



Science

FINDINGS

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"Science affects the way we think together."
Lewis Thomas

Does Housing Development Influence How Private Forest Landowners Manage Forest Land?

IN SUMMARY

Anecdotal evidence and some previous studies suggest that as development approaches private forest land, there's a decline in commercial timber management of those forests.

At the request of Gary Lettman, then a principal forest economist with the Oregon Department of Forestry, Jeff Kline and Andrew Gray, researchers with the USDA Forest Service Pacific Northwest Research Station, studied whether this held true in Oregon and Washington. They used data from the USDA Forest Service Forest Inventory Analysis program and state data from 2001–2016 to determine if there was a connection. Kline also reviewed previous studies conducted across the country on the effects of housing development on commercial timber management.

Both research efforts yielded similar results—site-specific productivity and socioeconomic factors influenced whether development reduced commercial timber management. Throughout the entire study area, stand and site characteristics were significantly correlated with the intensity of active management and harvest levels.

Active forest management decreased in western Washington as housing density increased. In other regions of Oregon and Washington, increases in housing density didn't result in significant decreases in active management. This information may inform future policy decisions about land use. Another consideration is that as these areas urbanize, public values around forests may shift from commercial timber management to managing for a variety of ecosystem services.

New housing development near Corvallis, Oregon. As urban and suburban areas expand, forest and agricultural land is often developed for housing. Both Oregon and Washington passed land-use legislation that attempts to restrict such development. USDA Forest Service photo by Jeff Kline.

*"Times go by turns, and chances
change by course, From foul to fair,
from better hap to worse."*

—Robert Southwell, Jesuit priest

For nearly 30 years, Gary Lettman has had a bird's-eye view of urbanization in Oregon. Using hardcopy photographs found in courthouse basements, and later, digital imagery, he's seen cities, such as Portland and Bend, expand their city limits. He has seen farmland and forest land on the

outskirts of cities become neighborhoods that were eventually annexed. In eastern Oregon, he's observed forests become a patchwork quilt of trees and houses on 5-acre parcels.

Before his retirement in 2011, Lettman was a principal forest economist with the Oregon Department of Forestry. During that time, he led statewide assessments to quantify the extent of, and change in, forest land in Oregon. The passage of statewide land-use planning legislation was designed to slow the development of agricultural and forest land. Both industries provide significant economic



Researchers used aerial photos, such as this image of Chehalis, Washington, and plot data from the Forest Inventory and Analysis program to discern land use and measure change over time. USDA Forest Service photo.

revenue for the state, which is why their conservation was prioritized. A decade later, “Questions started to come up,” Lettman says. “People were asking, ‘Are these policies working?’ There really wasn’t any data that

answered the question of whether land-use planning was working in Oregon.”

In the early 1990s, Lettman, in collaboration with Neil McKay and other researchers with the Forest Inventory and Analysis (FIA) program painstakingly developed a consistent method across the decades for analyzing aerial photographs to quantify the acreages of forest and agriculture land statewide. By linking the photographs to FIA plot data, the team created an on-the-ground view of the landscape; the built structures in the area and their proximity to forest land; and management activities, such as precommercial thinning, harvesting, or site preparation.

“They could actually see houses out in the woods,” says Andy Gray, a research ecologist for the USDA Forest Service Pacific Northwest (PNW) Research Station. “By using photo interpretation over time, they could look at how housing was increasing or not in different parts of the state.”

Lettman, Gray, and others developed and applied a method for running the statewide analyses within a geographic information system (GIS), as described in their 2015 paper, “Land-Use Change and New Houses on Forestland: Contrasting Trends Over 30 Years in Oregon and Washington.” This was a vast technological advance from when Lettman viewed hard-copy photographs and downloaded FIA data on mainframe tapes.

This and subsequent statewide assessments revealed that conversion of forest land was continuing, but it wasn’t the type of development envisioned in the land-use planning legislation.

“While Oregon’s land-use laws have been pretty effective at restricting large-scale urbanization, it has essentially had no effect on the increase of scattered houses in the woods,” says Gray.

Could a scattering of houses on 5-acre parcels contribute to declining commercial timber production? The 1999 report, *The Effects of Population Growth on Timber Management and Inventories in Virginia*, provided a possible answer: Drawing on interviews with foresters about the changes in forest management they were observing, lead author David Wear and his team found that as the density of housing increased, the level of active management and harvesting decreased. Several other subsequent studies came to similar conclusions.

“Any forestry professional interested in the impact of development on forestry, came away with the conclusion that houses lead to reduced commercial forestry,” explains Jeff Kline, a research forester with the PNW Research Station and frequent research collaborator with Gray. “From this came the idea that you had to keep forests working or else there is the likelihood of the land being

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developed. And if you have working forests near houses, it would be less likely to remain a working forest.”

This matched Lettman’s observations, both from the statewide analyses and personal experience.

“Having worked and lived in more rural communities and knowing the economic, social, and environmental importance of keeping forests in forest uses, it sometimes made me sad to see the erosion of prime timberland in Oregon,” he says. “With 60 plus million acres of land in Oregon, we are down to 7 to 8 million acres of highly productive wildland forest zoned and planned for timber management.”

Lettman wanted an Oregon-specific study to determine how housing development factors affected commercial timber management in the state. Again, he reached out to Gray for assistance. Kline, who had an interest in land development and open-space reduction, also joined the project.

What’s Driving Forest Land Loss?

“We looked at some measures of active forest management and then correlated them with site productivity and other factors that we thought might influence the level of management, such as housing density,” Kline explains.

They selected variables that were indicators of extractive management, such as clearcutting or partial cutting, and active management, such as precommercial thinning and site preparation. Tree basal area and road presence also served as indicators of commercial forest management.

KEY FINDINGS

- Development effects on active timber management depend on several factors, including (1) inherent site productivity of forest land and the prevalence of development, (2) the availability of ecosystem services relative to timber, and (3) land-use history.
- In some areas of Oregon and Washington, housing development negatively affected private forestry, whereas other areas remained largely unaffected.
- These inconsistencies stem from biophysical and socioeconomic factors within a given area that influence prevalent development effects and the ease with which the factors can be observed for empirical analysis.
- When analyzing the effects of housing development on commercial timber management, study methods may influence results. “Expert opinion” studies often find greater development effects than studies using actual landowner data. This could be because of potential biases among surveyed experts and the generalized ways that expert opinion surveys described forest management.

The researchers used FIA plot data from Oregon and Washington as well as Oregon land-use data from the Oregon Department of Forestry. “What’s unique to this study is having that photo interpretation dataset around the plots that we had actual management information data on,” Gray says. “We have house counts for each square mile surrounding every FIA plot.”

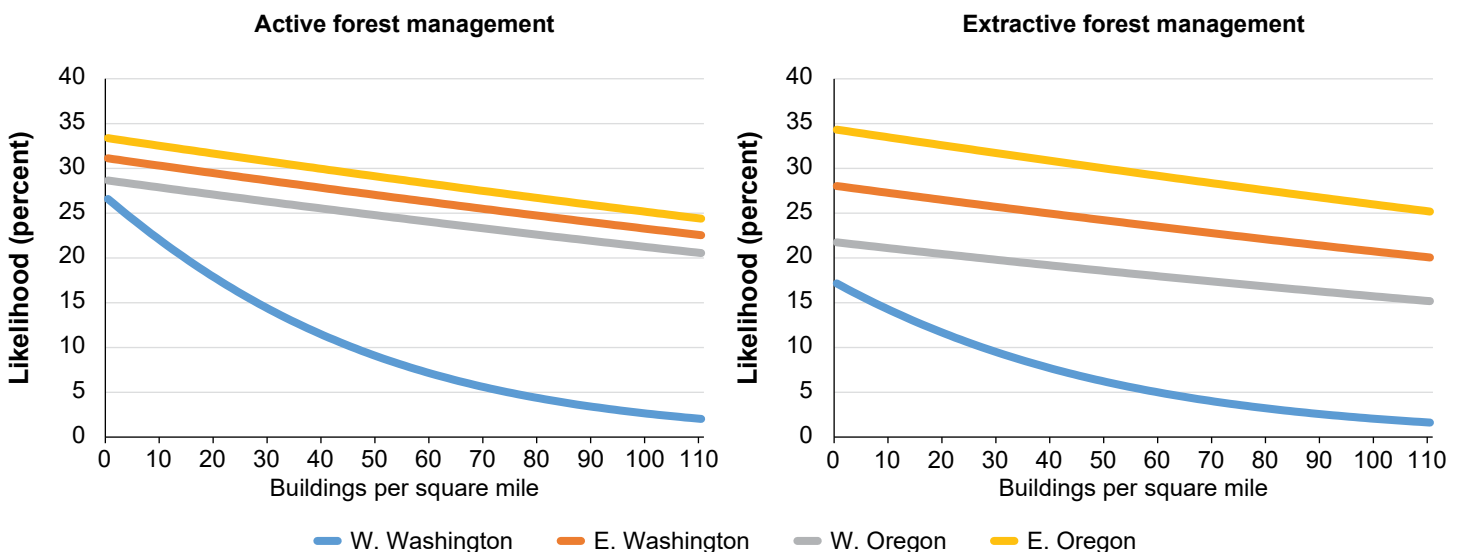
Kline describes another approach that sets this study apart: “Our measurements of management are actual observed harvest and thinning. We’re not relying on expert opinion as is the case with some of those other studies.”

Washington was included to compare the different approaches in statewide land-use planning laws; the state’s legislature passed the Growth Management Act in 1990 and adopted a local government-level approach rather than a state-level approach. The researchers used the time frame 2001 through 2016 because the

FIA plots had been measured twice, once in 2001–2006 and again in 2011–2016. These 15 years also spanned the housing market bubble and subsequent recession.

The modeled output indicated that all the variables significantly affected commercial timber management. Highly productive commercial forest land with road access was more likely to be actively managed for timber production.

Surprisingly, the housing density variable was barely statistically significant statewide. However, there is a caveat to this finding; it was statistically significant for a specific region. In western Washington, housing density did seem to correlate with reduced levels of both extractive and active management, although in eastern Washington and all of Oregon, this effect was less noticeable.



Likelihood for forest management in proximity of development. As the density of buildings increased adjacent to forest land managed for timber production in Oregon and Washington, active management (e.g., thinning, site preparation) and extractive management (e.g., active management and harvesting) declined. This decline was the steepest in western Washington, which has seen significant development in recent decades.

Gray says that he had a similar bias as Lettman regarding development affecting commercial timber management. “Surely there is an effect but to see it only in western Washington was a bit surprising because I was expecting to see something across the board,” he says.

What could explain why western Washington saw development affecting commercial forest management while other regions didn’t, especially since the Growth Management Act was supposed to reduce conversion?

“Oregon has had stronger land-use laws and is also favorable tax-wise for keeping the land in forest uses because of our tax laws on timber harvest,” Lettman explains. It is also possible that certain regions don’t have high site productivity, so commercial forestry management isn’t practiced as intensively.

For Kline, the results validate an earlier study he and David Azuma, a now-retired research forester with the research station, conducted in 2004. In this study conducted in Oregon, they found that the number of houses didn’t seem to affect commercial forest management.

Countering the Narrative

In conjunction with the model analyses, Kline reviewed past studies that examined the correlation between development and commercial timber management. He found seven studies, including Wear’s Virginia study, and two that Kline coauthored. These

LAND MANAGEMENT IMPLICATIONS

- Whether correlations found between housing development and private forestry justify significant public policy concern depends on the biophysical and socioeconomic contexts of changes in different locations.
- Forestry advocates tend to advance forest land protection efforts based on the need to safeguard productive timber-producing private forest land. However, nontimber ecosystem services produced from private forest lands and enjoyed by the public may eventually outweigh timber values as forest lands become increasingly scarce in urbanizing locations.
- Observed shifts in forest landowners’ management objectives from timber production toward protection and enhancement of ecosystem services may better align with shifting public preferences in urbanizing landscapes, which tend to favor aesthetics, recreation, and other nontimber values over continued intensive timber production.

studies used either expert opinion surveys or observed behavior inferred from FIA data regarding landowners’ timber harvest activities and development variables as their datasets. Of these seven studies, four arrived at a general conclusion: Development does affect forest management.

Kline also revisited a line of inquiry regarding Wear’s paper. Fifteen years ago, he reviewed the agricultural censuses data for the Virginia counties studied by Wear and saw that what was forest land in the 1990s had in fact been agricultural land just decades earlier. From this finding, a different story emerged than presented in the paper, Kline says. Instead of a decline in forest land being actively managed,

“It was agriculture land that has grown back into forest and now we don’t know how it’s being managed.”

The literature review revealed a disconnect between the generalization that development affects commercial management and the data. “Context matters,” Kline says. “Site productivity, land-use history, and how fast socioeconomic change is happening—all those things matter in terms of what’s really happening with forest land.”

With both the literature review and model results supporting this new perception, Gray has a succinct answer to their findings: “I guess we just blew a bunch of holes into a simple story.”

Active and extractive forest management is visible on hills behind a house in western Oregon. USDA Forest Service photo by Jeff Kline.





The Changing Purpose of Forest Lands

Discussions that center on development and commercial timber management often have an unspoken, underlying assumption that development results in a decline of timber production from remaining forest land. Yet what if that's not the only outcome? What if landowners are maintaining their forest land but shifting their management objectives from focusing solely on timber harvests to providing a broader suite of, ecosystem services, such as drinking water, outdoor recreation, or carbon sequestration?

"We're learning a little more of the process by which, as places become urbanized, public values eventually shift to focus more on nontimber forest amenities," Kline says. "We also know that landowners change their management as their forest parcels get smaller."

This could mean expanding the definition of a "working" forest. Even if forests are not being actively managed for timber, they can still provide benefits to the landowner and

surrounding community. The benefits may include wildlife habitat, aesthetics, recreation, and many other ecosystem services that society values and needs.

However, a line of research that Lettman sees needing to be explored further is whether a forest adjacent to development can still provide the same level of benefits as actively managed forests farther away from urban centers. "We know that forest land developed to urban or low-density residential lands affects wildlife corridors," he says. "What we don't know is the effects that development has on values such as wildlife habitat, water quality, and viewsheds."

"No house should ever be on any hill or on anything. It should be of the hill, belonging to it, so hill and house could live together each the happier for the other."

—Frank Lloyd Wright, American architect

For Further Reading

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