local, regional, federal, and tribal governments. The Willamette Restoration Initiative (WRI) was established in 1998 as the Willamette component of the Oregon Plan for Salmon and Watersheds. Its charge is to develop a basinwide strategy to protect and restore fish and wildlife habitat, increase populations of declining species, enhance water quality, and properly manage floodplain areas – all within the context of human habitation and continuing basin growth.

To make wise decisions, both of these planning efforts require information about human populations and natural resources in the basin. In 1996, the U.S. Environmental Protection Agency (EPA) initiated a five-year research effort to provide scientific support for community-based environmental planning.[21] The Willamette River Basin was selected as one of the focal areas for this EPA research because of the complexity of issues being addressed by active citizen-based initiatives, such as the WVLF and WRI. To implement its research, EPA formed the Pacific Northwest Ecosystem Research Consortium (PNW-ERC), consisting of 34 scientists at ten different institutions. This book is one of the primary products of this Research Consortium. Many of the results presented have already been incorporated into WVLF and WRI deliberations.

Trajectories of Landscape Change

Consortium research revolved around four basic questions:

1. How have people altered the land, water, and biotic resources of the WRB over the last 150 years since EuroAmerican settlement?
2. How might human activities alter the Willamette Basin landscape over the next 50 years, considering a range of plausible policy options and land use changes?
3. What are the expected environmental consequences of these long-term landscape changes?
4. What types of management actions, in what geographic areas or types of ecosystems, are likely to have the greatest effect?

We began by compiling, producing, and analyzing basic information on the physical, biological, and human features of the basin. The emphasis was on describing both current (circa 1990) and historical (circa 1850) conditions as well as recent trends, to address the first question. Understanding the natural and cultural processes that have shaped the basin to date provides an essential foundation for projecting future change. These results are presented in the first five chapters of the atlas: Landforms, Water Resources, Biotic Systems, Human Population, and Land Use and Land Cover.

We then developed three alternative "visions" or scenarios for the future (second question; Fig. 5) — that is, spatially explicit representations (maps of land use/land cover) of the combined results of policy decisions regarding urban, rural residential, agricultural, forestry, and natural lands, and associated water uses, across the entire basin at 10 year intervals through 2050. Designed with input from basin stakeholders, these three alternative futures were selected to bracket the range of plausible policy options and

divergent stakeholder viewpoints. The Plan Trend scenario represents the expected future landscape if current policies are implemented as written and, where no policies exist, recent trends continue. The Development scenario reflects a loosening of current policies, across all aspects of the landscape, to allow freer rein to market forces. The Conservation scenario places greater emphasis on ecosystem protection and restoration, although still reflecting a plausible balance between ecological, social, and economic considerations as defined by the stakeholders.

Next, we evaluated the likely effects of these alternative futures, and the long-term landscape changes from EuroAmerican settlement through 2050, on four selected resources of concern (third question; Fig. 6):

1. Ecological Condition of the Willamette River — projected changes in river channel structure and streamside vegetation, and the implications of these changes for fish communities in the main river.
2. Water Availability and Use — projected changes in the demands for water for irrigation, municipal and industrial supplies, fish protection, and other uses, and the degree to which these demands can be satisfied by the finite water supply in the basin.
3. Ecological Condition of Streams — projected changes in the quality and quantity of stream habitat and in the composition and diversity of native fish and benthic invertebrate communities in streams.
4. Terrestrial Wildlife — projected changes in the amount of habitat for amphibians, reptiles, birds, and mammals in the basin, and the abundance and distribution of selected wildlife species.

In combination, the development and evaluation of future scenarios (second and third questions) is referred to as an alternative futures analysis. The goal is to communicate to decision makers the system-level implications of positions and policies being advocated. Understanding the consequences of proposed actions is an essential step in the process of moving public groups from dialogue to group resolution and, ultimately, implementation.[22] Other examples of alternative futures analyses include the Poconos region in Pennsylvania,[23,24] Camp Pendleton in southern California,[25] and the Muddy Creek watershed within the WRB.[26]

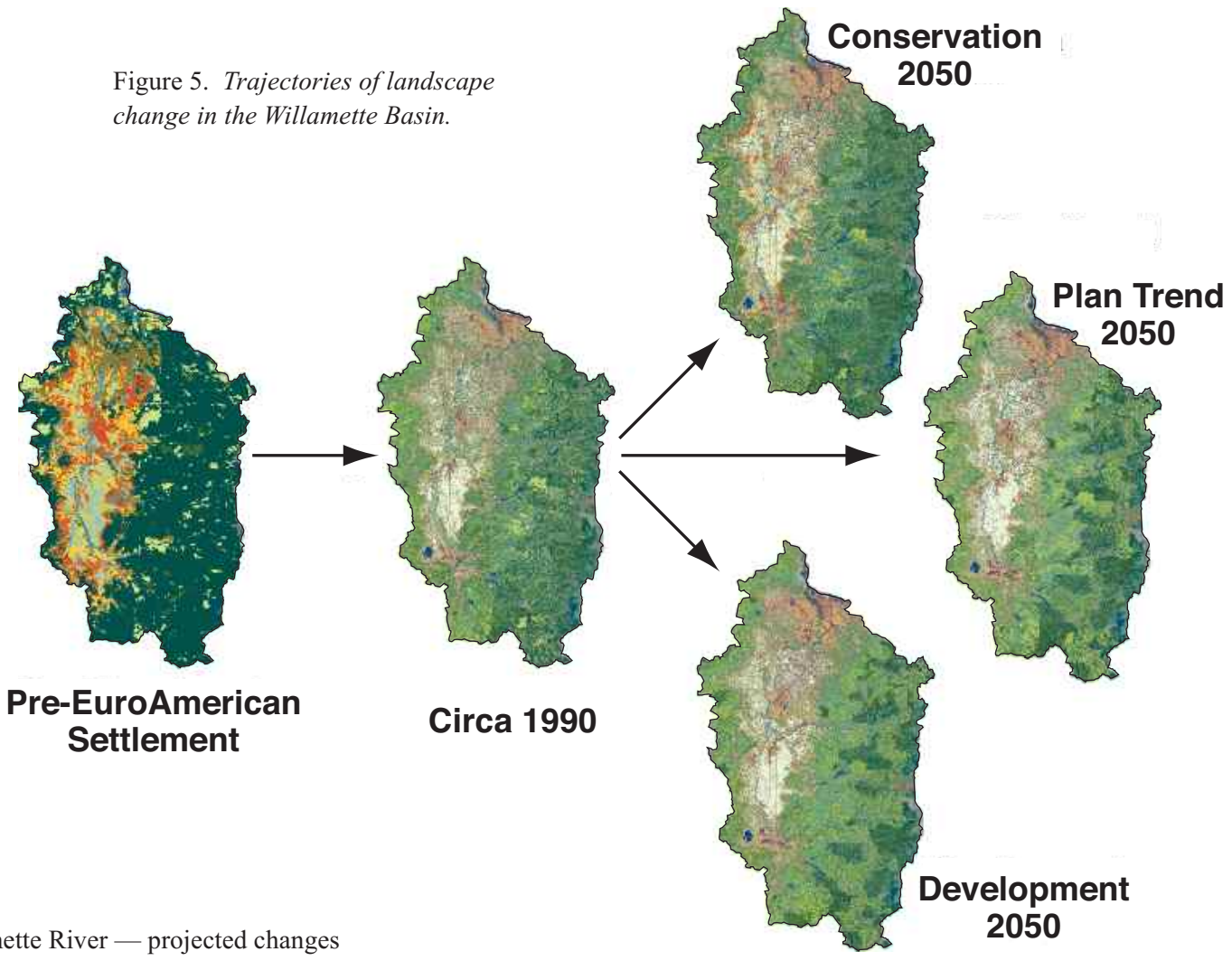

Figure 5. *Trajectories of landscape change in the Willamette Basin.*

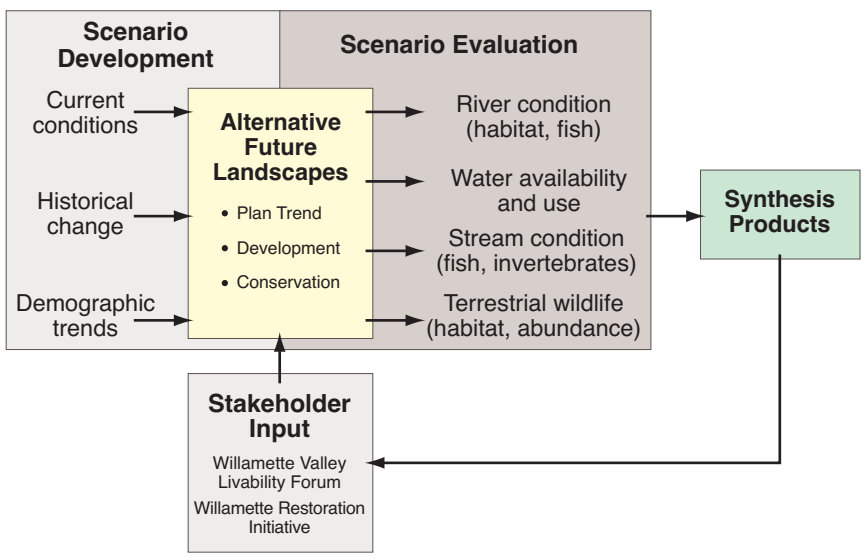

Figure 6. *Process for developing and evaluating the alternative futures.*

Certainly there are many other environmental issues that should be considered in evaluating policy options in addition to the four we address. Examples include point source discharges, changes in air and water quality, and the prevalence of toxic contaminants. And beyond these are many other concerns of great social relevance. The evaluations we present are not comprehensive, but they are illustrative of the types of ecological responses expected. Both the future scenarios and evaluations of ecosystem responses are described in Chapter 7, titled Trajectories of Change.

Finally, in the last chapter of the book (Chapter 8), River Restoration, we address the fourth question. Using the Willamette River and its floodplain as an example, we demonstrate how the data and understanding derived from these analyses can be used to prioritize and design a restoration strategy.

All of these analyses are parts of a continuing process, not an end. More information will likely lead to reconsideration of options, shifts in priorities, and eventually new or modified future scenarios, in an iterative loop between citizen choices and scientific evaluations (Fig. 6).

Purpose of This Book

The purpose of this book is to provide a long-term, large-scale perspective on changes in human and natural systems within the basin. In essence, we step back and look at the big picture, a picture we believe is essential to more fully understand the implications and cumulative effects of private, local, state, regional, and federal policies. However, by necessity, this long-term, large-scale perspective comes at the sacrifice of finer-scale resolution and specificity. Thus, the database and analyses presented here are intended to complement, and not substitute for, the more detailed analyses that are possible at individual sites, and at local and watershed scales.

This book is not all-inclusive. We address many of the major environmental issues in the basin, but several major potential concerns, such as climate change, groundwater depletion, and toxic pollutants are not addressed. The complexity of biophysical and cultural processes, as well as the large amount of environmental data collection and research that has occurred in the basin, make it impossible to do justice to these topics in one document. The focus here is on data and analyses used by the Consortium to characterize and evaluate trajectories of landscape change.