Spatial Pattern and Dynamics of Hardwood Patches in a Multi-Ownership Landscape in the Coast Range of Oregon, 1939 to 1993

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INTRODUCTION
Understanding the effects of environment and history on forest pattern is a fundamental problem in landscape ecology and forest management. To examine hardwood patch dynamics in this context of disturbance and succession we evaluated hardwood patch dynamics over a half-century of agriculture in Oregon's Coast Range, from the years 1939 to 1993.

METHODS
Our approach involved sampling two populations separated by time (Fig. 1). We scanned and georeferenced fields were a minor component of patches. The large clear-cut at right of initiation plots. The large clear-cut at right of initiation plots.

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Fig. 1. To achieve our objectives, we measured: (1) the characteristics of two populations of patches separated by time (ovals) and (2) the change in characteristics of patches over time (rectangle).

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Fig. 2. Location of study area and aerial photograph coverage (white polygons) in the Coast Range of Oregon.

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Fig. 3. Total area in hardwood, number of patches, and patch size declined from 1939; 244 patches obtained from 336 plots into 14 land cover types (Fig. 3, above) (n=891, 289) and percent of hardwood cover along strata gradients in 1939 and 1993 (bars). Open shrub fields were a minor component of patches. The large clear-cut at right of initiation plots.

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Fig. 4. Selected attributes of the study area. a. Land cover types. b. Elevation. Green to yellow gradient reflects lower to higher elevations. c. Streams.

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Fig. 5. Mean, median, and weighted mean patch size for each stratum are normalized by the total number of patches.

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Fig. 6. Patterns of change were similar for hardwood areas but differed by ownership.

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Fig. 7. Mean and median patch size in riparian and upland areas.

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Fig. 8. (above) Frequency distribution of hardwood patches across environmental strata of slope position and stream distance in 1939 and 1993. For each date, values for each stratum are normalized by the total number of patches.

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Fig. 9. Patterns of change were similar for hardwood areas but differed by ownership.

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Fig. 10. Patch survivorship and size change was related to ownership and environment. Disproportionate few patches disappeared from NIP lands, and nearly 30% of patches that gained in area were found on NIP lands, although this ownership class held only 15% of the patches. FS held over 30% of 1939 patches but only 20% of patches grew larger. Patches on IP lands tended to either disappear or increase in size (Fig. 12). Patches on gentle slopes and near stream systems most often increased in size.

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Fig. 11. Mean patch shape in riparian and upland areas.

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Fig. 12. Trajectories of patch size change for tracked 1939 patches in relation to initial patch size and patch ownership.

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Fig. 13. Tracked patches showed 37% change in shape over 54 years (1939-1993) and 28% of patches changed by more than 0.15 in shape. Patches on FS lands were more fragmented and irregular in shape than the patches on NIP lands.

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Fig. 14. Tracked patches showed 37% change in shape over 54 years (1939-1993) and 28% of patches changed by more than 0.15 in shape. Patches on FS lands were more fragmented and irregular in shape than the patches on NIP lands.

KEY FINDINGS

All Patches

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Fig. 15. Mean patch size change over 1939-1993 by land cover type and ownership. Inspection of mean change over time at each level of land cover type and ownership revealed that the greatest mean change in patch size occurred in hardwood areas on IP lands. Except for Meadow and Conifer, hardwood areas on NIP lands experienced no significant mean change in patch size over time.

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Fig. 16. Changes in mean patch area and patch size with time through fragmentation and coalescence processes affecting hardwood patches in Oregon's Coast Range during the period 1939-1993. Each point represents a hardwood patch.

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Fig. 17. Changes in mean patch area and patch size with time through fragmentation and coalescence processes affecting hardwood patches in Oregon's Coast Range during the period 1939-1993. Each point represents a hardwood patch.