## The Role of Alternative Futures in the Planning Process

The growing use of scenarios as anticipatory planning tools results from the robustness and generality of the approach.[107-111] Articulating an explicit story about how the future may unfold forces strongly held but vaguely defined viewpoints into written specificity. Significant and conflicting sets of values as to what the future *should* be can each be given a fair test against what is possible, enabling progress to be made on complex and partially understood problems in spite of incomplete information and widely divergent opinions. The creation of scenarios can be undertaken in ways that engage the interest of the public and that improve communication among parties, making it possible to inform present-day choices with their plausible future consequences.

The scenario approach used in this work emphasizes the importance to decision making of evaluating plausible alternative policy sets rather than in seeking a single preferred alternative. The approach is to express the principal alternatives of conservation and development in quantitative forms, to next express these quantities as digital maps of the future, and to then evaluate these spatially explicit futures using a range of scientifically defensible biophysical and social measures. The evaluations are accomplished by applying quantitative models of important phenomena like water availability, agricultural crop yields, or wildlife habitat quality to the maps of the future landscape as if the maps were the actual land condition. Comparing the evaluations of the various futures to each other and to present and past conditions provides insight into the possible consequences of choices concerning land and water use. The comparisons provide decision makers with tangible evidence of the ways different policies produce outcomes. For citizens and officials, it may be as important to learn that two policy sets produce nearly the same outcomes as it is to learn that they produce divergent ones.

## Citizen Stakeholders

The approach used in this project is premised on the idea that the usefulness of such efforts increases if citizens decide which alternatives are most plausible. The assumptions underlying the scenarios are defined by groups of citizens supplied with information and technical support by academic and agency researchers. This contrasts with scenario planning in which community members are asked to choose from alternatives developed by project personnel. In the present case, connection to governmental policy making is provided by initiatives authorized by the governor, public outreach to voters, and by the organizational affiliations of both core and advisory citizen stakeholders.

The human population of the WRB is projected to double by mid century at a time when many environmental systems are showing signs of degradation. These facts help define the major questions addressed in the scenarios and imbue policy making with urgency.

The PNW-ERC study defined five principal processes through which people interact with the land and water systems of the basin: urbanization, rural development, agriculture, forestry, and surface water withdrawals. A core group of approximately 20 residents of the basin with expertise in each of these major processes were convened in Spring of 1998 with the challenge of articulating plausible future scenarios, called the Possible Futures Working Group (PFWG). Candidates were selected who directly worked in fields such as forestry or agriculture, who were city or county administrators, who were knowledgeable in transportation planning or in state and federal water management, or who were actively engaged in residential development, land use planning, conservation, or economic development.

Additional groups of technical experts in agriculture, forestry, and land use policy were consulted as needed (see Preface p. ii). The work of this project and others was reviewed by a larger group of basin stakeholders convened by Governor Kitzhaber as the Willamette Valley Livability Forum (WVLF). The Willamette Restoration Initiative (WRI), another citizen based project established by the governor, also reviewed the PNW-ERC work and made significant contributions to it.

For approximately three years prior to convening the stakeholders for scenario development, ERC researchers worked to construct a base of essential demographic, historical, and biophysical data for the basin. This database formed the foundation for much of the material in the prior chapters of this atlas and was provided to the PFWG for scenario development.

The first synthesis of this information was a composite digital map expressing both land use and land cover as of approximately 1990 at a ground resolution of 30 meters (Map 24, p. 79). This means that a single type from among a legend of 65 types (p. 78) characterizes each roughly 1/4-acre unit of area within the WRB. Digital maps of many individual phenomena comprising or supporting the composite map were also constructed and registered to the same geographic coordinates (see pp.156-57 for a discussion of accuracy limitations).

## Future Scenario Development

Prior to defining any specific scenario, the PFWG first established fundamental assumptions to be applied to all scenarios:

- Population projections for the WRB in the year 2050 would be held constant across all future scenarios.
- Projections of future population adopted by state government would be used.
- Future population growth would be allocated across counties according to their 1990 proportions.
- A set of primary "drivers" of land and water use would be established, the values of which would be altered to discriminate the various scenarios within each of the five principal landscape change processes discussed above.
- The density of future urban residential development would differ for cities of different sizes.
- Three alternative future scenarios were developed, in the order shown below, depicting change in 10-year time steps from 2000 to 2050:
  Plan Trend 2050, a future in which the currently published policies of civil jurisdictions and land management agencies, and the currently dominant practices in private agriculture and forestry, would be extrapolated to the year 2050 ( pp. 86-87);
  Development 2050, in which legal and administrative land use regulations would be relaxed relative to Plan Trend, and market forces would have greater influence (pp. 88-89); and
  Conservation 2050, in which the conservation and restoration of ecological function would play a larger role in land and water allocation decisions (pp. 90-91).

The figure below diagrams the process of scenario development. Based on the guidelines above, the PFWG developed a set of written assumptions for each future scenario which the PNW-ERC researchers turned into a map which was then presented to the PFWG for revision. The cycle was repeated, increasing the specificity of the assumptions, until closure was reached.

Parallel to the work of the PFWG, PNW-ERC scientists were creating the evaluation models used to assess potential effects of the futures. Periodically, members of the science teams responsible for modeling particular phenomena met with the PFWG to explain what the models were, what types of questions they could and could not address, and what data were important to their work. A draft of Plan Trend 2050 was presented to the WVLF and

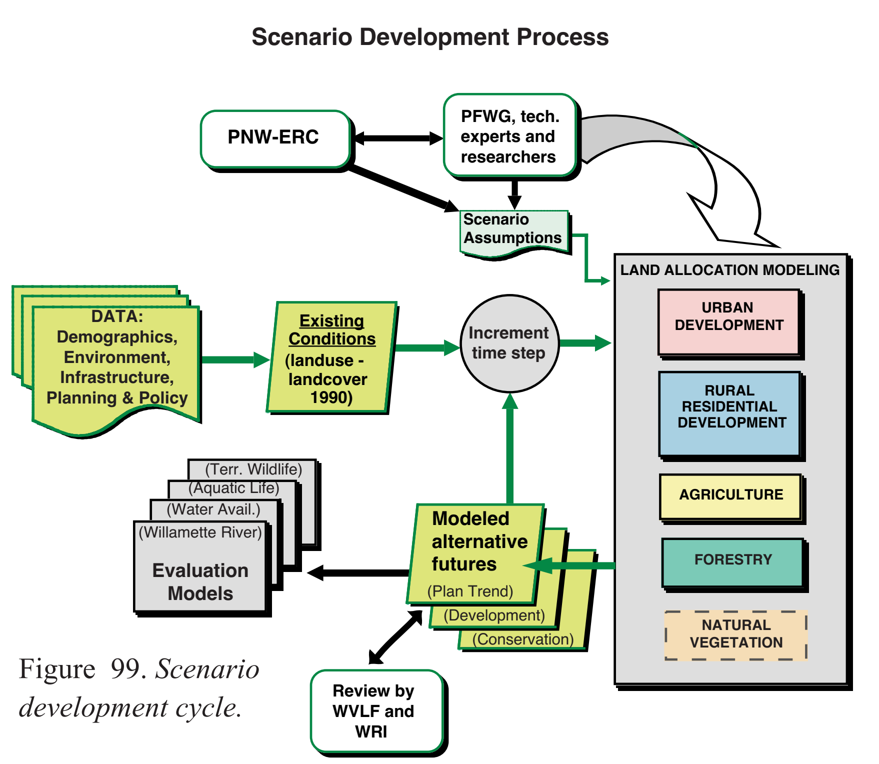


Figure 99. *Scenario development cycle.*

responses to a range of questions were tabulated electronically. These responses along with reviews by others including the WVLF and WRI were incorporated into revisions of Plan Trend 2050.

Development 2050 and Conservation 2050 were created using the same process of successive definition of assumptions and quantitative expressions of them in maps of the futures, in essence translating the assumptions of each PFWG future scenario into mapped form (Table 26).

## Land and Water Allocation Modeling

Written scenario assumptions become mapped alternative futures through land allocation modeling. Ultimately allocation means assignment of one of the 65 categories in the legend on page 78 to each 1/4-acre cell in the digital map, a condition that results from actions within specific models, interactions between the models, and final map assembly. The five principal processes (urbanization, rural development, agriculture, forestry, and surface water withdrawals) are modeled separately, but the models interact. For example, when an urban growth boundary expands, both agricultural land and previously rural residential land may convert to urban. Within the new UGB, agricultural lands may remain agricultural or be converted to urban uses. When that conversion occurs, responsibility for modeling the affected locations shifts from the agricultural model to the urban. The main reason for modeling the phenomena in 10-year time steps is to allow these interactions to occur.

Figure 100 diagrams interactions among the land allocation models. Straight arrows indicate the direction of effect. For example, urbanization may take land away from rural residential use, but there is no alternative future modeled in which rural residential use replaces urban uses. The circular arrows indicate the internal effects on each model's next time step of the prior steps.

The Conservation 2050 alternative allocates land to natural vegetation, creating groupings of land allocations not present in the other futures. These areas are called Tier One conservation zones (p. 90). As the diagram shows, these allocations can have complex interactions with the principal processes, at times forcing expansion of UGBs, and therefore conversion of agricultural land to urban uses as an indirect effect, as well as directly converting agricultural lands to various natural vegetation types.

The final step in land allocation is map assembly, in which the results of the individual allocation models are combined to produce a time step, for example, 2010 or 2020, of an alternative future. The individual land allocation models produce map layers which are combined in such a way that overlying land uses replace underlying ones if conflicting types exist for a particular 1/4-acre cell. This process carries out stakeholder-defined prioritization rules in each of the scenarios. In Conservation 2050, for example, agricultural uses are replaced by some wetland uses, while in Development 2050 the reverse is true.

The details of the alternative futures and comparisons between their results are presented in the sections of the Atlas that follow.

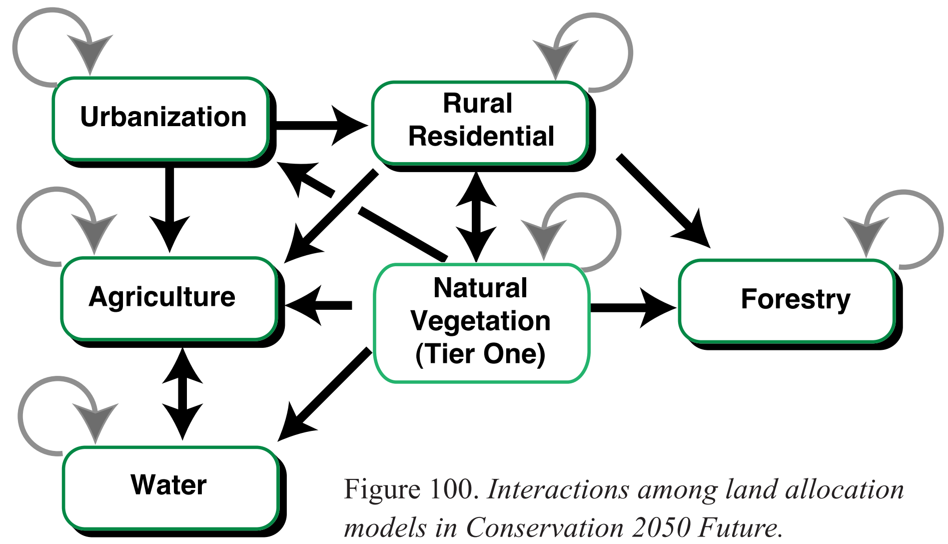


Figure 100. *Interactions among land allocation models in Conservation 2050 Future.*

Table 26. *Summary of principal assumptions and features of alternative futures.*

| | 1990 | 2050 CONSERVATION | 2050 PLAN TREND | 2050 DEVELOPMENT |
|---|---|---|---|---|
| **POPULATION** | | | | |
| DAS County Totals<br>Urban (UGBs) %<br>Rural % | 1,970,000<br>1,691,600 86%<br>278,400 14% | 3,900,000<br>3,649,000 94%<br>251,000 6% | 3,900,000<br>3,616,300 93%<br>283,700 7% | 3,900,000<br>3,377,100 87%<br>523,400 13% |
| **URBAN** | | | | |
| Density-<br>Gross residential dwelling units per acre<br>(Total WRB weighted average) | 4.2 (approx.) | 9.3<br>(average for new development 1990-2050) | 7.9<br>(average for new development 1990-2050) | 6.2<br>(average for new development 1990-2050) |
| Total acres in UGBs | 444,000 ac | 498,000 ac | 495,000 ac | 573,000 ac |
| Acres added to UGBs | - | 54,000 ac | 51,000 ac | 129,000 ac |
| **RURAL RESIDENTIAL**<br>Expansion area | Limited to rural res. zones and grandfathered parcels | 50% clustered development adjacent to 1990 rural res. zones | Within existing 1990 rural res. areas only | Location determined by probability based on suitability for rural residences |
| **AGRICULTURE** | | | | |
| By LU/LC<br>By active farm uses | 1,406,000 acres<br>1,090,000 acres | 1,158,000 acres | 1,367,000 acres | 1,219,000 acres |
| Riparian vegetation extent and timing | Range of vegetation types | All 1999 303d listed streams show riparian veg. by 2020, plus all streams by 2050 | 303d listed streams increased 1990 riparian veg. amount by 10% by 2050 | 303d listed streams increased 1990 riparian veg. amount by 10% by 2050 |
| **FOREST** | | | | |
| Highlights of management intentions | Continuation of major trends observed from 1972 to 1994. | Industrial forest land changes to private non-industrial if population density is greater than 100 persons per sq. mi. | Northwest Forest Plan for federal ownership, continuation of recent trends for others. | Industrial land changes to private non-industrial land if population density > 70 persons per sq. mile |
| Clearcut patch size<br>Fed, State, Priv.<br>Priv. Non-indus. | Non-industrial 13 ac, others approx. 30 ac. | Industrial declines from 30 - 10 ac; others range from 5.6 to 13 ac. | 30 ac<br>5.6 ac | 30 ac<br>5.6 ac |
| **PROPOSED RIPARIAN VEGETATION**<br>Urban | As depicted in Map 24 LULC ca. 1990 | Metro=200 ft all streams<br>Other urban areas:<br>100 ft 6-7 order (WillR)<br>50 ft 3-5 order<br>25 ft 1-2 order | No riparian buffers were designated to exclude development,<br>No riparian vegetation was added within UGBs. | No riparian buffers were designated to exclude development,<br>No riparian vegetation was added within UGBs. |
| Agricultural | As depicted in Map 24 LULC ca. 1990 | All streams have rip. veg. (pvt. – 100 ft min., pub. 300 ft. min.) plus additional areas in Tier 1 conservation zones | 303d listed streams increase 1990 rip. veg. amount by 10% in 100 ft. riparian zones | 303d listed streams increase 1990 rip. veg. amount by 10% in 100 ft. riparian zones |
| Forestry | As depicted in Map 24 LULC ca. 1990 | Federal: 300 ft (each side) all streams<br>State: 200 ft all streams<br>Private: 100 ft min. all streams, plus add'l Tier 1 | Federal: 300 ft on large fish-bearing streams (each side)<br>150 ft small streams<br>70 ft all other lands | Federal: 150 ft large streams only (each side)<br>None on other lands |
| **WATER USE** | Per OWRD water rights data base, in a moderately dry year. | Per capita municipal use 8.2% lower than Plan Trend; vacated irrigation rights transferred to in-stream use. | Per capita municipal use projects extension of recent trends. | Per capita municipal use 12.5% greater than Plan Trend. |