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Reprinted from THE NORTHWEST ENVIRONMENTAL JOURNAL
Vol. 4, No. 2, Fall/Winter 1988

Pest Response to Simplification of Forest Landscapes

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Changes in forest landscapes influence pest population dynamics and site productivity, although this is rarely recognized. Little concern has been shown for these consequences of change in forest landscapes. Landscape pattern can be characterized by at least three components: intersection by corridors, patch size, and variety of stand types and ages. When these components change, they affect the ability of potential pests to find and exploit suitable resources.

Populations of potential pests are controlled naturally. Factors of natural control include the availability of suitable host trees and how such trees interact with the abundance of predators and weather conditions. Typically, insects and pathogens can survive on a relatively small number of host tree species, usually at particular stages of tree development or during periods of tree stress. Finding or reaching a suitable host requires time and energy and can be expensive for short-lived insects or spores in complex ecosystems. Thus, old-growth forests, with their complex array of tree and predator species, large stand size, and high age class diversity, are less conducive to pest outbreaks than are the simplified forests created through current harvest and regeneration practices (Table 1).

Forest penetration by roads has provided site access and exposure to a number of potential pests, including Port Orford cedar root rot, blackstain root disease, gypsy moth, and spotted knapweed, which

TABLE 1. Arthropod biomass (grams/hectare) and numbers of species on Douglas-fir foliage, present in both old-growth (400-yr-old) forests and regenerating (10-yr-old) monocultures, in western Oregon during 1986.

	Old-growth Douglas-fir		Regenerating Douglas-fir	
	Biomass	No. of species	Biomass	No. of species
Herbivores	310	8	1,500	3
Predators	160	40	60	10
Cone-, seed-, and litter-feeders	50	18	0	2
Total	520	66	1,560	15

typically become established along roads. Homogenizing forest landscapes by planting a single tree species has eliminated predators and physical barriers to dispersing pests, such as aphids and bark beetles. Improved pest survival will increase the likelihood of region-wide pest outbreaks. Current management practices also are restricting the options available to forest managers for crop tree or stand selection. The potential for future insect and disease activity, and changes in markets for different tree species (e.g., for Pacific yew, a source of important anti-cancer compounds), favor diverse stands over monocultures. Future site productivity will depend, in part, on how landscaping pattern affects pest epidemiology.