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# Science

## FINDINGS

*“Science affects the way we think together.”*

Lewis Thomas

## RHAPSODY IN AVIAN MAJOR: A CONCERTO OF SONGBIRDS, FOREST MANAGEMENT, AND THE PUBLIC

*“Hark, by the bird’s song  
ye may learn the nest.”*

—Alfred Lord Tennyson (1809–1892)

Ah, the romance of a songbird. Nothing can turn heads quite like birdsong, especially birdsong that occurs in the middle of a field trip presentation to members of the public. Ask Todd Wilson.

He’s certainly not a dull speaker, yet he’s seen his audience lose the plot when a hermit warbler warbles its way into their consciousness or a song sparrow chirrups from the undergrowth. Quite literally, people turn their heads, and he’s lost them.

Maybe, he finally said to himself, I can do something with this.

“Birds are highly valued by much of the public because they contribute to the aesthetics of a forest experience,” Wilson says. “Both the number of individual people and the proportion of the population that participates in recreational wildlife watching in the United States, which includes feeding, observing, or photographing wildlife, have increased dramatically.”

He notes that there is substantial public support for migratory songbirds and they are readily recognizable by their songs, their behavior, and their appearance. In Pacific Northwest forests, birds are more often heard than seen. Even some of the more colorful species such as finches and warblers are not often spotted in the hiding places of the canopy or the understory. Nonetheless, people cue to their



*The western tanager is one of the Neotropical species that uses Northwest forests in the summer for both roosting and forage.*

songs, even if they cannot identify the actual birds.

Thus Wilson, a wildlife biologist with the PNW Research Station in Olympia, Washington, theorized that these musical creatures could provide an important and effective communication link among scientists, forest managers, and the public.

### I N S U M M A R Y

*Controversy over timber harvesting continues, and public perception of timber harvest has become increasingly important in the debate over land management decisions. However, forest management alternatives are often framed in terms to which the public cannot easily relate, such as “millions of board feet,” or terms that trigger a preconceived negative response, such as “harvesting,” which brings to mind clearcutting.*

*In contrast to attitudes toward timber harvesting, most people are quite positively attuned to wildlife, in particular to songbirds. But the public has very little knowledge about the relationship between forest condition and wildlife habitat, and how different stages of forest development can influence (both positively and negatively) songbird habitat.*

*Several Pacific Northwest Research Station projects in Washington state are seeking to connect findings about timber management effects on songbird habitat with public perceptions of songbird presence. The merging of two large-scale interdisciplinary studies—the Forest Ecosystem Study and the Silvicultural Options Study—incorporates the disciplines of silviculture, ornithology, sociology, botany, economics, mycology, entomology, mammalogy, ecology, and forest management. The Capitol Forest Bird Study was initiated specifically to investigate the use of songbirds as an interpretive tool to help measure public response to different treatments.*

# TIMBER MANAGEMENT AND BIRD COMMUNITIES

An area of special concern in biodiversity is maintaining resident bird communities in second-growth forests. Unlike Neotropical migratory birds, which only spend their time in the Pacific Northwest during the warmer months and when food is most abundant, resident birds must also face the opposite conditions. Low temperatures and increased precipitation in winter create thermally stressful environments, and winter weather affects foraging strategies, availability of food, and roost sites. All these factors affect size of breeding populations and thus probability of persistence, Wilson explains.

As part of the Forest Ecosystem Study, begun in 1991, researchers evaluated avian response to both traditional and new forest management strategies. Focusing on winter-resident birds, objectives were to examine

the effects of legacy retention [snags, large live trees, and fallen trees] versus multiple commercial thinnings. Under each of these traditional strategies, one half of the stands were also subjected to variable-density thinnings (VDT). After treatment, researchers measured effects on bird species abundance, bird species richness, and consistency and completeness of stand use by birds in winter.

“Thinning as a forest management strategy produced stands that supported more winter birds, and more species of winter birds than legacy retention,” Wilson says. “This result is somewhat surprising because legacy retention is often implemented with the expressed purpose of providing habitat for over-wintering, cavity-using birds, and conventional thinning often results in reduced decadence in overstory trees and thus reduced utility to cavity users.”

Overall, VDT treatment had immediate positive effects on the bird communities in the legacy stands even before sufficient time had elapsed for the understory to fully respond to reduced and variable canopy density, Wilson says.

Wilson notes that the mechanism for these improvements is not yet clear, but could include enhanced understory development with improved foliage, fruit, seed, and insect abundance; changed microclimates with patches of sunlight that might help raise local temperatures; and increased vigor of overstory trees.

The VDT had little additional effect in the thinned stands, suggesting that thinning in general has positive effects on winter bird communities. Finally, no species common in winter preferred unthinned legacy stands.

## SPECIES AND THEIR PREFERENCES

The responses of several common winter-resident birds give some insight into these response patterns.

Winter wrens are understory-gleaning insectivores that frequently nest in fallen trees. Winter wrens clearly exhibited greater use of thinned stands than of legacy stands. Their low use of unthinned legacy controls could reflect the limited forb, fern, and shrub cover in unthinned stands, which reduced foraging substrate and availability of prey, Wilson explains. When VDT subsequently increased understory vigor in forests that already had

large fallen trees, the quality of winter wren habitat improved.

Golden-crowned kinglets, by contrast, are flocking birds that move through the forest canopy. They are foliage-gleaning insectivores directly affected by any reduction in crown cover. Thus their posttreatment preference was largely for thinned control stands, which had deeper, more developed crowns than legacy stands, yet a higher number of crowns than VDT thinned stands.

Song sparrows, another understory-gleaning insectivore species, also used thinned stands

more than legacy stands and showed a strong positive response to VDT even in the previously thinned forest, Wilson notes. Again, this was likely because of a more developed understory.

Only 6 years after treatment, VDT legacy stands approached the same levels of attractiveness to birds attained after 10 or 15 years



### KEY FINDINGS



- Variation in bird community composition among six silvicultural treatments, ranging from clearcut to control, suggest that some species are resilient to management activity.
- Proportion of area used and bird species richness increased 3 to 6 years after variable-density thinning was applied to two forests, even though they each arose from different management histories, one with legacy retention, one with multiple commercial thinnings.
- Treatment plots across a broad geographic area and under a wide range of management strategies differed in bird abundance and number of bird species. Some of these differences should be discernible to interested members of the public who are willing to conduct visual and aural surveys for birds.

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in commercially thinned forest. Researchers believe VDT appears to be a valuable adjunct to legacy retention, and holds promise as a tool to manage for biodiversity and multiple forest values.

“It seems clear from the avian component of the Forest Ecosystem Study that silviculture can enhance abundance and diversity of winter birds,” Wilson says. “Variable-density thinning can shorten or preclude the competitive-exclusion stage and accelerate the development of understory and midstory structure in overstocked closed-canopy forests. This will help create conditions that support more diverse and abundant wintering bird communities.”

## LAND MANAGEMENT IMPLICATIONS

- Although within-stand bird diversity can be negatively affected by harvesting in the short term, overall higher landscape biodiversity could result from a greater array of stand conditions across the landscape.
- Variable-density thinning, in conjunction with other conservation measures (legacy retention, decadence management, and long rotations) can provide habitat for abundant and diverse birds.
- Public acceptance of timber harvesting may well depend on their understanding of forest development, the effects that different timber harvest strategies have on forest development, and the response of birds to increasing forest complexity.

## TIMBER MANAGEMENT AND BIRDSONG

The Silvicultural Options for Young-Growth Douglas-Fir Forests, initiated in 1997, is designed to evaluate alternative operational-scale regeneration harvests in second-growth Douglas-fir forests. The measures of consequences are economic and biological, and acceptance by the public. Because the study site is located near both urban and rural communities, it provides a cost-effective opportunity to evaluate public response to alternative harvests from a wide range of user groups, Wilson explains.

“There is still a lot of polarization out there about timber harvest,” he says. “We still need discussions about these issues, and we need wherever possible to discuss them within the context of multiple spatial and temporal scales. In addition, we are now recognizing that public perceptions of forest management include factors other than visual impressions. We believe factors such as frequency and variety of bird songs and calls may be important components influencing

human experience and perceptions of managed forests.”

To date, few empirical data exist on the value of natural cues to aesthetic experience, or their use in interpretive programs. In addition, few studies of silvicultural options have been conducted in second-growth conifer forests that include measurement of aesthetics. It’s an open field.

Within the larger silvicultural study, the Capitol Forest Bird Study was initiated to evaluate the effectiveness of birds as an interpretive tool for land managers evaluating public perception of alternative forest management strategies. Within the study’s broad biotic and social components, the objectives include determining how songbird abundance and community structure respond through time to six silvicultural treatments, how these changes affect fre-



*The chickadee is a resident songbird in Northwest forests, requiring roosting and foraging habitat year-round.*

quency and variety of calls and songs, and how the public responds to the frequency and variety.

The bird study encompasses all birds, including both winter residents and Neotropical migratory species.

## VARIABLE BIRD RESPONSES

In the Capitol Forest Bird Study, six treatment units ranged in size from 30 to 80 acres. Harvest regimes included extended rotation without thinning as a control, extended rotation with continued thinning, group selection, small patch cutting, two-age management, and clearcutting. The study area encompasses about 300 acres in the Capitol State Forest just 15 miles southwest of Olympia, Washington, so is easily accessible for both researchers and the public.

Bird surveys were conducted 1 year after treatments were implemented, but have already yielded preliminary results that suggest discernible patterns.

“As has been found in other experiments based on harvest treatments, both abundance and species richness appeared to decline initially, relative to the control treatment, in any treatments that had more disturbance from timber harvest. These include clearcut and two-age treatments,” Wilson explains. “However, in accord with results from elsewhere, we expect this short-term response to habitat disruption to reverse as plant communities respond to changes to the ecosystem brought on by the disturbance, including the increase in sunlight to the forest floor.”

As in the Forest Ecosystem Study, species patterns were found. The species most

abundant in the least disturbed treatments (control and commercial thin) were all less abundant in the more heavily harvested treatments, but Oregon juncos and white-crowned sparrows displayed the opposite trend. The juncos are known habitat generalists, often found in recently disturbed forests, and white-crowned sparrows appear to prefer more open environments, including clearcuts.

Winter wrens reduced their presence in clearcut and two-age treatments, but are expected to increase their populations as density of low shrub cover increases over the next couple of years. Brown creepers,

Pacific-slope flycatchers, and Wilson’s warblers were all at greatest abundance in the control treatment and absent from the clearcut treatment.

“The variation in bird community composition between the control treatment and other treatments suggests that, for some species, there is varying resiliency to the management activity that occurred on these sites,” Wilson says. “We expect bird species richness to increase over the next several years in all of the treatments as both understory and overstory respond to the treatments. This will increase plant species diversity resulting in more food sources, greater density of hiding cover and nest sites, and continued progression of decadence in overstory trees to provide cavities.”

The researchers predict that this increase in species richness will be greatest in the patch cut and group selection treatments where the mosaic of forest and small clearings provides a heterogeneity across the landscape at a scale that may favor greater biodiversity for birds.



*Legacy retention holds snags and coarse woody debris in the forest, but passive management allows rapid canopy closure, a long competitive exclusion stage, and little understory development.*

## UNDERSTANDING PUBLIC PERCEPTIONS

Can the public perceive differences in bird cues among treatments? This is the question, of course, upon which the idea of using songbirds as interpretive tools hangs. While the data clearly establish numerical differences in both bird abundance and species richness among treatments, whether those differences are meaningful to the public has yet to be determined, Wilson explains.

“Auditory cues accounted for most observations during the study period, as is typical for most bird surveys in Pacific Northwest forests during the breeding season. Therefore a focus on auditory cues in building an interpretive program appears more promising than a focus on visual cues alone,” he says. “On field trips to forested study sites, participants from a wide range of academic, professional, and technical backgrounds have repeatedly been very attracted to—or distracted by—aural cues emitted by birds, even though these birds are seldom visible.”

One piece of the challenge with involving the public in aural measurements is helping them understand levels of diversity. For example, *within-stand* diversity (alpha-level diversity), differs from beta-level diversity, which is diversity *between stands*. Wilson notes that beta-level diversity is the basis for forming opinions about the acceptability of treatments.



*Thinning brings light into the forest, helping the development of midstory and understory forest layers, which support many small bird and mammal communities. Variable-density thinning helps delay canopy reclosure, delaying competitive exclusion.*

“Our data so far suggest that detection of differences between two treatments is possible, particularly between extreme harvest intensities such as clearcut and control, but it is also likely between patch cuts and two-age treatments.”

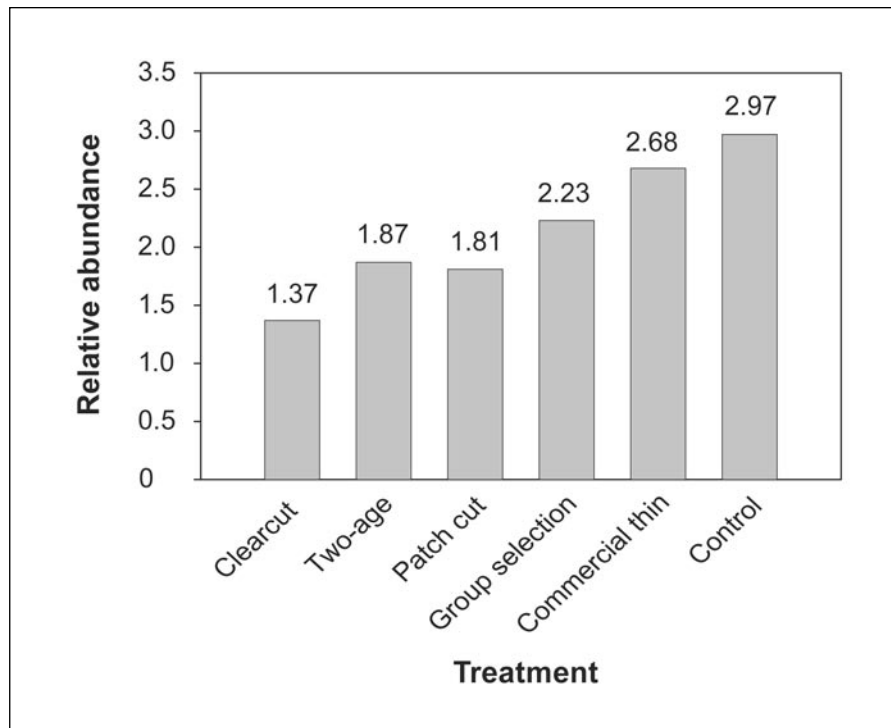
When it comes to gamma-level diversity, however, the differences *among all stands*, the confounding variables start to increase.

The order of moving through treatments may influence decisions, for example where there are extreme differences between adjacent stands. Further, because treatments vary in size, perceived differences in species richness could occur based on observer route and time spent in each treatment. This challenge could be mitigated by making interpretive trails the same length in each treatment, Wilson suggests.

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### WRITER’S PROFILE

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Bird abundance (mean number of birds detected per point per day) by treatment regime.

## TESTING PUBLIC-PERCEPTION HYPOTHESES

Given the measurable differences in both bird abundance and species richness after just one year, researchers next will begin evaluating three key hypotheses. The first is that treatments will increase landscape-level and stand-level songbird diversity and abundance. The second is that treatments will also increase within-stand songbird species richness and abundance. And the third supposes that increased avian abundance and diversity will be apparent to the public through increased frequency and variety of bird calls and songs.

“We’re hoping that the experience of walking through the six treatments in turn in this particular area will really help people begin to take notice of any differences in bird calls, in both variety and frequency,” Wilson says. “To date, the terminology involved in communicating various harvest treatments to the public are discipline-specific and don’t mean much to a lot of people—‘millions of board feet,’ or ‘variable-retention harvest strategies.’ I have discerned a real interest in birds out there, and I am hoping that this is a tool that can successfully communicate science and forest management strategies to a grow-

ing body of interested public who help shape how we manage our forests.

Wilson and his colleagues hope to test their hypotheses in the next few years, as even more dramatic differences in bird community structure among treatments are expected, and when additional replicates become available.

“We want to continue to test people’s reactions through time, as well as birds’ reactions, not least because we suspect people’s acceptance of harvesting may depend on their understanding of the ‘trajectory’ of conditions created by various harvest methods,” he says.

As knowledge and issues become more complex, the need to communicate science in a meaningful way becomes ever more paramount if science is to continue to be used as the basis for sound management decisions.

The romance of the songbird may yet become the social measure of the songbird.

*“Music hath charms to soothe the savage breast.”*

—William Congreve (1670–1729)

## FOR FURTHER READING

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## SCIENTIST PROFILE



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