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Introduction

Future land use change in the Willamette Basin is likely to affect habitat for wildlife species. Can we measure what the effects might be? One way is to calculate statistics based on the percentage change in amount of habitat for various groups of species between the LULC ca. 1990 landscape and the future and Pre-EuroAmerican (PESVEG) landscapes. Another way is to look at the spatial distribution across the basin of the numbers of species for whom there are suitable habitats in the different landscapes. Both of these measures address the effects of possible changes on large groups of species, and thus attempt to assess the overall biological diversity of the terrestrial ecosystems of the basin.[24,26,57]

Preparing Data for Species and their Habitats

The 279 amphibian, reptile, bird, and mammal species that are assumed to occur in the basin at present or to have occurred at the time of first Euro-American settlement were the foundation for the wildlife studies (pp. 46-47, 160-61). Wildlife experts in the basin defined a set of 34 habitats that these species could use (Table 46). These habitats were then cross-referenced to one or more of the standard land use and land cover classes used to describe the LULC ca. 1990 landscape (p. 78) and the Conservation, Plan Trend, Development, and Pre-EuroAmerican landscapes, supplemented with additional wetlands data from the National Wetlands Inventory and the Oregon Department of Fish and Wildlife.

Wildlife experts assigned each species to one or more of the 34 habitats, using a suitability rating on a scale of 0 to 10 that represented the relative preference of the species for breeding in the habitat. Ratings greater than or equal to 5 meant that the habitat, if present in sufficient amount, has the potential to support a viable population of the species. These initial ratings were then modified by one or more of 50 adjacency rules that adjusted ratings up or down to reflect the importance of nearby features, such as water or houses, on habitat suitability (Fig. 159). Finally, the geographic range for each species in the basin was defined by ecoregions (pp. 48-49), elevation ranges (page 13), or one or more of 65 equal area grid cells covering the basin. Habitat outside a species' range was not included in the analyses. A team of wildlife experts helped to prepare all of these elements of the wildlife data.[146]

Changes in Habitat

A final habitat score at each location for each species in each landscape was calculated from the suitability ratings, adjacency rules, and geographic range for the species. From the maps of habitat scores an estimate of the total amount of habitat for a species in a landscape was calculated as the sum of all the scores across the landscape. The percentage change in habitat for each species relative to LULC ca. 1990 was then computed for the three future landscapes and for the Pre-EuroAmerican landscape. The median of the percentage changes for different groups of species was used as a summary statistic. Positive values of the median percent change statistic meant that there was more habitat in the future landscape or in the Pre-EuroAmerican landscape than in LULC ca. 1990, and negative values meant that there was less habitat. The groups of species analyzed were native amphibians, reptiles, birds, and mammals, all native vertebrate species taken together, species introduced to the basin, species extirpated from the basin, and rare species. The last group was defined as those species with state conservation ranks of S1, S2, or S3, as determined by the Oregon Natural Heritage Program[48] (see pp. 160-161 for this listing).

Relative to LULC ca. 1990, habitat for all groups of species changed more in the Pre-EuroAmerican landscape than in any of the future landscapes (Figs. 160, 161). For the future landscapes, the median percent change for each of the native vertebrate groups, as well as for all native species taken together, was less than ±6%. As an example, for the Plan Trend 2050 landscape the median percent change for birds and mammals was between 0 and -1%. The median percent change in habitat in the Pre-EuroAmerican landscape relative to LULC ca. 1990 for all groups of species, except introduced, was at least +20%. Median percent change in habitat for introduced species in the future landscapes was +10% to +33%.

Habitat Name	# Species	Oregon Slender Salamander	Western Pond Turtle	Blue Grouse	Western Meadowlark	Douglas' Squirrel	Red Fox
Conifer 0-20 yrs	92	0	0	2	0	2	4
Conifer closed 21-40	47	2	0	3	0	7	4
Conifer closed 41-60	60	4	0	8	0	8	4
Conifer closed 61-80	81	4	0	10	0	8	4
Conifer closed 81-200	102	10	0	9	0	9	2
Conifer closed 200+	107	10	0	7	0	10	1
Mixed forest closed	113	4	0	5	0	7	5
Hardwood closed	104	0	0	3	0	1	8
Conifer semiclosed upland	120	3	0	5	0	6	4
Mixed forest semiclosed upland	134	2	0	4	0	6	6
Hardwood semiclosed upland	120	0	0	0	0	1	9
Tree open upland	118	0	5	3	0	5	10
Oak savanna	85	0	7	0	9	0	10
Shrub dry, tree open, semiclosed, valley	69	0	5	0	2	0	10
Shrub wet valley	61	0	0	0	0	0	4
Christmas trees	28	0	0	0	2	1	4
Orchards, hybrid poplar	8	0	0	0	0	1	0
Vineyards, berries	15	0	0	0	0	0	0
Leafy vegetables	3	0	0	0	0	0	0
Grass short	10	0	4	0	0	0	3
Grass natural	50	0	10	0	10	0	10
Grass tall	20	0	5	0	3	0	6
Bare, burnt, fallow	5	0	5	0	0	0	0
Rock montane	26	0	0	0	0	0	0
Snow, ice montane	1	0	0	0	0	0	0
Seasonal wetlands	58	0	0	0	2	0	0
Lakes, reservoirs, permanent wetlands	41	0	0	0	0	0	0
Streams small	24	0	0	0	0	0	0
Streams large	19	0	0	0	0	0	0
Channel gravel	10	0	0	0	0	0	0
Built high density	7	0	0	0	0	0	0
Built mid density	17	0	0	0	0	3	2
Built low density	60	0	2	0	0	2	4
Roads, railroads	0	0	0	0	0	0	0

Table 46. *The 34 wildlife habitats with the number of viable species assigned to them, and suitability scores for breeding in the habitat by example species.*

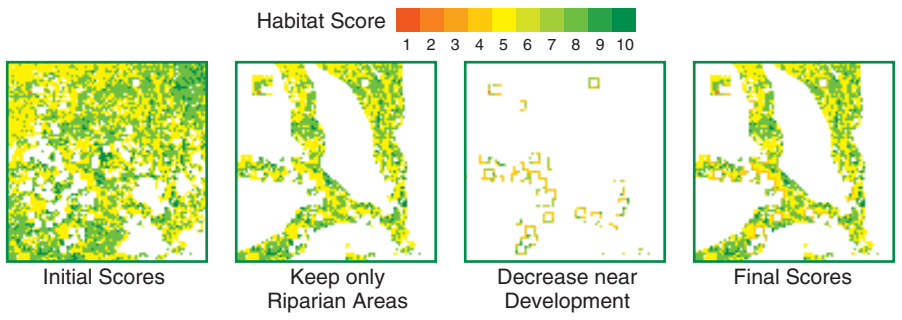

Figure 159. *The application of two adjacency rules to the habitat scores for the Great Blue Heron in a small section of the basin. Areas that are blank had no score.*

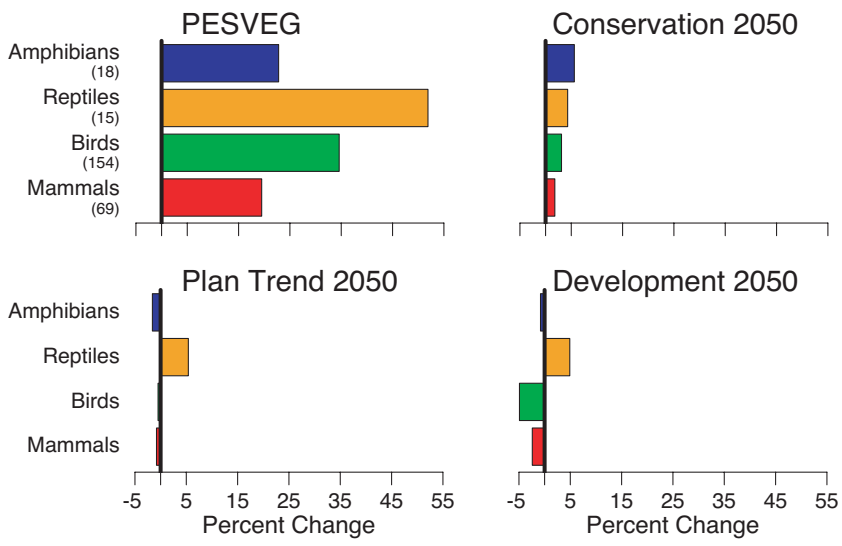

Figure 160. *Percent change in habitat for four taxonomic groups in each scenario compared to LULC ca. 1990.*

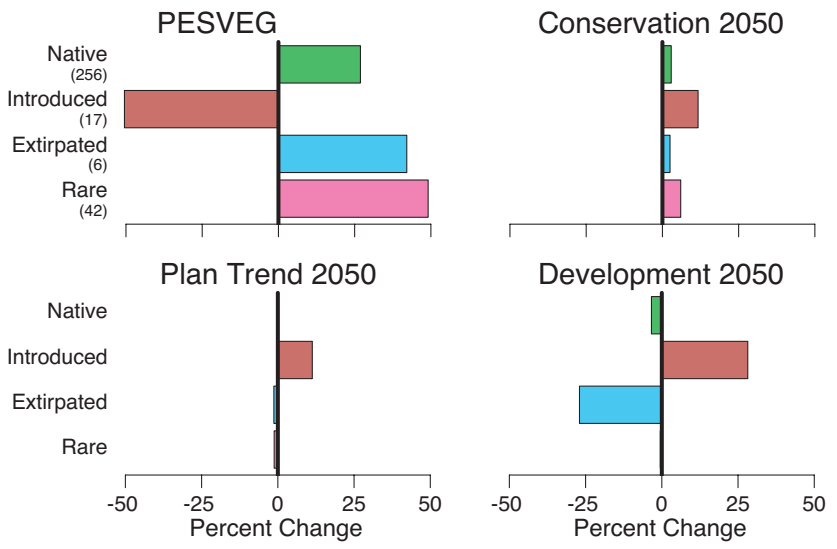

Figure 161. *Percent change in habitat for four groups of species in each scenario compared to LULC ca. 1990.*

The median percent change in habitat for native reptile species was positive in all future landscapes. In part, this was because of a greater amount of young-age conifer forest in the uplands in Plan Trend and Development, and greater amount of open habitat in the Lowlands in Conservation, both important for reptiles. The +52% change in reptile habitat in the Pre-EuroAmerican landscape relative to LULC ca. 1990 was associated with greater amounts of open habitat such as oak savanna, dry shrub, and natural grass (prairies).

An alternative perspective is to look at the percentages of native species that had increases or decreases in habitat in the future or Pre-EuroAmerican landscapes relative to LULC ca. 1990. If the differences between scenarios are random or neutral relative to their effects on wildlife, we would expect 50% of the species to increase and 50% to decrease. Figure 162 shows the degree to which the scenario comparisons deviate from this random pattern. The Pre-EuroAmerican and Conservation 2050 scenarios had 44% and 31%, respectively, greater numbers of species with increased habitat than with decreased habitat. In contrast, Plan Trend 2050 and Development 2050 had more species (10 and 39%, respectively) with decreased habitat than with increased habitat.

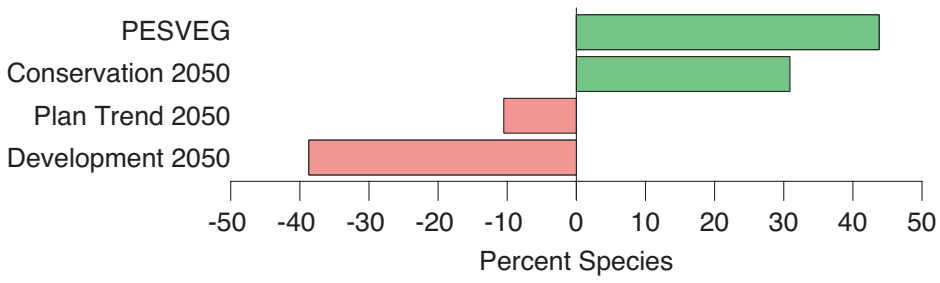

Figure 162. *Net change in species with increased or decreased habitat for each scenario, expressed as the percent of species with more habitat than in LULC ca. 1990 minus the percent with less habitat than in LULC ca. 1990.*

Changes in Numbers of Species

In the habitat maps for each species, any location with a final score of 5 or greater could potentially support a viable population. Maps showing the number of native species with scores greater than or equal to 5 for each location were generated for each landscape. Changes in numbers of species were then calculated by subtracting the LULC ca. 1990 map of numbers of species from the corresponding maps for the past and future landscapes.

To examine these changes across the scenarios, the differences in numbers of species for each map location were divided into seven classes: loss of more than 50 species, loss of 11 to 50 species, loss of 1 to 10 species, no change, gain of 1 to 10 species, gain of 11 to 50 species, and gain of more than 50 species. The numbers of square miles in each of these classes were calculated for each scenario (Fig. 163). The Pre-EuroAmerican landscape had the greatest area with both gains and losses in species relative to LULC ca. 1990 of the four past and future landscapes. The amount of area with no change relative to LULC ca. 1990 was about 10% in Pre-EuroAmerican, 64% in Conservation 2050, 63% in Plan Trend 2050 , and 54% in Development 2050.

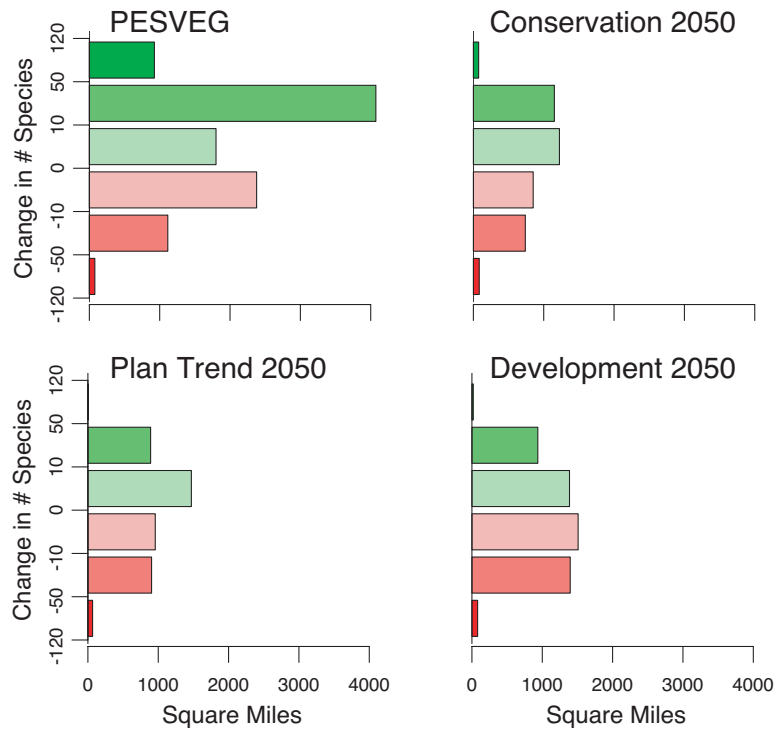

Figure 163. *The distribution of area by numbers of species gained or lost for each scenario compared with LULC ca. 1990. Zero change is not shown. Colors and class intervals are the legend for Figure 164 below.*

The relative difference between the Pre-EuroAmerican landscape and the future landscapes was apparent from the maps of the changes in numbers of species (Fig. 164). In Pre-EuroAmerican relative to LULC ca. 1990, there were greater numbers of species in what is now the Portland metropolitan area and along the riparian corridors of the Willamette River and its major tributaries. There were fewer numbers of species in the foothills where open habitats in Pre-EuroAmerican supported fewer species compared to forested conditions in LULC ca. 1990 (although reptiles as a group increased in these areas). In the future landscapes, there were areas of fewer numbers of species relative to LULC ca. 1990 at the edges of the current urban growth boundaries. There were also fewer numbers of species in the forested uplands, particularly in Development 2050 where short rotation forests were located. In Conservation 2050 there was less than 5% more area with gains in species than there was in Plan Trend 2050 and Development 2050, however there was 13% less area in Conservation 2050 with losses of species than in Plan Trend 2050 and 44% less than in Development 2050.

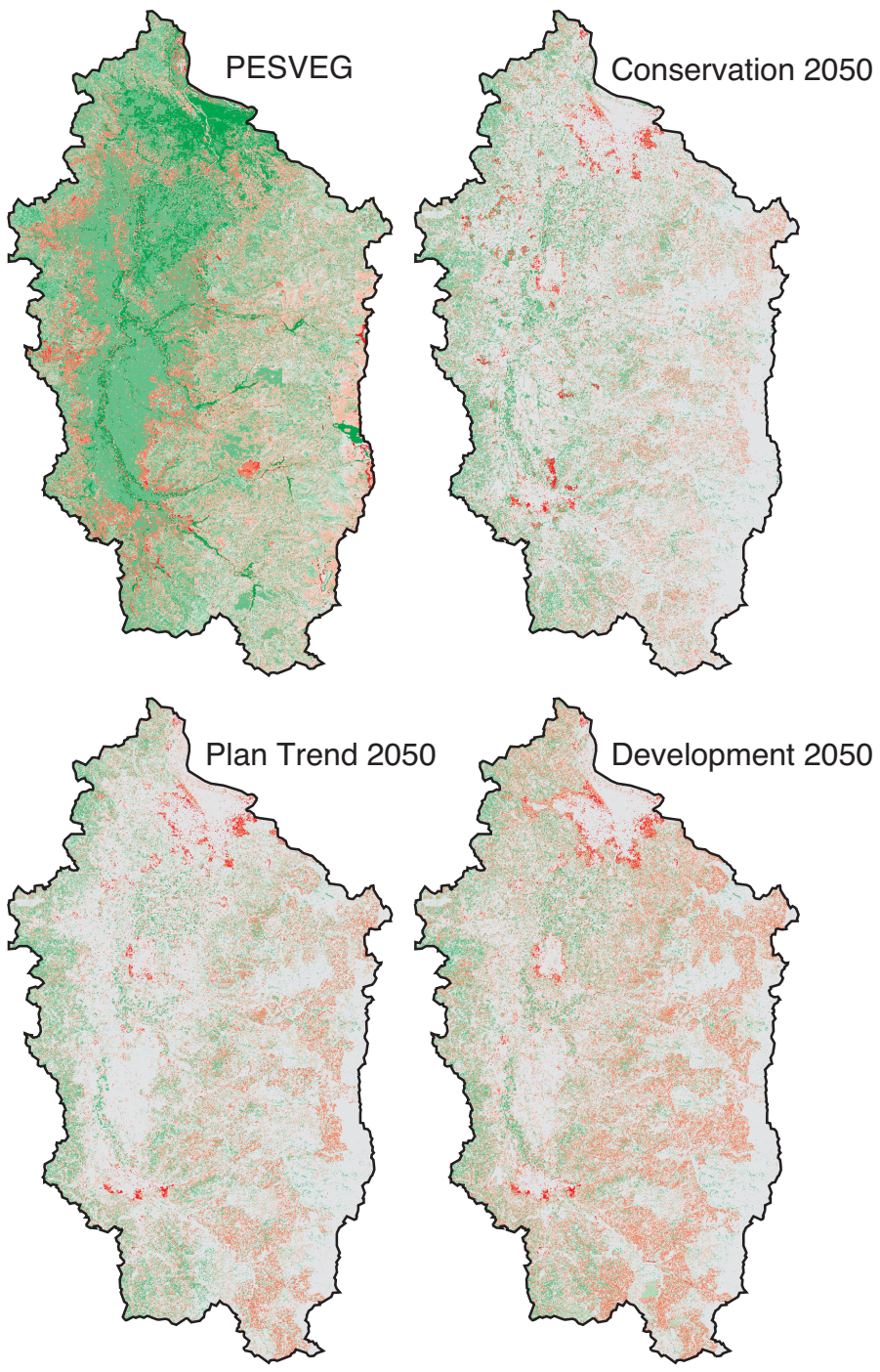

Figure 164. *Spatial patterns of the numbers of species gained or lost for each scenario compared with LULC ca. 1990. The classes of gains and losses, and the colors used to symbolize them are the same as Figure 163 above. Areas with no change are shown in light gray.*

Summary

Using median percent change as a measure, wildlife habitat for native species did not change dramatically in any of the future landscapes relative to LULC ca. 1990. However, the percentage of species that gained or lost habitat did show substantial differences between landscapes. Conservation 2050 had almost as large a percent gain as Development 2050 had loss (+31%, -39%). Plan Trend 2050 had a small loss (-10%); Pre-EuroAmerican had only a slightly larger gain than Conservation 2050 (+44%). In general, the urban fringes and forested uplands had fewer numbers of species in the future landscapes than in LULC ca. 1990. Areas that are now urban, agriculture, or in riparian zones in the Willamette Valley generally had greater numbers of species in the Pre-EuroAmerican landscape than in LULC ca. 1990.