Are Shrub and Hardwood Tree Cover Types Declining in the Coast Range Mountains of Oregon? Potential Causes and Implications

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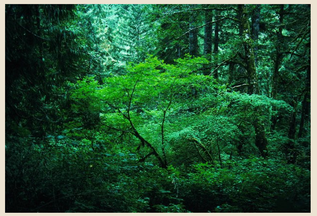
INTRODUCTION

Little is known about the long-term changes in shrub and hardwood tree cover in the Coast Range. Shrubs and hardwood trees are positively associated with the biodiversity of bryophyte, epiphytic macrolichen, insect and neotropical migratory bird diversity in young, mature, and older forests in Oregon's Coast Range.

Conservation priorities on federal lands focus on providing late successional conifer habitat, and large wood for streams. Management on private industrial lands emphasizes producing commercially valuable conifers.

We hypothesized that both federal conservation and private timber management practices in Oregon's Coast Range may be leading to declines in early successional vegetation types such as shrub fields and hardwood trees.



Vine maple (*Acer circinatum*) shrub in a coniferous forest gap

Fruiting salmonberry (*Rubus spectabilis*) shrub beneath a red alder (*Alnus rubra*) hardwood overstory

OBJECTIVES

(1) Determine the historical and current location of the collective shrub and hardwood cover type

(2) Describe changes over time in shrub and hardwood cover amount and location, with respect to ownership and environment

(3) Explore implications to biodiversity

METHODS

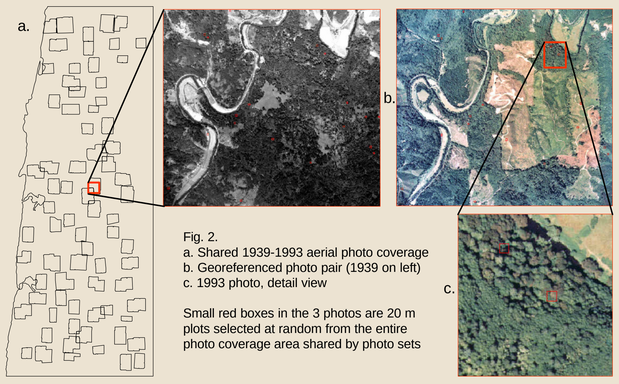


Fig. 2.
a. Shared 1939-1993 aerial photo coverage
b. Georeferenced photo pair (1939 on left)
c. 1993 photo, detail view

Small red boxes in the 3 photos are 20 m plots selected at random from the entire photo coverage area shared by photo sets

We analyzed land cover change for the years 1939 and 1993 in the west-central portion of the Coast Range mountains of Oregon (Fig. 1, below right).

We scanned and georeferenced historical (1939) and recent (1993) aerial photographs and used GIS techniques to randomly sample, digitally examine, and determine land cover type for 1500 20-meter plots (Fig. 2, above).

We pooled the 14 land cover types into 9 classes including a shrub/hardwood class because shrubs occur at high densities both under a hardwood canopy and in exposed shrub fields, and because some other cover types (such as very small and small conifer types) likely serve similar ecological functions. We compared landcover classification results with a suite of GIS-based environmental and ownership information (examples, Fig. 3, above right) for each plot-photo date combination.

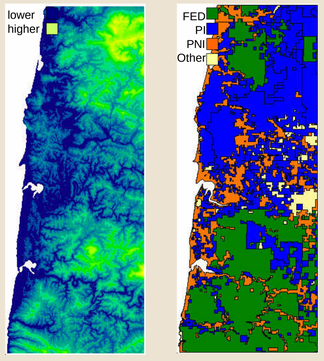


Fig. 3. Elevation and ownership

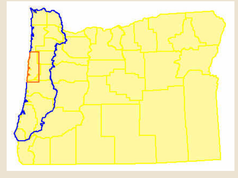


Fig. 1. Study area (red box) in the Coast Range of Oregon. Blue boundary is CLAMS area.

KEY FINDINGS

The most notable and expected change in land cover from 1939 to 1993 in the Coast Range was the loss of older coniferous cover and the increase of young coniferous cover (Fig. 4).

Shrub and hardwood cover types showed moderate declines.

Shrub fields and hardwoods were classified as 31% of land cover in 1939 and 25% in 1993 (Fig. 4). This is a within-class decline of 16%.

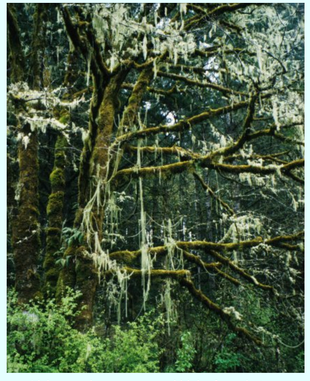
However, the relatively small change in overall shrub and hardwood cover masks large changes in the distribution of these cover types across ownerships and landscape positions.

Shrub and hardwood cover decreased on federal (FED) and private industrial (PI) land ownerships. They increased on private non-industrial (PNI) ownerships (Fig. 5), an ownership class found primarily along the larger streams in the study area. The trajectory for future hardwood tree and shrub amounts on PNI lands is uncertain because management practices there are difficult to predict.

Shrub and hardwood plots occurred at lower slope positions and closer to streams in 1993 than in 1939.

In 1939, shrub and hardwood plots occurred across the spectrum of environmental gradients in the landscape similar to the environmental distribution of all plots (Fig. 6).

By 1993 shrub and hardwood plots were found at lower slope positions and elevations, and were located closer to streams and closer to roads.



Lichen and moss-covered bigleaf maple tree (*Acer macrophyllum*) in a coniferous forest

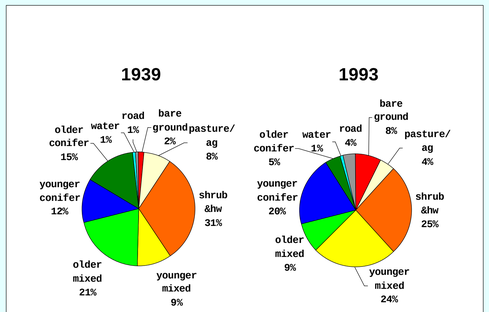


Fig. 4. Change in land cover from 1939 to 1993

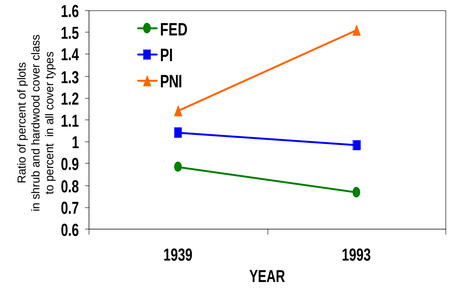


Fig. 5. Change in shrub and hardwood cover across ownerships

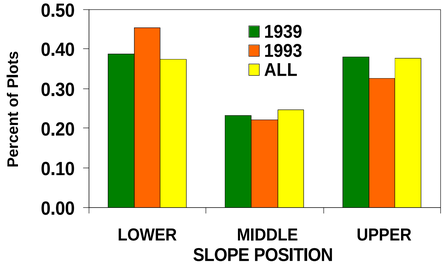


Fig. 6. Slope position of shrub and hardwood plots in 1939 and 1993 compared to slope position of plots of all cover types

Shrub and hardwood tree cover was not locationally consistent.

More plots shifted out of or into shrub and hardwood tree cover than remained shrub and hardwood cover from 1939 to 1993. (Fig. 7).

This could be detrimental to low-motility species groups such as epiphytic macrolichens and bryophytes, which may require stable substrate conditions to achieve high representations of rare species.

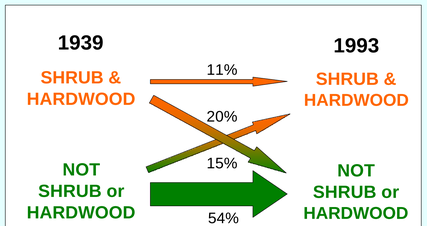


Fig. 7. Plot trajectories to and from shrub and hardwood cover type. Arrow width is proportional to the number of plots following each trajectory.

DISCUSSION

In Oregon's Coast Range, intensive timber management on private industrial lands and timber and conservation priorities on federal lands likely combined to cause the observed declines in shrub and hardwood tree cover from 1939 to 1993.

Intense and frequent fire, and grazing and logging disturbances which occurred prior to 1939 could have resulted in higher than historical average amounts and broader than average geographic distributions of shrub and hardwood cover.

However, if broad-scale disturbance such as wildfire continues to be restricted in the system, and if land uses continue to be partitioned strongly by ownership, we may see sustained or accentuated restrictions in the amount and distribution of shrub and hardwood cover to pre-1900s levels, and declines in associated species.