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Willamette Basin Alternative Futures Analysis

Alternative futures analysis is an environmental assessment approach for helping communities make decisions about land and water use. The process helps community members articulate and understand their different viewpoints and priorities. The product is a suite of alternative "visions" for the future that reflects the likely outcomes of the options being advocated. The visions are expressed as maps of land use and land cover. Potential effects of these alternative futures are then evaluated for a wide range of ecological and socio-economic endpoints (i.e., things people care about). By capturing the essential elements of a complex debate in a fairly small number of alternative futures, combined with an objective evaluation of the consequences of each choice, the alternative futures process can help groups move toward common understanding and possible resolution and collective action.

We conducted an alternative futures analysis for the Willamette River Basin in western Oregon, an area home to 68% of Oregon's population. The Basin also contains the richest native fish fauna in the State and supports several species federally listed as threatened or endangered, including the northern spotted owl and spring Chinook salmon. By 2050, the number of people in the Basin is expected to nearly double, placing tremendous demands on limited resources and creating major challenges for land and water use planning.

Three future landscapes were designed with detailed input from local stakeholders to illustrate major strategic choices for the Basin (Figure 1). Each was projected at 10-year intervals through the year 2050. Plan Trend 2050 represented the expected future landscape if current policies are implemented as written and recent trends continue. Development 2050 reflected a loosening of current policies, to allow freer rein to market forces across all components of the landscape, but still within the range of what stakeholders considered plausible. Conservation 2050 placed greater emphasis on ecosystem protection and restoration although, as with Development 2050, still reflecting a plausible balance among ecological, social, and economic considerations as defined by stakeholders. All three futures assumed the same population increase, from 2.0 to 3.9 million people by 2050. The three alternative futures were compared to present-day (ca. 1990) and historical (pre-EuroAmerican settlement, ca. 1850) landscapes, and the likely effects evaluated on four endpoints: terrestrial wildlife, water availability, small streams, and the Willamette River.

Changes in the Willamette River Basin have been substantial since 1850, particularly in the valley. Conversion of land for human use and fire suppression have lead to nearly 100% loss of some of the valley's unique native habitats, in particular wet and dry prairie and oak savannah. Only 20% of the area once covered with bottomland forest along the Willamette River remains forested today, and total river length has declined by 25%. Upland portions of the Basin still are predominately forested, although the extent of older conifers (> 80 years) has been reduced by about two-thirds. As a result of these habitat changes, ecological endpoints (terrestrial and aquatic biota indicators) are estimated to have been 15 to 90% higher historically than today, depending on the specific endpoint (Figure 2).

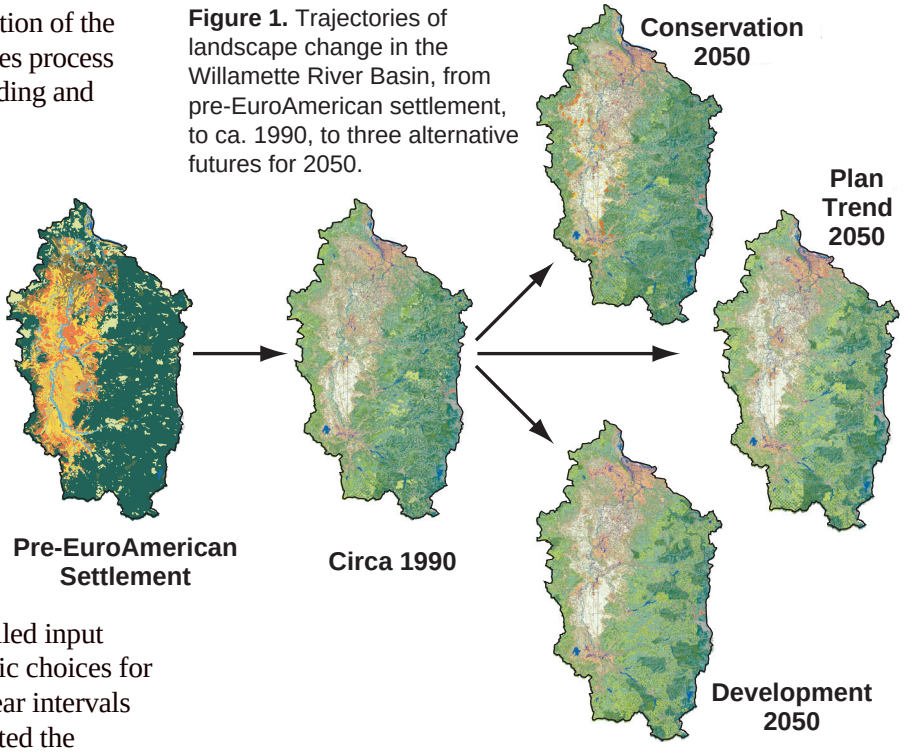

Figure 1. Trajectories of landscape change in the Willamette River Basin, from pre-EuroAmerican settlement, to ca. 1990, to three alternative futures for 2050.

Even with a near doubling of the human population by 2050, more landscape change, and thus more ecological effects, are estimated to have occurred from 1850 to 1990 than stakeholders considered plausible from 1990 to 2050, regardless of the future scenario (Figure 2). In all three futures, most landscape changes reflected a shifting of past human uses to new uses, rather than a substantial expansion of human use into relatively unimpacted, natural ecosystems. For example, future urban and rural development was projected to occur predominately on lands now used for agriculture. Not surprisingly, our results indicate that the difference between agriculture and development, in terms of effects on terrestrial and aquatic biota, is much smaller than the difference between natural systems and either agriculture or development. Even in Development 2050, substantial portions of the landscape, particularly in the uplands, retained their natural vegetation cover and some level of environmental protection. The stakeholder advisory group,

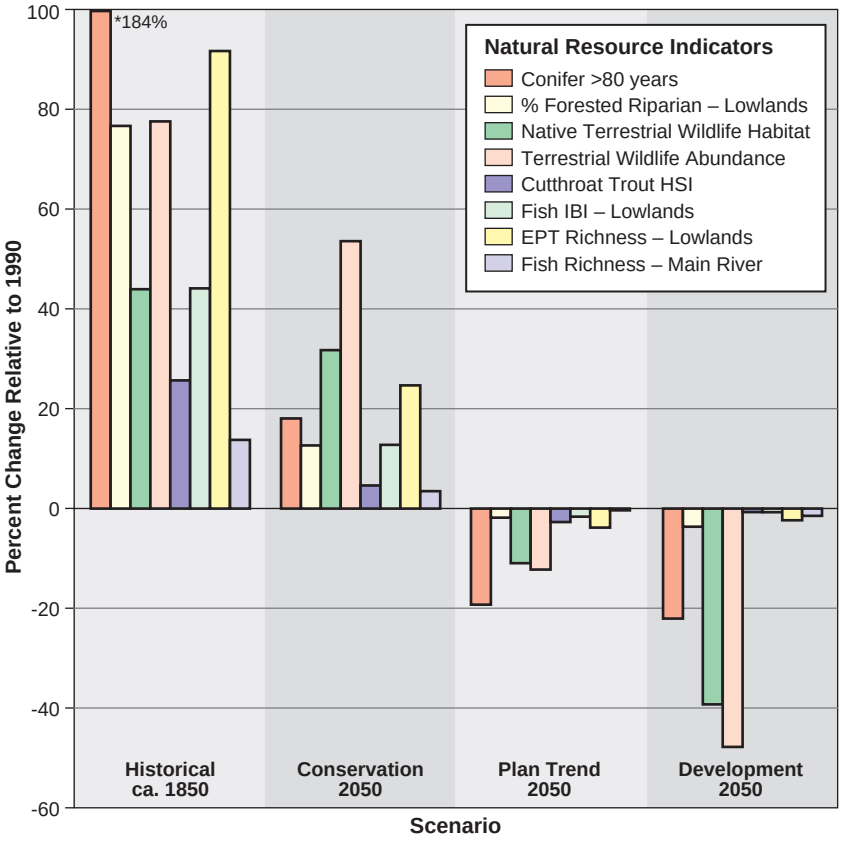

Figure 2. Percent change in selected indicators of natural resource condition in the Willamette River Basin, in the three futures and pre-EuroAmerican settlement scenarios, relative to ca. 1990. Vegetation indicators are the estimated area of conifer forest > 80 years old and % of 120-meter wide riparian buffer along all streams in the Valley Ecoregion with forest vegetation. Indicator for native terrestrial wildlife habitat is % of all 256 species projected to gain habitat minus % projected to lose habitat. Indicator of terrestrial wildlife abundance is % of 17 species modeled projected to increase more than 10% in abundance minus % projected to decline > 10%. Stream condition indicators are % change in median cutthroat trout habitat suitability index (HSI) for all 2nd to 4th order streams in the Basin and % change in median fish Index of Biotic Integrity (IBI) and Ephemeroptera, Plecoptera, and Trichoptera (EPT) richness in 2nd to 4th order streams with watersheds predominately in the Valley Ecoregion. Willamette River indicator is % change in median fish richness.

which oversaw design of the future scenarios, did not consider more drastic landscape alterations plausible given Oregon's history of resource protection, social behaviors, and land ownership patterns.

There were, however, differences in ecological endpoints among future scenarios and there were important local variations within each future. Because Oregon has several conservation-oriented policies in place, landscape changes and projected environmental effects for Plan Trend 2050 were surprisingly small (most ≤10% change relative to 1990). The one exception was a projected 57% increase in surface waters consumed for irrigation, municipal, industrial, and other human uses. As a result, the length of streams expected to go dry in a moderately dry summer doubled, but still represented <10% of the total Basin stream length.

Estimated effects of the Development 2050 scenario included loss of 24% of prime farmland, and 39% more wildlife species lost habitat than gained habitat relative to the 1990 landscape. Projected effects on aquatic biota were less severe, primarily because many of the land use changes involved conversion of agricultural lands into urban/rural development, both of which adversely impact streams. Changes in water consumption were similar to those projected for Plan Trend 2050.

In response to the conservation measures incorporated in Conservation 2050, most endpoints (both terrestrial and aquatic) recovered 20 to 70% of the losses sustained since EuroAmerican settlement. Although 15% of 1990 prime farmland was lost, cropland was converted mostly to natural vegetation, rather than to urban and rural development as in Development 2050. The extent of older conifer forest increased by 17% relative to 1990, yet was still less than half of what occurred prior to EuroAmerican settlement. Water conservation measures had a moderating effect, but were not sufficient to reverse the trend of increasing water consumptiontion for human use observed in all three futures (40-60% increase relative to 1990). Major changes in Oregon's water rights laws would likely be needed to substantially reduce water withdrawals, but such changes were not considered plausible by stakeholders.

Results from these analyses have been actively discussed by stakeholder groups charged with developing a vision for the Basin's future and basin-wide restoration strategy. For example, Plan Trend 2050 generated a heated debate about the reasonableness of assuming that existing policies would be implemented exactly as written if no further policy actions were taken. The restoration opportunities map, created as an interim step toward Conservation 2050, served as a centerpiece of the restoration strategy proposed by the Willamette Restoration Initiative, a stakeholder group established by Oregon Governor John Kitzhaber. Although we have no direct measure of our influence on stakeholder decisions, there is substantial evidence that people listened and, in some cases, changed their way of doing business.

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A more complete description of the project can be found in:

Willamette River Basin Planning Atlas: Trajectories of Environmental and Ecological Change (D. Hulse, S. Gregory, and J. Baker, editors), published by Oregon State University Press in 2002 (1-800-426-3797).

Selected data from the project can be downloaded from http://oregonstate.edu/dept/pnw-erc/.