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Science

F I N D I N G S

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“Science affects the way we think together.”

Lewis Thomas

DEVELOPING NEW SILVICULTURAL REGIMES: THE EYES HAVE IT



Credit: Dean DeBell

A Clearcuts in full view of well-traveled highways or located close to residential areas frequently bring conflict and complaint or litigation to forest owners regardless of how carefully planned and executed.

“Of all the non-timber values, forest aesthetics is the most visible, and when ignored, can cause the most negative reaction.”

Geoffrey T. Jones, *Journal of Forestry*, 1995

The thing about the mountainous topography of forests in the Pacific Northwest is that everyone can see what you're doing. And they can see it from a long way away. Put a clearcut on a hillside that faces a freeway and you have a fuss. Put it in the high-relief viewshed of an urban area and you have a furor.

“The Puget Sound area has seen a massive boom in population in the last 25 years, placing more and more land in the visually

sensitive suburban-forest interface,” says Dean DeBell. “Concerns about aesthetics after clearcut harvesting rank higher than concerns about most other forestry matters. And aesthetic dislike of clearcutting also can predispose people to accept other anteforestry allegations that may or may not have any factual basis.”

Already this conflict over clearcutting has shown all the signs of becoming an intractable problem, from minor protests to major court cases. But behind the conflicts, two realities of forestry today drive the issue of “visually sensitive” areas into new realms of complexity. One is specific to management, the other to research.

To take a Puget Sound example, the Washington Department of Natural Resources (DNR) is one of the largest forestry organizations in the Pacific

I N S U M M A R Y

What are the best alternatives for easing conflict among aesthetics, economic values, and sustained wood production of responsible timber harvesting? How can forest managers craft options across a landscape for a mix of values and forest conditions? In part, with an understanding of the interactions of sustained timber production, wildlife habitat, and aesthetics.

This issue of Science Findings examines a joint research project being conducted by the PNW Research Station and the Washington Department of Natural Resources on highly productive, predominate Douglas-fir land in the 90,000-acre Capitol Forest near Olympia, Washington.

Scientists developed six biologically and operationally reasonable options to study: clearcut, extended rotation without thinning, retained overstory, small patch cutting, group selection, and extended rotation with commercial thinning. One key finding to emerge early from the study is that foresters, environmentalists, tree farmers, and nonforestry undergraduate students view the aesthetics of many silvicultural practices similarly. The differences of opinion among these groups are mostly in the degree to which they like or dislike a particular practice.

Northwest, managing over 2 million acres of forest land, much of it in full view of millions of people. By law, the DNR must manage its forest lands to generate income in perpetuity for its trust beneficiaries, which include educational and other state and county institutions. This means balancing financial tradeoffs, long-term productivity, and citizen support. Giving up timber harvest and the revenue it generates is not an option. Neither is consistently angering the public. Private companies face similar conflicts between the desires of their shareholders and the state of their public image.

Although it might seem that the solution would therefore lie with abandoning clearcutting as a harvest practice, the associated research problem immediately gets in the way: there is little solid research information available to guide the way.

"Public and private forest owners are trying to satisfy various combinations of owner

KEY FINDINGS

- Sociological work to date indicates that foresters, environmentalists, tree farmers, and nonforestry undergraduate students view aesthetics of various silvicultural practices similarly; differences among these groups are mostly found in the degree to which they like or dislike a particular practice.

- Data on differences among five managed regimes in person-days and thus estimated costs for preparation of timber sale and administration of harvest contract suggest that costs per 1,000 board feet for these activities differed considerably between the regimes, but these differences were relatively minor in comparison with either harvesting costs or sale revenues.

- Most alternatives to clearcut harvesting increase shading and competition both of which reduce growth of younger stand components. Results from a short-term study suggest that gains from planting genetically selected stock may offset such growth losses.

objectives, societal expectations, and regulatory requirements," says DeBell. "But in most instances, there is no opportunity to determine what is gained or lost in comparison with conventional clearcutting-

a long accepted practice—or even whether the desired objectives are attained."

DeBell is silviculture team leader with the PNW Research Station in Olympia.

REFINING THE CURRENT VIEW

For most of the past 40 years, DeBell says, the focus of silviculture research has been largely on even-age management, with clearcutting and planting as the regeneration system. In other words, on fine-tuning the current system. The history of forest management in the United States is replete with the tendency to take one system and focus only on its refinement until forced to take another direction by social or economic circumstances, such as the current backlash against clearcutting.

Fifty years ago, former Station Director Thornton T. Munger wrote that "Silviculture is an art that should base its practices on the proven findings of many sciences. It should not be swayed by considerations of passing expediency or popular appeal." And 20 years later, Yale silviculture professor David Smith weighed in. "The history of silviculture in this country is long enough to reveal that there has been too much tendency for methods of cutting to vacillate

between extremes that are partly fads and partly reactions to problems of a temporary nature." It seems we have been here before. Practices other than clearcutting might have evolved over the last century if historical circumstances had been different. An attempt to introduce a form of selective timber harvest in the 1930s was abandoned as a failure. But the "failed" experiment had been applied to low-vigor, old-growth stands under depression-era economic circumstances, which forced removal of the best trees and precluded the small patch cuttings needed to create conditions for regeneration of Douglas-fir.

Robert Curtis, recently retired mensurationist from the PNW Station, writes: "An unfortunate result of this episode was the abandonment of efforts to develop alternative silvicultural systems. There is a great and continuing need for systematic long-term trials of alternative silvicultural regimes over a range of sites and geography, designed so that they can provide

statistically reliable comparisons of economic and environmental gains and costs."

DeBell and Curtis concur that the failure of the 1930s experience with an alternative system may have contributed to the view that clearcutting is the only system suitable

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for Douglas-fir, and thus to today's significant dearth of research data about alternative harvest approaches.

"What has been loud and clear in the writings through the last century is that there isn't a one-size-fits-all harvest regime for the Douglas-fir region," says DeBell, "and yet on the ground that's what we've been doing. The 'toolbox' for meeting our needs out of the forest is much larger than we think." There are choices. We just have to work to develop them.



MANAGEMENT IMPLICATIONS



- Many silvicultural practices and management approaches are biologically reasonable and operationally feasible in forests of the Douglas-fir region. There are substantial differences among them with regard to visual appearance, probable levels of sustained timber productivity, economic effectiveness, and the nature and levels of other nontimber values.
- Stand visualization systems of various kinds can be used to foster understanding of stand dynamics through time, and to suggest how this and adjacent landscape features affect visual quality and public perceptions of management activities.
- The feasibility and general attractiveness of two-aged and multiage management regimes may be enhanced when associated thinnings and extended rotation lengths also increase wood yields.

CONSIDERING DESIGN OF THE FUTURE

We know how to grow trees. The practice of silviculture over the last half century has honed our skills at producing wood successfully on many types of terrain in varying climates. We know how to clearcut, with various systems of cutting, yarding, and road building. We know how to regenerate different species of trees after clearcutting, particularly Douglas-fir, which do best out of the shade of competing species. But in terms of detailed data, it tails off rapidly after that. What are the best options for easing conflicts between aesthetic values and the economic returns and sustained wood production of responsible timber harvesting? At what scale are various alternative treatments operationally realistic? In other words, how do costs of sale planning, layout, and administration compare? What is the public response to visual quality?

Concerns about the suburban-forest interface and its "visual sensitivity" have found expression in a joint project between the DNR and the PNW Research Station on Capitol Forest, 90,000 acres of highly productive, predominantly Douglas-fir land adjacent to the Olympia Forestry Sciences Laboratory.

The Capitol Forest contains and abuts many scenic areas and is adjoined by many residences. Portions of the forest are visible from major travel routes. In addition, much of the forest is surrounded by industrial lands where extensive recent cutting indirectly limits DNR options in many view-

sheds, even though most stands are 60 to 70 years old and would normally be considered ready for regeneration harvest.

"Increasingly, we have had to balance the legal need to manage our lands for income against the need to operate within the good faith boundaries of our neighbors," says Jeff DeBell, former timber harvest manager for the Capitol Forest, and now DNR resource scientist. "Most of what we know is based on the single system of clearcutting, and although we have been trying some different things around the forest, what we really need are clear evaluations of different systems."

Six silvicultural options have been selected for comparison, each option imposed on areas from 35 to 80 acres. Each will be replicated three times on the forest.

"We believe all options are biologically and operationally reasonable," he says. "We expect differences among them in public response as well as economic and crop productivity, but none would be ruled out at current stumpage prices. The study has rapidly given us figures on layout and harvesting costs in comparable areas, but many of the most important answers won't come for some years, like regeneration and wildlife issues."

The six options applied include a clearcut—the conventional, well-understood, even-aged system, which provides a quantitative comparison with other treatments of both wood and nontimber values. There is also an

extended rotation without thinning—a "no-harvest" option that defers management of any kind, thus providing an experimental control as well as a possible short-term option for some management situations.

Between these two ends of the spectrum lie three regeneration alternatives that provide two-aged and multiage forests. A uniform retention option initiates a two-aged system that leaves about 15 trees per acre in the overstory, which would be retained through the next harvest, providing large trees and high-quality wood. A small patch cutting regime would allow regeneration in patches of 1.5 to 5 acres with surrounding areas thinned as needed. Twenty percent of the total stand will be regenerated at 15-year intervals, resulting in five age classes over a 75-year period. Group selection provides an uneven-aged system in which trees are cut in groups occupying less than 1.5 acres. Regeneration harvest to produce gaps will occur at 15-year intervals, and surrounding areas will be thinned as needed.

The sixth alternative is an extended rotation with commercial thinning. Repeated thinnings will be needed to maintain high growth rates for extended periods. Regeneration harvest will be deferred. An understory of tolerant species will develop under this system. This alternative provides a contrast for the extended rotation without thinning.

WRITER'S PROFILE

Sally Duncan is a science communications planner and writer specializing in forest resource issues. She lives in Corvallis, Oregon.

TRACKING VALUES THROUGH TIME

The value of a study such as this, according to Dean DeBell, depends heavily on its survival over time. “Long-term continuity was deliberately built into the study, in order to grasp the sustainability issues through time, and to pull new people in as it developed. We designed it to have minimal essential expenses to reduce the risk that it might be dropped because of a downturn in political interest or a passing low in funding,” he says. The specter of abandoned and poorly evaluated experiments has left its mark on this study.

Permanent plots have been established to assess damage, survival, growth, and development of residual stand components and regeneration. An associated study will

compare the growth and productivity of genetically selected stock with standard planting stock in some of the harvest options. Results from a previous study by Station geneticist Brad St. Clair already suggest that gains from planting selected stock may offset growth losses caused by increased shading on some of the alternatives.

The DNR foresters are also closely tracking economic factors. “We are evaluating planning, sale preparation, and administration costs by harvest option,” says Jeff DeBell. “Data on quantity and grade of products removed, production rates, and costs of harvest have been collected, and will be

used with other data as part of an overall economic assessment.”

So far, data on differences among the five managed regimes in person-days for sale preparation and harvest administration indicated significant differences in costs per thousand board feet. But the differences became relatively minor when compared with either harvesting costs or sale revenues.

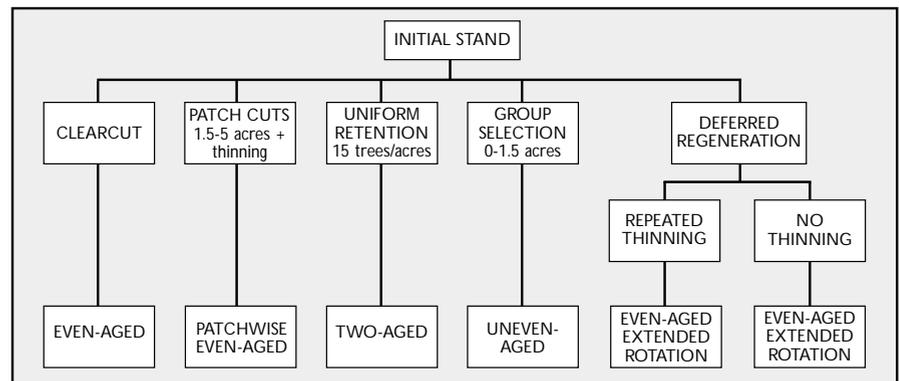
Other values under study include wildlife habitat, with songbird surveys and inventory of both current and potential wildlife trees, as well as soil disturbance and timber productivity. And, of course, the principal driver of the project: visual appearance.

HOW DOES IT LOOK?

We needed an approach to evaluate public response that would be transferable to other situations,” says Jeff DeBell. “Reactions of people to harvesting are influenced by personal factors and on-site matters such as post-harvest appearance, changes over time, and surrounding conditions, including the nature and extent of harvesting on the landscape.”

In assessing people’s reactions to different treatments, researchers have a choice between reality and simulation. Over time, the study will use both approaches, but in the early stage, sociological research is focussing on actual appearance and response of the landscape, rather than computer modeling, according to Gordon Bradley, land use planning specialist with the College of Forest Resources at the University of Washington. Bradley has coordinated the visual preferences component of the project. Pretreatment investigations with selected groups including tree farmers, foresters, environmentalists, and University of Washington nonforestry undergraduates, began to delineate some of the potential responses.

“In these groupings, as in more recent ones, the differences were mostly in the degree to which they like or dislike a particular scene,” Bradley says. “In general, we found that environmentalists’ impressions, whether favorable or unfavorable, tended to be much stronger than those of either foresters or tree farmers. Opinions of undergraduate students tended to be closer to those of the environmentalists



▲ The alternative silvicultural regimes selected for the Capitol Forest study are expected to produce markedly different stand conditions over time.

than to those of the foresters and tree farmers.”

Clearly, people’s opinions of how a particular harvest system looks are affected by many variables, and researchers intend to investigate these during the study. But for initial data, an “uncontaminated” questionnaire was used, Bradley explains, in which people saw only photos of the different systems, with no explanatory notes about futures or costs.

“We show people 5 or 6 slides of various landscapes to sensitize them, then 35 slides of the actual prescriptions in the study, randomly assigned and mixed, and track their perceptions,” he says. “Another set of 10 slides is then presented so that people can jot down why they have the preferences they do, such as noting that a landscape appeals because it’s green, or doesn’t because it’s messy.”

Predictably, the clearcut is usually seen as the “worst” and the noharvest as the “best” to almost all viewers. The gradations come within. “Those more involved with the utilitarian aspects of forestry are not as bothered by the more managed scenes, compared with those who use forests recreationally,” explains Bradley. “Clearly, background, education, and training come into play. We want to know what shapes these individual preferences and why, where do the differences occur and why, how much does rural-urban or environmentalist-industrial forester background matter?”

Followup work will involve “intervention,” in which people will be given additional information about costs, different timber and nontimber values, and asked about their reactions with this broader information in mind.

BUT HOW WILL IT LOOK?

The greatest challenge, of course, and the bane of every forestry operation, is conveying what a landscape will look like over time. "Most people are accustomed to short planning horizons. They make 5- and 10-year plans but don't think in terms of 80-year rotations," says Jeff DeBell. "I like to suggest that what we're seeing now is like one frame in a movie, and our interest should be in what the whole movie looks like."

Bradley's part of the study will probably manipulate some distance photos of the experimental plots to show what a particu-

lar harvest treatment would look like across the larger landscape.

His group plans to disseminate its images and results as widely as possible, using them in workshops, courses, and publications. The group believes that the more people can grasp the concept of forest dynamics, of change over time, the more thoughtful might be the response to immediate postharvest appearance.

Meanwhile, technology is driving an associated effort to help people "see" the future of the landscape. Recently, researchers at

the PNW Station's Seattle Lab developed software to provide images of stands and landscapes from topographic and stand inventory data.

"This visualization software has been linked with existing growth models to provide approximations of stand development over time," explains Dean DeBell. "The software continues to be refined, both for general use and specific application to this project. We believe the technology—even in its present state—is valuable for demonstration and public interaction."

CRAFTING MULTIPLE FUTURES

If there's one thing we really need to achieve, it's to reinforce the idea that there is no one best approach or option to multipurpose forest management," says Dean DeBell. "The initial emphasis of this project on visual characteristics should help foster a broad outlook. It seems obvious that even for visual objectives alone, approaches must differ greatly in various situations."

Near-term benefits include the experience already gained in adaptive management; in other words, developing and implementing a design that will provide useful information for modifying harvesting practices in the future.

The study area has already become an extremely valuable demonstration site, Jeff DeBell says. "Our upper managers are aware that public perception will become

more, not less, important, and it's much easier to discuss silvicultural options on the ground than in a meeting room. The more we can show, the better, because otherwise people make their decisions based on soundbites and quick impressions."

This kind of study also contributes to better understanding of whole-landscape management, Dean DeBell adds. "To provide the mix of values and stand conditions desired by society, we need some land dedicated to intensive fiber production, some set aside for unique uses such as wilderness, and the greatest quantity to provide various uses. It's that latter category that this study is striving hardest to address."

"A culture is no better than its woods."

W. H. Auden 1907-73

FOR FURTHER READING

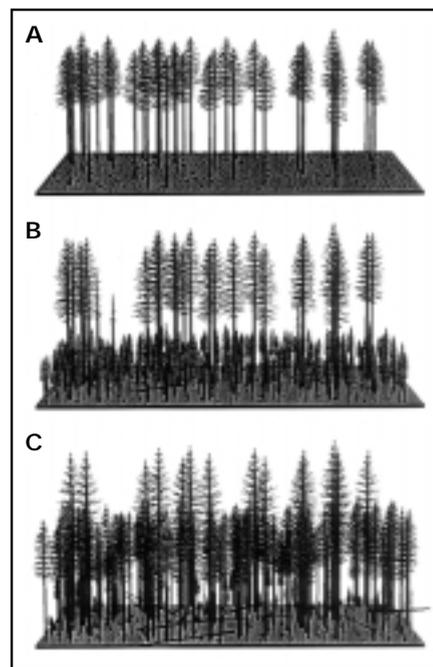
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▲ Projected appearance of the two-aged regime at time from initial cut of (A) 1 year, (B) 30 years, and (C) 75 years. Simulations depicted with the stand visualization system.

Credit: Bob McCaughey

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