Forestry Land Use

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Introduction

Here, we compare historical and current coniferous forests with the three alternative futures as of the mid-21st century. The alternatives are mapped simulations which, like all projections, are dependent on their underlying assumptions and data. The principal objective is to observe results of forest management under the differing assumptions of the scenarios described on pages 86-91. Plan Trend 2050 is based on a continuation of current policies. Development 2050 emphasizes market forces, and in Conservation 2050, ecological considerations prevail where choices must be made.

The assumptions upon which the forest modeling is based are derived from policies contained in state and federal legislation and in administrative rules and plans. For federal ownerships — USDA Forest Service and USDI Bureau of Land Management — the Northwest Forest Plan [121] is the principal policy framework. Published in 1994, it is a multi-agency response to federal court rulings mandating protection of species. For forest lands under state ownership, the Northwest Oregon State Forests Management Plan [122] is now the controlling policy statement for the agency. It was adopted late in the PNW-ERC project and affects primarily Conservation 2050. The 1971 Oregon Forest Practices Act,[123] with its subsequent revisions, defines minimum standards and requirements for forestry operations on private land. The Oregon Department of Forestry has responsibility both for managing state forest lands and for implementing requirements of the Forest Practices Act.

Modeling Forest Harvests in the Alternative Futures

Not all of the phenomena resulting from forest uses are included in these simulations. Road density, for example, is an important condition that can vary between forestland ownership types and between future alternatives. However, logging roads are too narrow for our digital maps to represent. Our data do allow us to distinguish coniferous from non-coniferous vegetation, and to estimate the age of coniferous forests.

The age class and pattern of closed-canopy coniferous forests are the principal outcomes that vary between the mapped futures. The distributions of forest age classes and patches are caused by differences in ownership type, differences in controlling jurisdiction and forest practice rules, and different land management. The scenarios were translated into rules for each ownership type specifying the average rate of harvesting, how the choice of trees to be cut is affected by their age, the size of clear cutting patches, the width of stream protection zones and the choice of streams to be protected, and the effects of nearby human land occupancy. The landscape patterns produced are outcomes of the interactions among these and other scenario assumptions and are not themselves explicitly stated or designed.

Five forest land ownership types were recognized: State of Oregon, USDI Bureau of Land Management (BLM), USDA Forest Service (FS), industrial, and nonindustrial private. Based on satellite imagery, Figure 114 shows the amount of closed-canopy coniferous forest area within the WRB for each of the ownership types circa 1990. The youngest ca. 1990 age class, 0-20 years, includes patches of land recently clear cut or burned, which could not be identified as coniferous forest locations via satellite imagery.

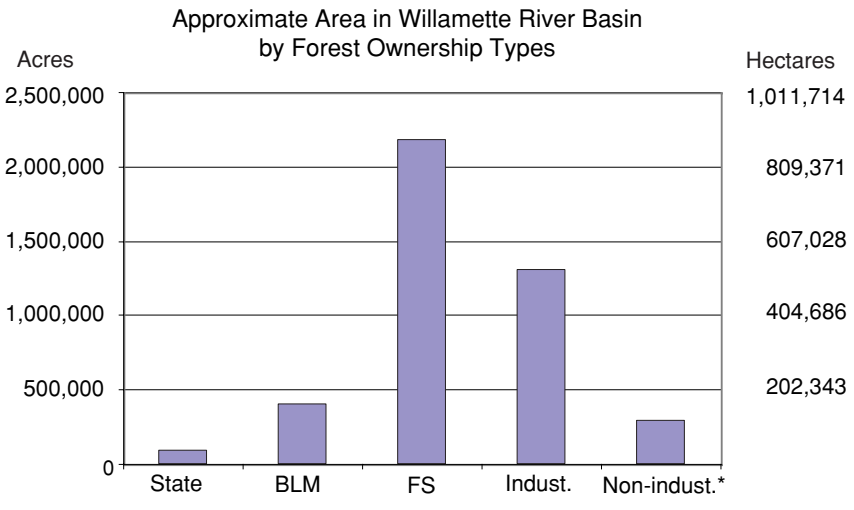


Figure 114. *Circa 1990 area of closed canopy coniferous forest by ownership class. *Non-industrial private was determined by being closed canopy coniferous forests circa 1990 and not in any other ownership type.*

Although the 2050 condition of each alternative is reported here, each alternative was modeled one decade at a time, starting with ca. 1990 and producing the year 2000 as the first modeled result. For some of the futures, values of some modeling parameters remained constant for all time steps, while others changed over time.

Harvesting is simulated separately for each ownership type. A computer program selects single 1/4 acre cells on the map according to the likelihood that trees of that age or in that location would be harvested. The probabilities are set as part of the scenario definition for each ownership type. A cell in a stream protection zone might have a harvest probability of zero, for example, while cells outside such zones containing older or younger conifer age classes would have higher or lower probabilities relative to each other depending on assumed management practices.

Each cell becomes the center of a patch of cells whose harvest patch size varies by ownership type (see Table 26, p. 85). When harvest occurs, all cells in the patch are set to the 0-20 year age class to indicate that the trees have been cut. The number of such patches is determined by the harvesting frequency defined for each ownership in each scenario. Six conifer age classes are used: 0-20 yrs., 21-40 yrs., 41-60 yrs., 61-80 yrs., 81-200 yrs., and greater than 200 yrs. Age classes between zero and 60 yrs. are increased to the next oldest age class once every two decades of modeling time.

Figure 115. *Willamette Valley (green) and Upland ecoregions.*

Forest Futures

Both Native Americans and EuroAmericans manipulated vegetation intensively in the valley Lowlands, and more recent manipulations have intensified in the Uplands (Fig. 115). The Lowland portion of total conifer area decreased about 9% between 1850 and 1990, while the total area in conifers basinwide has declined 27% (Table 27, p. 96; Table 29, p. 97). The two zones are defined by ecological geography, not by a specific elevation.[124] Although the majority of coniferous forests are in the Uplands, the historical sequence of EuroAmerican forest exploitation leaves a legacy of land ownership in which elevation is a distinguishing factor.

Although they are both managed according to federal rules, the BLM and FS lands are at different average elevations. Clustered at mid-elevations are the BLM, state, and industrial ownerships lying between the nonindustrial, 77% of which is in the Lowlands, and the FS lands essentially all of which are in the Uplands. About half of the lowland coniferous forest area is in nonindustrial private ownership. About one-fifth of industrially owned and BLM forests lie in the valley. For state-owned forests the fraction is about one-tenth. Since almost all of the human population in the basin lives in the Lowlands, population increases affect the various forest ownerships in different ways and at different rates.

For state-owned forests, the principal differences between the alternative futures is a higher fraction of land area clearcut each decade in Development and use of Option Six of the state forest management plan in Conservation.[122] For BLM forests, a model under study by the agency for implementing the NW Forest Plan was used to define harvesting rates by age class in Plan Trend. In Development, harvest rates increased and stream protection decreased on BLM lands, while in Conservation, patches were cut only to increase age variation among stands less than 60 years of age, and harvest patch sizes were reduced and variable.

Plan Trend for the Willamette National Forest was based on harvest rates specified for individual forest stands in a digital map produced by the USFS. The relationship between stand age and harvest frequency derived from this map was applied to modeling the Mt. Hood and Umpqua NF lands

in the basin. Siuslaw NF lands in the basin are in Late Successional Reserves and were not cut in any alternative future. Modifications for Development and Conservation similar to those described for the BLM were used in modeling FS forests, with expansion of developed recreation sites occurring in Development. Forests in Native American and indeterminate ownership were not clearcut.

Clearcutting rates for industrial forests in Development and Conservation differed from the recent historical trends used in Plan Trend with greater emphasis on cutting older timber and reduced stream protection in Development, and higher cutting of younger timber, greater stream protection, a gradual decrease in average harvest patch size, and retention of small patches of legacy trees in Conservation. The density of nearby human population at which industrial forest land is converted to nonindustrial private ownership is the same for Plan Trend and Development at 70 persons per square mile, but rises to 100 persons per square mile in Conservation. The increased amount of rural residential land use in Development increases the rate of forest land ownership change (Figure 116).

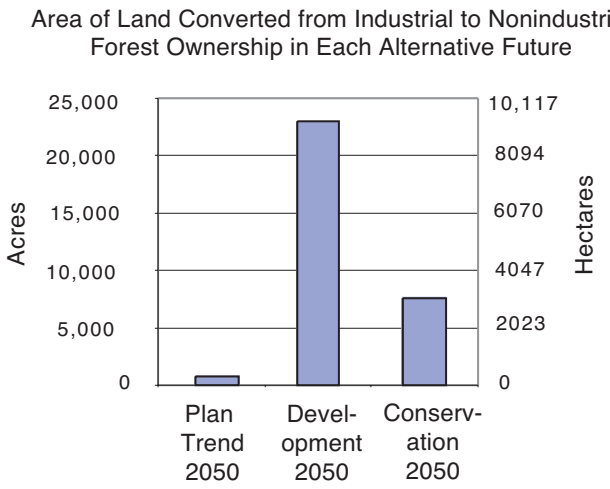


Figure 116. *Cumulative change in ownership from 1990 to 2050.*

Nonindustrial harvest rates were increased in Development and decreased in Conservation while stream protection was decreased and increased respectively. Forests on lands converted to nonindustrial ownership due to human population pressure were clearcut at an accelerated rate in proportion to their proximity to roads. Quantities used in modeling the alternative forest futures can be found on pages 86-91 and in Table 26 on page 85.

Results show that differences in management style can have consequences as significant as the differences between the futures' scenarios. Figure 117 shows how the fraction of coniferous forest area in stands less than 80 years of age changes for each ownership type across alternatives.

For private ownerships, average forest age increases in Development 2050 relative to 1990 due to choices in the age classes of simulated timber cutting. In Conservation 2050, the percentage of industrial forest area in older age classes triples relative to ca. 1990 (Fig. 118). The area of coniferous forest older than 80 years is roughly 1.2 million acres in Plan Trend 2050 and Development 2050, and rises to about 1.7 million acres in Conservation 2050 (Table 48, p. 128). Figure 119 depicts change in area of old growth conifer forest since the mid-19th century for the lands in ca. 1990 and 2050 forest land ownership for each of the alternatives. The data used to produce Figure 119 are shown on pages 86-95.

Figure 120 compares landscape pattern between Conservation 2050 and Development 2050 along a portion of the Clackamas River.

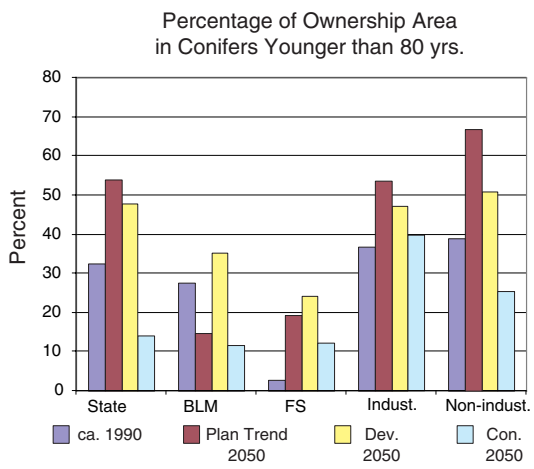


Figure 117. *Young conifer ownership.*

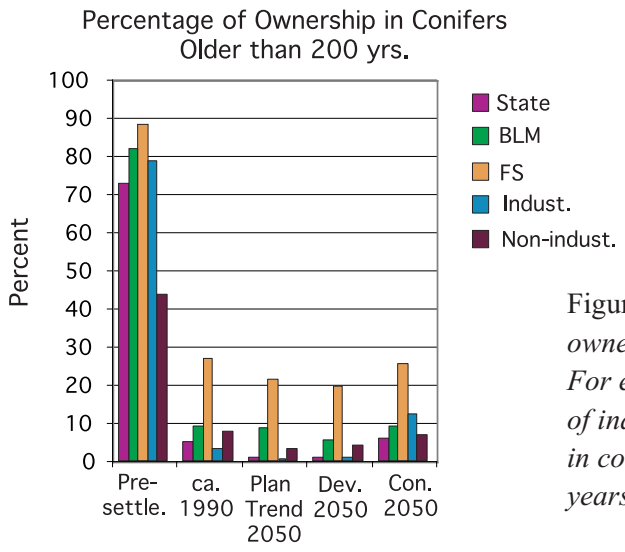


Figure 118. *Old growth ownership percentages. For example, less than 5% of industrial forest land was in conifers older than 200 years ca. 1990.*

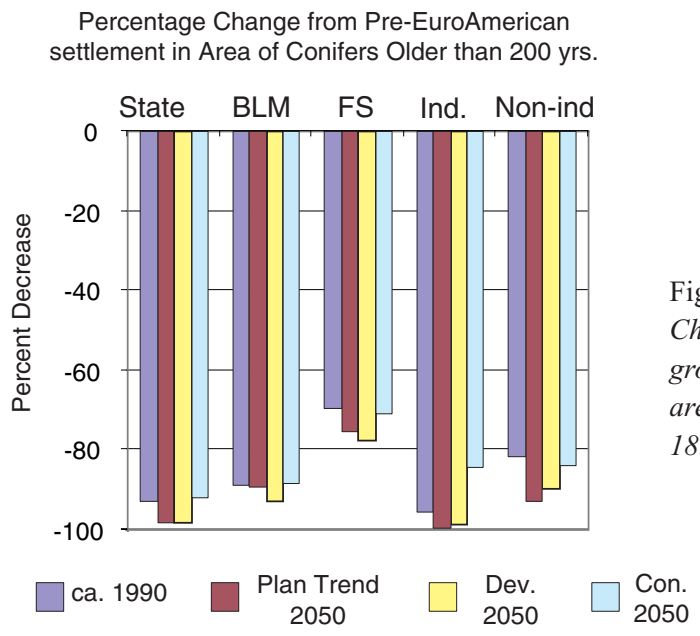
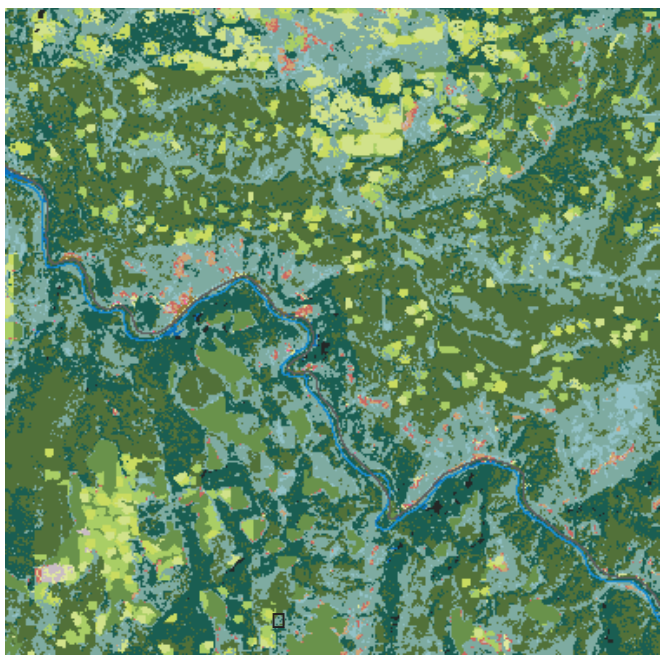


Figure 119. *Change in old growth conifer area since ca. 1850.*

Conservation 2050



Area shown is 7 by 7 miles, 11.3 by 11.3 km.

Development 2050

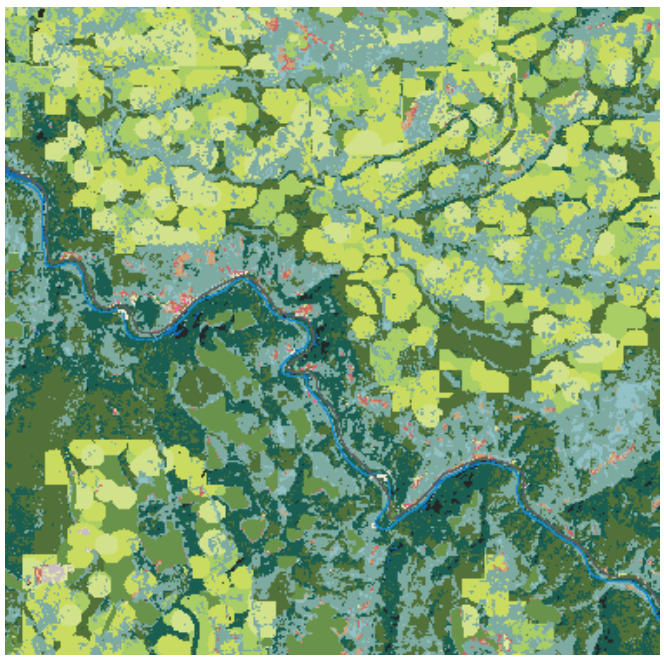


Figure 120. *Comparing the Conservation 2050 and Development 2050 alternatives around the Clackamas River scenic corridor. Map legend is the same as in LULC ca. 1990, p 78. Darker green means older forests, lighter green means younger.*