Remember Redcedar! An Overlooked Species Reveals Its Potential

“Oh, the cedar tree! If mankind in his infancy had prayed for the perfect substance for all materials and aesthetic needs, an indulgent god could have provided nothing better.”
—Bill Reid

Western redcedar (Thuja plicata) is one of the more easily recognized trees growing in Pacific Northwest forests. Look for a tree with reddish fibrous bark and lacy foliage of small, interlocking, scale-like leaves. Indigenous people along the Pacific Coast called cedar the “Tree of Life,” valuing its beauty, versatility, and durability. Northwest tribes used it for their homes, canoes, baskets, and other daily necessities. Redcedar’s straight wood grain and resistance to rot also have made its wood commercially valuable. Yet, as Don Minore, an ecologist with the Pacific Northwest (PNW) Research Station, observed in 1983, “Much less time, money, and effort have been invested in learning how to grow the species than in studying its products.”

When Connie Harrington, a research forester, moved from the East Coast to the Pacific Northwest more than 30 years ago, she was surprised to find that although old-growth redcedar was considered very valuable and

Until recently, little was known about how young western redcedar would respond to management. A series of studies, some initiated 30 years ago, have found that the species responds well to thinning and fertilization. Above, an old-growth western redcedar in Olympic National Park, Washington.

IN SUMMARY
People have long valued mature western redcedar for its strong, lightweight wood that is rot-resistant. The species has cultural importance for Northwest tribes who use the tree’s bark and roots as well as the wood.

Redcedar is very shade-tolerant and is often found in the understory and midstory of Pacific Northwest forests. It is also very adaptable and can grow on a wide range of site conditions in both single- and mixed-species stands. In contrast to Douglas-fir, the subject of countless studies related to its growth potential and response to management in the region, very little has been reported for redcedar.

A series of studies conducted over 30 years on the responses of young-growth redcedar to a wide range of stand, site, and management conditions has led researchers with the Pacific Northwest Research Station to conclude that redcedar is very responsive to management. For example, the species responded well to both thinning and fertilization on a nutrient-poor site, it didn’t experience thinning shock when released from overtopping competition, and in a range-wide analysis, its growth rates held up better under competition than Douglas-fir. These findings are helping land managers evaluate opportunities for growing redcedar to meet multiple economic and ecological objectives.
was being rapidly harvested, the species was treated as a nonrenewable resource. No system was in place to manage young-growth stands of redcedar. As Harrington dug deeper to determine why redcedar was being neglected, she learned that after old-growth trees were no longer available, researchers and forest managers devoted most of their energy to developing management guidelines in young-growth stands for the most common species, such as Douglas-fir and ponderosa pine.

“Managers thought only old-growth redcedar had value, which was basically true when substantial inventories of old-growth were still available for cutting. But the value of logs from young-growth stands has increased substantially, and redcedar is one of the most valuable species we can grow on many sites,” Harrington notes.

“Another misperception was that red cedar was a very slow-growing species,” she continues. “I think this perception developed because the species sometimes grows in conditions where growth rates are very low, such as on nutrient-poor sites or in deep shade. Also, deer and elk browse young redcedars, which makes it particularly difficult to regenerate. So you have both misperceptions and challenges. For me, redcedar was a species that was ripe for research to see how it would respond to management practices that favor it in young-growth stands.”

EXPLORING REDCEDAR’S RESPONSE TO MANAGEMENT

Over the past three decades, Harrington has undertaken a series of long-term studies with fellow foresters from the PNW Research Station, focusing on how redcedar responds to different management scenarios. Recognizing the unique opportunity to learn more about the species, private landowners and forest management agencies have provided land and other support for this research.

In one study, research foresters Harrington and Warren Devine examined how redcedar responded to a variety of thinning and fertilization treatments over 25 years. When Harrington initiated the study in 1980, she established control plots with no treatment, and plots with thinning only, fertilization without thinning, and thinning and several types of fertilizer applications.

Harry Bell, who was then manager of ITT Rayonier’s silviculture research program, provided land for the research and coordinated the management activities needed to implement the thinning and fertilization. Bell recalls, “We were thinking of planting cedar but had no knowledge about how to manage it in an intensive forestry context—how to thin it or whether it responds to fertilizer. We had lots of unanswered questions, so we did the project.”

Devine and Harrington divided their analysis into two segments: Devine examined the taper, height, and diameter measurements of the 250 largest “crop” trees per hectare, and Harrington looked at the data for all of the trees, which included many new young hemlock and redcedar ingrowth developing in the stand. “The major strength of this study was that Connie had the foresight to establish it in 1980, and she included quite a few treatment options,” notes Devine, “So we have the advantage of long-term data on this species for which there’s very little information.”

Another study led by Leslie Brodie, a forester with the PNW Research Station, focused on
how redcedar responds to being released from shade to sunlight, and whether fertilization enhances its response. Brodie observes, “There’s an anecdotal belief among foresters that redcedar doesn’t respond well to thinning and experiences shock when released from competition from trees that overtopped it or whose crowns were overlapping. We suspected that wasn’t the case.”

On the study site, managed by the Washington Department of Natural Resources (DNR), root disease was killing the Douglas-fir in a mixed-species stand, but the redcedar was much more tolerant of the disease. The Washington DNR was interested in creating more variation in the future stand, so it removed the Douglas-fir and left the redcedar. The research team selected 74 redcedar trees in a range of sizes, canopy positions, and light conditions. “Some were out in the open after the logging, and others were still under the stand,” Brodie explains. “We applied fertilizer to half of the study trees, and I analyzed several different competition indices to see which had the best statistical ability to predict the response to release.”

In a much broader study, PNW research forester Peter Gould took the lead in assembling and analyzing a redcedar database covering 50,000 trees on more than 3,000 plots in Oregon, Washington, Idaho, Montana, and British Columbia. These trees had been measured at least twice, and in some cases had been remeasured repeatedly over several decades. The research team analyzed growth rates for redcedar under a range of conditions, including tree age, competition, site quality, and type of management. Data came from the above two studies and from the U.S. Forest Service and the British Columbia Ministry of Forests. “Some of the plots were established more than 70 years ago,” says Gould. “We often just look at short, 5-year segments. Having data where trees were measured over long periods is very valuable.”

One objective of the range-wide growth study was to improve the estimate for maximum stand density index for redcedar. “Basically, the maximum stand density index is a measure of tolerance to crowding and represents the trade-off between tree size and the number of trees,” explains Harrington. “Trees that are more shade-tolerant tend to have higher maximum stand density index values. If you haven’t accurately determined this index, your growth projections will be less accurate, and you’ll make management decisions based on flawed information. If the trees are spaced too widely, they’ll have large branches, which create large knots and reduce their value. But if the spacing is too narrow, the trees will grow very slowly.”

The PNW scientists weren’t alone in their quest to better understand redcedar. In 2010, Harrington worked with others in British Columbia and Alaska to organize an international symposium on western redcedar and yellow-cedar in Victoria, British Columbia. People from federal, state, and provincial agencies, tribes, universities, the forest industry, and consulting firms attended. She recalls, “Several of us thought that rather than having researchers publish their results individually and talk to just a few people, the symposium would create some synergy by getting both researchers and managers together, to talk about a whole range of topics. I think both the symposium and the resulting proceedings raised awareness about cedar and its ecology and how it can be managed.”
Tree growth on nutrient-poor soil sites can be increased substantially by thinning and fertilization. These results are based on the 250 largest trees per hectare (100 per acre) measured over 25 years.
BRIDGING ECONOMIC AND ECOLOGICAL OBJECTIVES

As a result of this research and its projections of growth under different densities, industry managers are thinning more redcedar stands than previously. “When we initiated the study years ago, there was no market for redcedar. We were doing the research just to gain an understanding of how to optimally grow trees,” recalls Harry Bell, who is currently the chief forester with Green Crow. “Now that young-growth cedar has a high market value, we have more incentive to thin and fertilize, and we have the research that confirms we can get a good return on our investment with these treatments.”

Public forest management agencies are also finding this research useful, according to Florian Deisenhofer, who is a silviculturist for the Washington DNR’s Pacific Cascade Region. “Pacific Cascade Region manages about 500,000 acres of state land,” he explains. “Some of them are reserves, some are multilayered late-successional forests managed for northern spotted owl habitat, and some are used for variable retention harvesting. Cedar is a highly valuable species, but it’s very difficult and expensive to regenerate because of the browsing problem. Typically, 10 to 15 years ago, if you had some understory saplings or midstory trees that had no merchantable value at the time of the harvest, they probably would have been cut down.”

Deisenhofer continues, “In forestry, everything takes so long, that sometimes it’s difficult to know if an approach is working as well as we think it is. Leslie’s and Connie’s research shows that redcedar responds very well to release, as long as the logging damage is minimized. We have many stands with 30- to 50-foot-tall redcedar ready to be released. These trees are hanging out in the midstory, waiting for an opportunity to start growing. This research helps me persuade managers that we need to do more of this type of release-and-retain management. Because the research was conducted on DNR property, the results are that much more convincing. I can say here’s what they found, it works, and it’s even on DNR land.”

With this information, managers can decide where and how to manage stands to meet multiple objectives, such as creating multilayered tree canopies for wildlife habitat and enhancing redcedar’s market value for timber production.

Says Gould, “There are often tradeoffs between managing for ecological values or timber values, but they’re not mutually exclusive. Redcedar might be a good bridge between the two objectives. Managers can create multistory stands with Douglas-fir in the overstory and redcedar in the understory and midstory and still get a fairly decent growth rate out of the redcedar. Most of the redcedars out on the landscape are there because they naturally regenerated. Letting nature take its course may be fine. But when you can help it out, why not plant and manage for the species, rather than just rely on the luck of the draw?”

FOR FURTHER READING


WRITE’S PROFILE

Joan O’Callaghan writes and edits publications about a variety of issues, including environmental protection, resource conservation, and energy efficiency. Her company, Communications Collective, is based in Bethesda, Maryland.
SCIENISTS PROFILES

LESLIE BRODIE is a forester with the Pacific Northwest Research Station’s Genetic and Silvicultural Foundations for Management team. She is working with Connie Harrington on a wide range of research questions related to plant growth and management. She received her M.S. in forestry and its relation to land use from Oxford University.

CONNIE HARRINGTON is a research forester with the Pacific Northwest Research Station’s Genetic and Silvicultural Foundations for Management team. She works on a wide range of research questions related to plant growth and management. Harrington received her Ph.D. in plant and soil science from the University of Tennessee.

PETER GOULD is a research forester with the Pacific Northwest Research Station, working on topics related to forest productivity and growth models. He received his Ph.D. in silviculture from Penn State University with a focus on modeling forest regeneration.

WARREN DEVINE is a biological scientist working under contract for the Olympic National Forest on a project that addresses the potential effects of climate change on forest trees. He received his Ph.D. in plant and soil science from the University of Tennessee.

Harrington, Brodie, and Gould can be reached at:

USDA Forest Service
Pacific Northwest Research Station
3265 93rd Avenue, SW
Olympia, WA 98512-9193

Harrington:
Phone: (360) 753-7670
E-mail: charrington@fs.fed.us

Brodie:
Phone: (360) 753-7681
E-mail: lbrodie@fs.fed.us

Gould:
Phone: (360) 753-7677
E-mail: pgould@fs.fed.us

Devine can be reached at:
Olympic National Forest
1835 Black Lake Boulevard, SW, Suite A
Olympia, WA 98512
E-mail: wdevine27@yahoo.com

COLLABORATORS

Harry Bell, Green Crow (previously ITT Rayonier)

British Columbia Ministry of Forests

Jeff DeBell and Florian Deisenhofer,
Washington Department of Natural Resources

University of Victoria

U.S. Forest Service
Forest Inventory and Analysis Program

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