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Chapter 13

Applied Concepts of Ecosystem Management: Developing Guidelines for Coarse, Woody Debris

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ABSTRACT

Coarse, woody debris (harvest residues and standing dead or unmerchantable trees) is an important component of forest ecosystems. The Blue River Ranger District seeks to perpetuate this component over time in harvest areas by reducing cleanup of residues to ensure adequate supplies of soil organic matter and leaving more standing trees to ensure wildlife habitat. The District has developed guidelines that not only deal with the technical aspects (what kind, how much) to manage for, but also address how to deal with key people to ensure that the guidelines are met.

INTRODUCTION

Recently, there has been increased interest in ecosystem management—the concept of managing forests with consideration for all parts of the ecosystem. In order to address the concepts of ecosystem management, the Blue River Ranger District, Willamette National Forest, has, in concert with researchers on the H. J. Andrews Experimental Forest (located on the Blue River District), developed several management techniques that are implemented when timber is logged for sale on the District. This chapter describes how the Blue River Ranger District manages the coarse, woody debris—both downed harvest residues (slash) and standing dead or unmerchantable trees—after harvest.

MANAGING FOR RESIDUES

The work with ecosystem management/long-term site productivity on the Blue River Ranger District began several years ago when our staff realized that harvest units were ending up too "clean" after YUM (yarding of unmerchantable material) yarding. Our concern was heightened when we realized that much of the harvest residue being yarded to the landing was not utilizable in any way—it was just too rotten. To address the situation, we convened a task force composed of researchers, resource specialists, and technical experts from Oregon State University, the Pacific Northwest Research Station, the Willamette National Forest Supervisor's Office, and the Blue River Ranger District. The objective of the task force was to determine the level (by amount and size class) of slash that *should be left* on site following harvest to ensure adequate supplies of soil organic matter in future. We felt it was important to look at slash from this perspective rather than from the traditional perspective of how much to remove.

The result of the task force's effort is the Blue River Residue Guideline (Fig. 13.1), which has several important features. First, the Guideline uses common terminology and graphics to enhance understanding. Second, the Guideline calls for a "target" weight per hectare rather than a maximum weight per hectare because we consider the weight per hectare to be just that—a target, as much a minimum as a maximum. Third, for residue larger than 20.1 in. (51.1 cm), the Guideline deals in number of logs rather than weight per hectare because weight per hectare is not a good measure of impacts to the two common areas of concern in Douglas-fir [*Pseudotsuga menziesii* (Mirb.) Franco] forests—fire intensity and planting barriers—for larger residue. As an example, 15 logs 24 in. × 20 ft. (61 cm × 6.1 m) weigh 14 tons (31 Mg) whereas 15 logs 48 in. × 20 ft. (1.2 × 6.1 m) weigh 54 tons (119 Mg) (Table 13.1). While this is a dramatic difference in weight per hectare, there would be little difference in the effect on fire intensity and reforestation because the total area actually covered is virtually the same in both cases. One caveat concerning the Blue River Residue Guideline: it is not the actual numbers in the Guideline that are important, but rather the process used in developing the Guideline. The numbers themselves were developed for the Blue River District and may not apply to other areas.

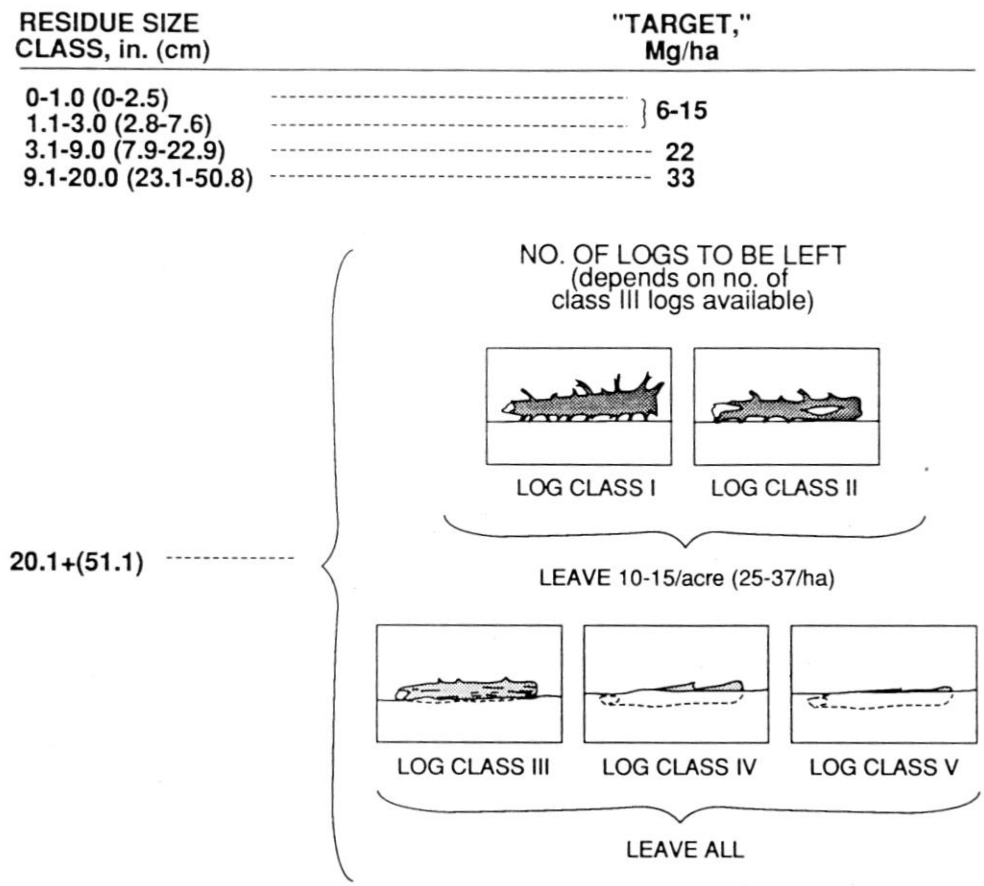

FIG. 13.1. Blue River Residue Guideline.

TABLE 13.1. Weight of 15 Douglas-fir logs [12% moisture content, 30 lb/ft.^{3} (480 kg/m^3) density].

Small-end log diameter, in. (cm)	*Log length, ft. (m)*		
	20 (6.1)	*32 (9.8)*	*48 (14.6)*
	tons (Mg)		
12 (30.5)	3 (7)	5 (11)	6 (13)
24 (60.9)	14 (31)	21 (46)	27 (60)
36 (91.4)	30 (66)	46 (101)	64 (141)
48 (121.9)	54 (119)	84 (185)	120 (265)
60 (152.4)	87 (192)	132 (291)	192 (423)

Implementation of Guidelines

Our work really had just begun when the Residue Guideline was completed—because the key step is getting results on the ground. To do that effectively, our fire management and sale administration sections developed a process to address the various situations that would be encountered (Fig. 13.2). Implementation is very simple for new timber sales—just build the Guideline into the sale prescription and reflect the Guideline in the contract and appraisal. But new sales were not our biggest concern because they are so easy to handle. We have about 3 years of existing sales under contract at any given time, and it was these existing sales for which the implementation strategy was primarily developed.

To start with, existing sales were each assessed on the ground in terms of volume per hectare, defect levels, and other variables that affect residue amounts following logging. After each sale was assessed, the decision was

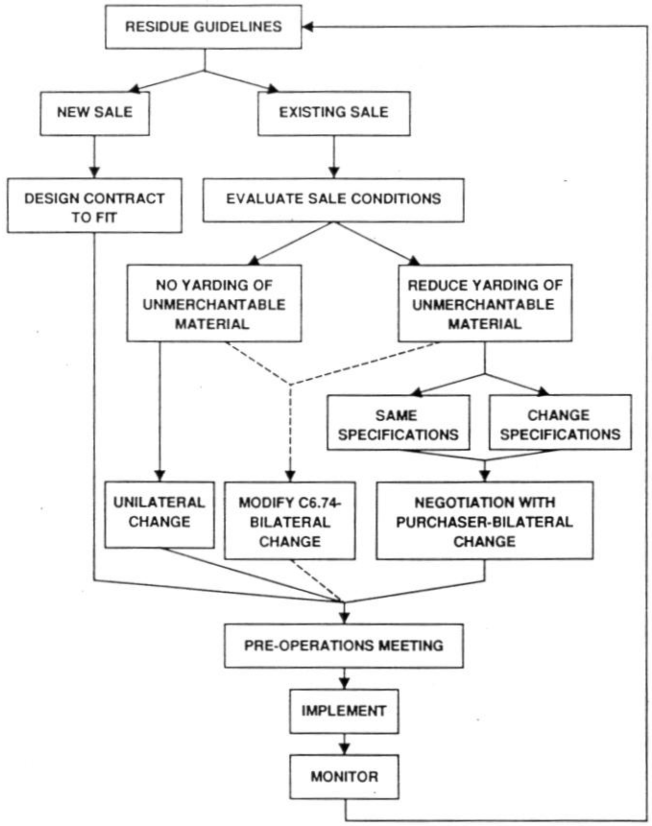

FIG. 13.2. Process for implementing the Blue River Residue Guideline.

made to either eliminate YUM yarding or just reduce it in some way. If YUM yarding was to be eliminated, we simply notified the purchaser and completed a unilateral (the purchaser did not have to agree) contract change. If YUM yarding was to be reduced, we either changed the YUM size specifications (size of the material to be yarded) or retained the same specifications and reduced the amount to be yarded. Both of these strategies required working with the purchasers to complete a bilateral (both parties agreeing) contract change. Concurrently, we worked with purchasers to modify contract clause C6.74 to require logs to be left in the harvest units because a good wood chip market can encourage purchasers to yard residues (unless there is a contractual constraint against doing so).

Once contracts are settled for both new and existing sales, we focus on a key step—the sale pre-operations meeting. Having well-thought-out guidelines or implementation processes, or even good contracts, does not ensure success: you must also spend time explaining your objectives to the people out on the ground doing the work. In most cases, this means not only the timber sale operator but also some of the operator's employees. This explanation is especially important because we have for years been exhorting these people to "be sure not to miss any of those YUM logs."

Our intent now is to monitor the results of implementing our Residue Guideline to see if any changes are warranted and, if so, what those changes should be. We intend the Guideline to be a dynamic product that is fine tuned as needed.

MANAGING FOR WILDLIFE TREES

Completion of the Residue Guideline left us feeling good about the log component of coarse, woody debris but we realized that we needed to improve our management of the other key component of coarse, woody debris—wildlife trees. We were particularly interested in perpetuating the availability of wildlife trees into future rotations. We began by using chapter 7 of *Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington* (Neitro et al. 1985) as a reference for doing some basic modelling of wildlife-tree management alternatives.

Some basic assumptions guided our modelling. The first was an assumption about the "residence time" (expected life) of the various stages of wildlife trees (Fig.13.3). The second was an assumption about the minimum habitat requirements of the five primary cavity nesters of the Douglas-fir Region at the 40% biological potential level—that is, the habitat needed to support at least 40% of the maximum potential populations of these cavity-nesting species (Fig. 13.4). The minimum needs, when all tree size classes are added together, total about 250 trees/100 ha, or about 2.5 trees/ha. (Remember, this is the *minimum* that must be present at any given time to meet the 40% biological potential level.)

Using the preceding assumptions, we started our modelling with the composite of the minimum needs at year 100—about the end of the next rotation (Fig. 13.5a). We estimated what the wildlife tree mix would have to be at year 80 of the next rotation to ensure that the minimum needs would be met at year 100, and what mix would be needed at year 60 for year 80, and so on back to year 0 (Fig. 13.5b). The year 0 figure, therefore, represents what wildlife tree mix would have to be left in a harvest unit today to ensure that minimum needs are met 100 years from now—approximately 1,000 trees/100 ha or about 10 trees/ha. Since some wildlife trees are lost during burning or logging even in a careful operation, the actual number needed to ensure the proper succession to year 100 would probably be closer to an average of 15 trees/ha. Note that most of the wildlife trees called for are live culls (green trees with defect) and not snags (standing dead trees).

We also wanted to ensure that the wildlife tree mix could be met in future rotations as well as in the current one. To do that, we assumed that we would want to start each successive rotation with the same "year 0" mix deemed necessary in a harvest unit today. Therefore, for the sake of modelling, we needed to determine if we could replace (regrow) that "year 0" mix during successive rotations (Fig. 13.5c). Using "snag replacement"

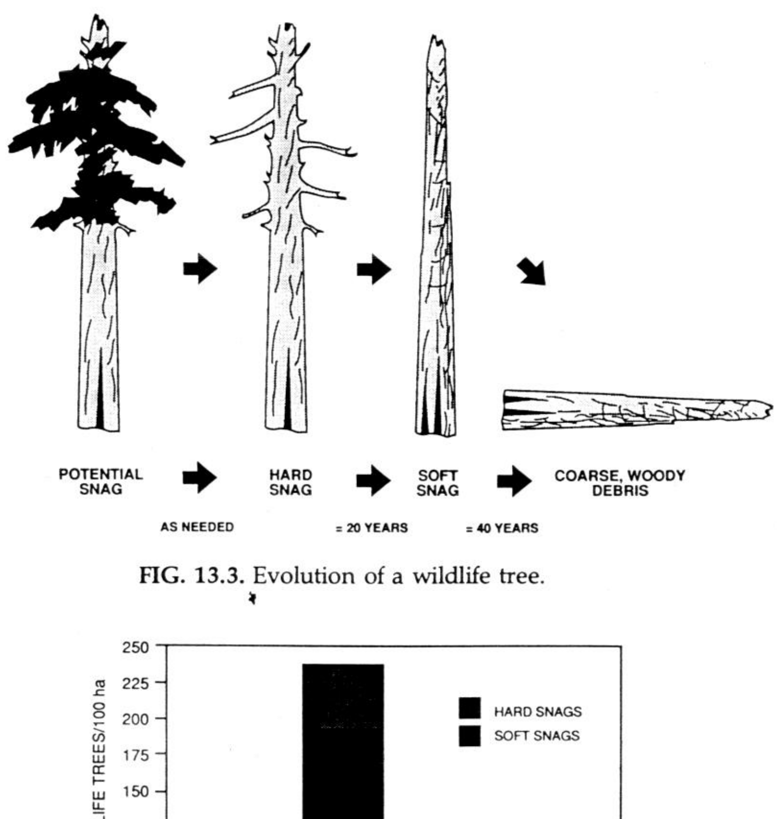

FIG. 13.3. Evolution of a wildlife tree.

FIG. 13.4. Minimum needs of the five primary cavity nesters of the Douglas-fir Region at the 40% biological potential level (adapted from Neitro et al. 1985).

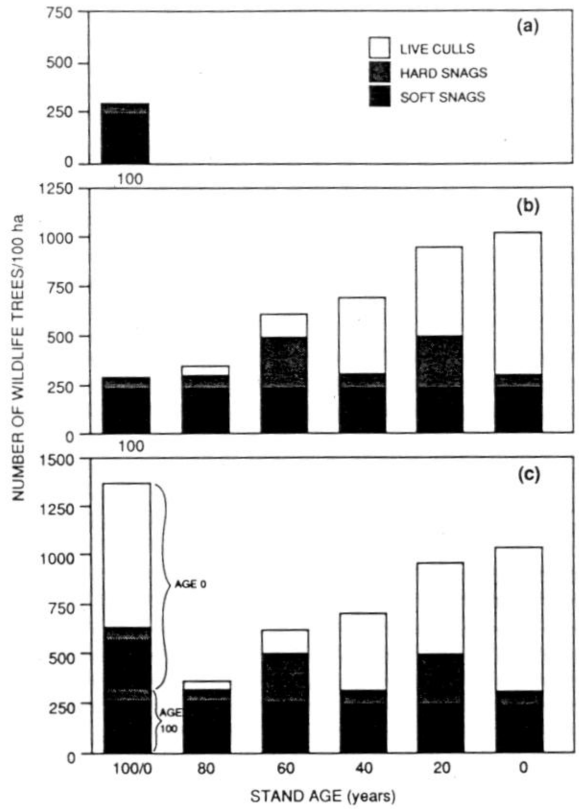

FIG. 13.5. Managing wildlife trees over time to meet the minimum needs of the five primary cavity nesters of the Douglas-fir Region (all size classes combined).

tables in chapter 7 of Neitro et al. 1985 and our own knowledge of timber stands on the Blue River District, we concluded that we could, in fact, regrow the "year 0" mix. There is, however, a "catch"—there must be a commitment to consciously manage for that wildlife tree mix. It will mean less salvage and less volume removed at intermediate harvests so that cull trees will be present at the end of the rotation.

To better assess some of the issues associated with such a management scheme, the Blue River District is completing a pilot project that implements our findings and examines the various trade-offs involved (for example, extra yarding costs and loss of yields). We feel that another issue, that of safety of workers near wildlife trees, has been addressed since we developed a marking guide for wildlife trees in conjunction with representatives of Associated Oregon Loggers, Willamette Timbermen Association, and the Oregon State Accident Prevention Division. In addition, because most of our wildlife trees will be live culls, there should be no more concern about safety in the case of wildlife trees than there is with most normal shelterwood cuts.

FUTURE CONSIDERATIONS

Where do we go next? I think we need to find better ways of perpetuating harvest residues—the log component of coarse, woody debris—into future rotations. At present, it is easy to get support for reducing or eliminating YUM yarding because, with the large amount of defect generally found in old-growth stands, there is an ample supply of logs to leave with no product value. But what happens in future rotations when there is little defect and little likelihood of large cull logs? This is especially of concern when you consider that the large, fast-grown logs of the future will decompose much faster than the tight-grained, old-growth logs of today.

QUESTIONS FROM THE SYMPOSIUM FLOOR

Q: How do you designate the trees to be left in a harvest unit—Forest Service mark or "faller select"?

A: We have used both methods and feel the "faller select" method is best for our conditions. With the larger number of trees being designated, it would take much more time for us to do the marking, and we are unable to take into account the variables faced by fallers.

Q: How much logging cost increase is associated with extra wildlife trees?

A: The amount of increase hasn't been determined yet—that information will be in our pilot project final report. I don't think it will be that significant. After all, the number of trees being left represents about the same density as that of a light shelterwood.

Q: Do your calculations for coarse, woody debris consider the logs provided by the wildlife trees you are leaving?

A: The wildlife trees will provide logs over time, but not in the numbers that we are leaving to start with. For example, a typical old-growth clearcut may have 30+ Class III, IV, and V logs/acre (74+ logs/ha), and we are leaving 10–15 Class I and II logs/acre (25–37 logs/ha) in addition to that. Even the number of wildlife trees left in the pilot project will not provide that number of logs over time. I think perpetuation of the log component of coarse, woody debris is probably the next issue we will tackle—probably with modelling similar to that used for wildlife trees but more complex.

Q: How do your silviculturists feel about leaving 4–6 cull trees/acre (10–15 culls/ha)—seed sources, disease, etc.?

A: There shouldn't be a problem with the cull trees as seed or disease sources. First of all, we need the genetic diversity over time, and it can be argued that you need some unhealthy individuals to provide the diversity needed to ensure a healthy stand—certainly, we need a future source of wildlife trees, and these culls may provide some of that source. Second, many of the cull trees may actually be superior trees that have been dominants throughout most of their lifetime and are just getting old.

Q: Have you considered clumping the wildlife trees?

A: Some of the wildlife trees, mainly the few soft snags that will be left, may be clumped to minimize safety problems. We want other wildlife trees to be fairly evenly scattered around the stands so that we receive greater benefit from them as coarse, woody debris when they eventually fall to the ground.

Q: Have you considered how your wildlife trees will affect aerial silvicultural treatments such as halitorch burning, fertilization, and herbicide application?

A: Yes. Our fire managers feel that helitorch burning should still be possible—it's a matter of adjusting the viscosity of the mix. Fertilizer and herbicide can be applied from a higher altitude but may require better conditions (less wind for example).

Q: How will you keep the wildlife trees standing (avoid blowdown)?

A: I think the problem with wind is often overstated. I have seen little real problem with blowdown in wildlife trees in most areas I have visited around the West. Many of the trees we are leaving are old former dominants that established windfirmness early in their lifetimes, and even if some of the trees blow down, they can function as coarse, woody debris a little ahead of schedule. However, the process of topping trees is pretty well established and the cost is reasonable, so topping can be used if blowdown is a real concern.

Q: In reference to rewording C6.74 to require that logs be left (part of the Blue River Residue Guideline), the standard B provisions are set up to include removal or substandard removal. If the purchaser chooses to remove the cull logs because of market conditions, how can you stop it?

A: Our interpretation is that the most constraining clause controls, particularly when we have established through the Environmental Assessment Report and prospectus (notice to prospective timber-sale purchasers) the intent to leave logs on site. Ultimately, I think a new clause should be developed to reflect our intent.

Q: What management changes have you made to protect understory duff?

A: We now broadcast burn only when we have "spring burn" conditions, i.e., high duff and soil moisture content.

Q: Why did you use old-growth ecosystems as the base for your guideline for harvest residues and wildlife trees? Historically, extensive disturbance has been the rule.

A: Actually, there has been much more small-scale disturbance in the Douglas-fir Region than was once believed. However, I think the key in looking at old-growth systems is that old growth is nature's way of restoring the "bank account" of productivity. If that is the case, we need to look at that model as a way of at least maintaining the "bank account" as long as possible.

Q: Are you planning to assess differences in seedling survival, plantability, stocking levels, cost of reforestation, etc. If so, how?

A: We are already monitoring those variables on a routine basis. It should be fairly simple to compare the results of our old and new residue treatments.

Q: Having the H. J. Andrews Experimental Forest on your district must make it easier for you to transfer research into application. How can other locations facilitate this transfer of information?

A: I have been involved in ecosystem management for about 10 years and have seen many of the concepts I discussed implemented on other units. Having a close working relationship with the research community has allowed us to progress faster at Blue River than would have been possible in other places, but the real key in getting things started is to have a few people who are interested and committed. I have found the researchers involved in long-term site productivity/ecosystem management to be more than willing to help—all you have to do is ask. A set of videotapes addressing the kinds of issues covered in this symposium, and much more about ecosystem management—both theory and practice, is now available from the College of Forestry's Media Center at Oregon State University.

Q: The options you discussed for land management are often frustrated by political forces or people in higher positions. How can we overcome that?

A: I believe that real improvements tend to begin at the field level (Ranger District or equivalent)—generally, mandating them from above doesn't work as well in the long run. I also believe we can influence the political process and people in higher authority and get them in tune with needed improvements. To do so, we need to communicate the facts. In this case, we must show what we are dealing with and risking if we ignore the needs of the ecosystem over time and develop practical solutions that can be implemented effectively. We must ensure that politicians and those with authority at least are making informed decisions. That can help change policies over time.

REFERENCES

Neitro, W. A., V. W. Binkely, S. P. Cline, R. W. Mannan, B. G. Marcot, D. Taylor, and F. F. Wagner. 1985. "Snags (wildlife trees)." In *Management of wildlife and fish habitats in forests of Oregon and Washington.* Publication no. R6-F&WL-192-1985. Washington, D.C.:U.S. Government Printing Office.