

Response of Birds to Thinning Young Douglas-fir Forests



Thinning provided habitat for three species of birds that were rare or absent in unthinned stands (Townsend's solitaire, American robin, and Hammond's flycatcher). Increased numbers of these species may be the result of more open canopy conditions following thinning.

- if abundance of breeding birds was influenced by thinning,
- if influences varied with thinning intensity, and
- if effects varied in time during the first 6 years following thinning.

The study was conducted in the northern Oregon Coast Range in an area known as the "Tillamook Burn," named for the series of intense fires that burned through the region between 1933 and 1951. As a result of intensive replanting and seeding efforts between 1949 and 1970, today these lands primarily consist of large tracts of contiguous, even-aged Douglas-fir forest. Three study areas on the Tillamook State Forest and one on lands managed by the Stimson Lumber Company consisting of three 65- to 100-acre stands of 35- to 45-year-old forest were selected for study (Figure 1). Each stand within a replicate was randomly assigned to one of three treatments (Figure 2): no thinning (control), moderate thinning (thinning to a relative density (RD) of 35 (or roughly 100 to 130 trees per acre (tpa)), or heavy thinning (RD 20, or roughly 60 to 85 tpa). The moderate thinning treatment was designed to emulate operational commercial thinning that is typically used in the area to achieve wood fiber production goals. The heavy thinning treatment was designed to increase size of canopy openings, accelerate growth of overstory trees, stimulate understory development, and enhance structural complexity of the stands. The thinning treatments were performed between 1994 and 1995.

As a result of recent fire history and decades of even-aged forest management, many coniferous forests in western Oregon are composed of young (20-50 yrs), densely stocked Douglas-fir stands. Often these stands are structurally simple—a single canopy layer with one or two overstory tree species—and have a relatively sparse understory. The lack of structural complexity in these stands may limit the availability of key habitat components for several species of vertebrates, including birds.

Thinning may increase structural diversity by reducing competition among overstory trees and increasing the amount of sunlight reaching the forest floor, thereby increasing development of understory vegetation. Existing old-growth forests may have developed under lower densities than is typical of contemporary plantations. Thus, thinning also may be a tool for accelerating the development of late-successional forest conditions in some circumstances. In addition to the potential increases in structural and biological diversity, thinning frequently is used to optimize wood fiber production and to generate timber revenue.

Because of its potential ecological and economic benefits, thinning is underway or planned for hundreds of thousands of acres of forest in western Oregon. However, there are few studies documenting the implications of commercial thinning to wildlife populations. As part of the Cooperative Forest Ecosystem Research (CFER) program, Dr. John Hayes and colleagues evaluated the short-term response of breeding birds to thinning in the northern Oregon Coast Range. The study objectives were to determine:



Figure 1. Map of Tillamook study sites.

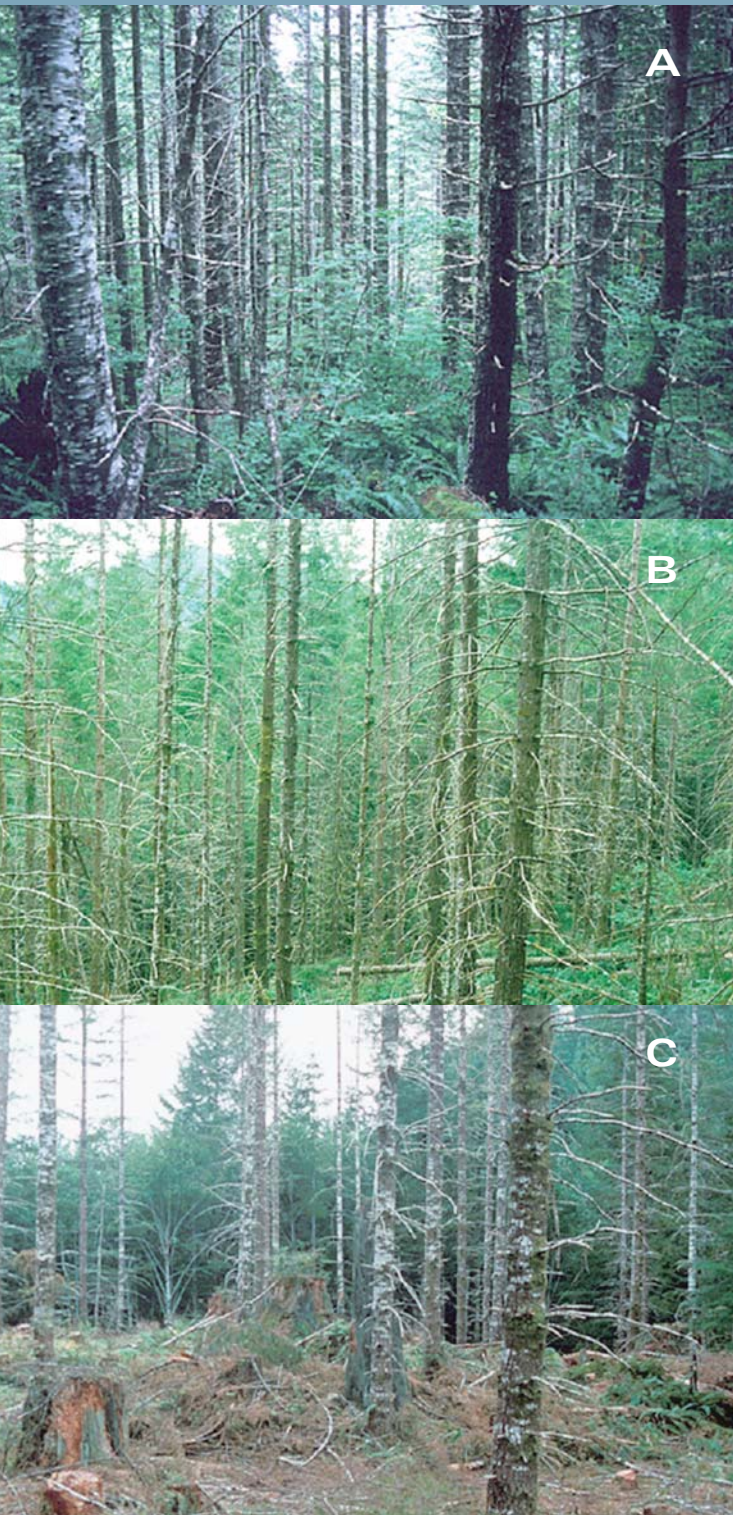


Figure 2. Treatments that were studied include (A) control sites (no thinning, to remain at pre-existing densities), (B) moderately thinned sites (thinned to a relative density of 35, or approximately 100-130 tpa), and (C) heavily thinned sites (thinned to a relative density of 20, or approximately 60-85 tpa).

Detections of hairy woodpeckers increased substantially in thinned stands. Foraging resources following thinning may have been an important factor influencing habitat suitability for hairy woodpeckers in the study.

To sample bird abundance, five point-count stations were established in each of the 12 stands. Each stand was visited seven times during the year prior to treatment (1994) and during each of the 6 years immediately following treatment (1995-2000). Observers recorded all birds seen or heard within 80 m of each point-count station during an 8-minute observation period.

Information-theoretic approaches (Burnham and Anderson 1998, *Model Selection and Inference: a Practical Information Theoretic Approach*. Springer-Verlag. 353 pp.) were used to construct a set of conceptual models describing the response of birds to thinning. Models were based on four possible scenarios for mean treatment differences: $C=M=H$; $(C=M)\neq H$; $C\neq(M=H)$; and $C\neq M\neq H$, where C, M, and H represent the mean index of bird abundance or temporal trend in the control, moderately thinned, and heavily thinned stands. The strength of the individual models to fit the data was based on Akaike's Information Criterion (AIC; Burnham and Anderson 1998).

Of the 22 bird species statistically analyzed, detections of nine species decreased (Figure 3A) and detections of eight species increased (Figure 3B) relative to controls following thinning, and there was no strong evidence that thinning influenced abundance of five species (Figure 3C, Table 1). Of the 17 species that responded to thinning, the magnitude of response of eight species varied with thinning intensity. Numbers of Pacific-slope flycatchers (Figure 3A), Hutton's vireos, and brown creepers decreased more in heavily thinned stands than in moderately thinned stands, and numbers of dark-eyed juncos (Figure 3B) and hairy woodpeckers increased more in heavily thinned stands than in moderately thinned stands. Two species, the Steller's jay and varied thrush, decreased only in the heavily thinned stands, and warbling vireos increased only in the heavily thinned stands.

Although no species was extirpated from stands following thinning, detections of Hutton's vireos, golden-crowned kinglets, brown creepers, black-throated gray warblers, and varied thrushes in one or more of the thinning treatments were 50 percent or less than detections in controls, suggesting thinning significantly impacts their numbers. In contrast, American robins, Townsend's solitaires, and Hammond's flycatchers were rare or absent in controls but regularly present in thinned stands, and detections of western tanager, evening grosbeaks, and hairy woodpeckers increased by threefold or more in thinned stands relative to controls.

Only Pacific-slope flycatchers, warbling vireos,



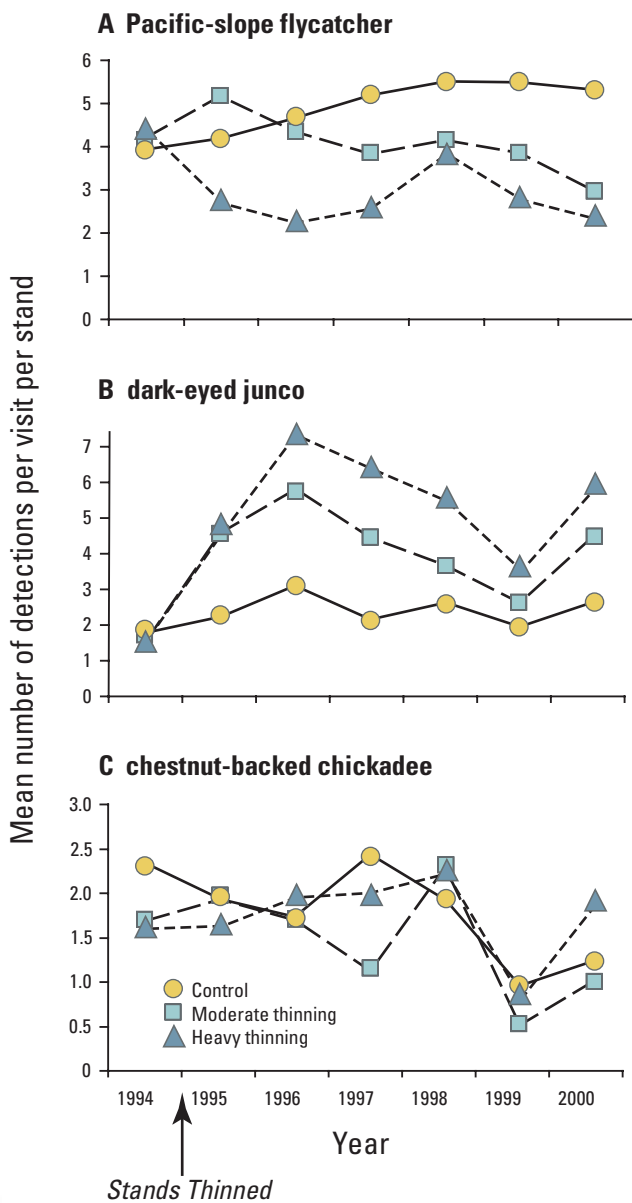


Figure 3. Examples of birds that (A) decreased in numbers in response to thinning, (B) increased in numbers in response to thinning, and (C) showed no strong evidence of change in response to thinning.

and western tanagers showed strong evidence of temporal trends in response to thinning. For these three species, differences between numbers in controls and thinned stands became more extreme through time.

These results, in combination with other recent studies, demonstrate that thinning influences abundances of several species of wildlife during the first few years following thinning. Because neither thinned nor unthinned stands provide optimal habitat for all species, it may be beneficial to retain some densely stocked, unthinned patches in landscapes dominated by younger stands to provide refugia for species that are negatively impacted by thinning. However, because the short-term consequences of thinning for many species of wildlife are positive, neutral, or of minor negative impact, most wildlife populations in landscapes dominated by young, densely stocked plantations should benefit from thinning over a large proportion of the landscape if the thinning is done in conjunction with management and retention of legacy structures and dead wood, as well as other conservation measures.



Some of the species that declined following thinning, the brown creeper, golden-crowned kinglet, and varied thrush (pictured here) are most abundant in or associated with older forest conditions. Unthinned stands may provide important refugia for these species in landscapes with little remaining older forest.

Table 1. Response of species to thinning treatments.

Declined in response to thinning	No evidence of change in response to thinning	Increased in response to thinning
Pacific-slope flycatcher	Chestnut-backed chickadee	Dark-eyed junco
Hutton's vireo	Winter wren	Warbling vireo
Hermit warbler	Gray jay	American robin
Golden-crowned kinglet	Wilson's warbler	Hairy woodpecker
Steller's jay	Red-breasted nuthatch	Townsend's solitary
Swainson's thrush		Evening grosbeak
Brown creeper		Western tanager
Black-throated gray warbler		Hammond's flycatcher
Varied thrush		

KEY RESULTS

Short-term Effects of Thinning

- Of the 22 species analyzed, detections of 9 species decreased relative to detections in controls following thinning (Table 1).
Responses of Pacific-slope flycatchers (Figure 3A), Hutton's vireos, and brown creepers varied with intensity of thinning; numbers of these birds decreased more in heavily thinned stands than in moderately thinned stands.
- Detections of 8 species in thinned stands increased relative to detections in controls following thinning (Table 1).
Of these species, responses of dark-eyed juncos (Figure 3B) and hairy woodpeckers varied with thinning intensity. Increases in heavily thinned stands were greater than in moderately thinned stands for these two species.
- Five species did not exhibit a strong response to thinning (Table 1).

Temporal Trends

- Responses of most species to thinning were rapid and evident within the first year following thinning. Most species did not demonstrate temporal trends during the post-treatment phase of the study.
- Numbers of Pacific-slope flycatchers in thinned stands continued to decrease relative to the controls through the duration of the study (Figure 3A).
- Numbers of warbling vireos in the heavily thinned stands tended to increase relative to numbers in the control and moderately thinned stands over the course of the study.

This factsheet is one in a series of information products developed by the Cooperative Forest Ecosystem Research (CFER) program on biotic responses to changes in structure of young forests of western Oregon. Personnel of the Oregon Department of Forestry and the Stimson Lumber Company provided access to study sites, logistical support, implementation of treatments, and accommodation of the research in their management plans. Funding for this research was provided by the Coastal Oregon Productivity Enhancement (COPE) program, College of Forestry, Oregon State University, and by funding to the CFER program by the USGS Forest and Rangeland Ecosystem Science Center and the Oregon Department of Forestry.

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For Further Reading

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