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Young-stand management options and their implications for wood quality and other values

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Abstract

This study used the forest vegetation simulator (FVS), empirical wood product recovery information, and expert judgments to examine volume production and potential revenues for different silvicultural prescriptions grown to rotation ages of 70, 110, and 150 years. Our intention was to provide policymakers and managers with some of the information needed to evaluate the merits of extensive (custodial) and intensive (various levels of thinning) management options for young-growth forests in southeast Alaska. At rotation ages of about 70 years, a prescription that included a precommercial thinning (PCT) to 3.7 m × 3.7 m spacing at 20 years (PCT 12) produced more merchantable volume than three other prescriptions: 5.5 m × 5.5 m precommercial thinning at 20 years (PCT 18), commercial thinning to 6.1 m × 6.1 m at 60 years (CT), and a passive management prescription (PAS) with no stand tending. A combination of PCT and CT was also examined for the 110-year rotation. The PCT 18 prescription usually produced lower merchantable volume than the other prescriptions and was never better than next to the last in merchantable volume production. In the longer rotations, the PAS prescription caught up with the PCT 12 prescription on both a high-productivity site (Sitka spruce [*Picea sitchensis*] height of 27.4 m in 50 years [high site class, 90 ft]) and a low-productivity site (Sitka spruce height of 18.3 m in 50 years [low site class, 60 ft]). Wood grown under the PAS, CT, and PCT + CT prescriptions is expected to have a broader product potential than the PCT prescriptions. This should allow manufacture of higher value products from the non-PCT prescriptions. As a result, revenue per m^3 from both the CT and the PAS prescriptions surpassed the PCT 12 prescription at 110 and 150 years, but no economic analysis was conducted to examine returns on investments for the different prescriptions.
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1. Introduction

Management of federally administered forests in southeast Alaska changed dramatically over the past decade and will probably continue to change in coming years. One consequence is a major adjustment in the size and structure of the wood processing industry. The structure of the southeast Alaska industry will undoubtedly continue to evolve as the raw material shifts from old- to young-growth timber. Decisions made over the next several decades about how the existing young-growth stands are tended and the way new stands are established and managed will affect the nature and profitability of future timber harvest operations in the region. A fundamental question is whether policies guiding the management of young forests in southeast Alaska will follow the model used in more temperate coniferous forests where intensive management activities (early respacing, herbicides, thinning, fertilization, pruning, etc.) are designed to encourage rapid growth of individual trees. Or will policies favor a more extensive, or custodial, management system where diameter growth on individual trees is sacrificed in favor of lower management costs? A potential side benefit of the extensive strategy could be wood characteristics that some purchasers might perceive as being of higher quality, such as slower growth, fewer or no knots, colored heartwood, or (under long rotations) trees large enough to saw edge-grained lumber.

A financial argument for extensive management in regions such as southeast Alaska, where operating costs are high but opportunity values for the land are low, is that by reducing investments in stand establishment and early tending, capital that would otherwise go into these activities is freed for other investments (Sedjo, 1982). In southeast Alaska, natural regeneration is a viable option, and natural mortality generally keeps stand growth from stagnating. Accordingly, it seems reasonable to explore options that do not require investments in young-stand management. Another consideration is that owing to the high costs of forestry operations, transportation, and labor, wood products manufactured in Alaska are likely to cost more than those from other timber-producing regions. This puts Alaska manufacturers at a disadvantage because the lowest cost producers are generally favored in commodity wood markets. As a result, Alaska producers might benefit if they could differentiate their products, based on superior performance or unique quality, from those available from other timber-producing regions. Existing information suggests that it is possible to grow Sitka spruce (*Picea sitchensis*) and western hemlock (*Tsuga heterophylla*) on 90- to 100-year rotations by using extensive management or low-intensity management options to produce a resource with characteristics that make it suitable for both high-value appearance products and structural products with high strength and stiffness (Christensen et al., 2002).

The major economic argument against extensive management strategies is the higher cost of longer investment periods and slower turnover of cash. This is a compelling argument and requires a different type of analysis than we present here. Our intention is to provide the technical information on log and lumber volumes and lumber grade yields likely to be recovered by using different silvicultural prescriptions. This type of information is needed for the economic analyses that individual landowners or public land managers might want to conduct as they set timber production policies.

We do not consider other resource values that are affected by management policies. For example, subsistence hunting is an important part of Alaska culture, and density management in young stands could promote understory conditions that enhance Sitka black-tailed deer habitat (*Odocoileus hemionus sitkensis*). The more diverse and abundant understories associated with opening up young stands might enhance opportunities for gathering medicinal, food, and non-food plants that are important to many southeast Alaskans. Tourism is also a major part of the Alaska economy, and this might cause aesthetic considerations to outweigh timber management objectives in visually sensitive areas. These and other issues will likely cause policymakers to avoid one-size-fits-all management directions, and this will certainly provide resource managers with ample opportunities to make site-specific management decisions. The analysis described in this paper will provide both groups with more information about the implications of their directions and decisions on the wood product potential of the future resource.

Regardless of the management goal, decisions about whether to grow trees quickly or slowly are best made early in rotations, and ideally they are based on results from replicated silvicultural experiments. Even without experimental work on stand development, it is possi-

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