

Growth and Yield Considerations and Implications for Alternative Density Management Objectives and Approaches

David Marshall

Presentation Abstract

Density management through thinning is the most important tool foresters have to affect stand development and stand structure of existing stands. Reducing stand density by thinning increases the growing space and resource availability (e.g., light, water, and nutrients) for the remaining trees. This can result in increased average tree growth. More available site resources can also encourage the development of understory vegetation and trees. Alternatively, the highest amounts of stand volume (or tree biomass) growth will generally occur when the site is fully occupied. The competition levels of this high level of site occupancy will lead to self-thinning mortality of the less vigorous trees and reduced net stand growth. Reducing stand density reduces site occupancy, growing-stock, and total leaf area and generally results in reduced stand volume growth.

The impact of thinning on stand growth rates will depend on the amount of residual growing stock retained and the vigor of the trees that remain. Thinning younger stands with adequate crown and rapid height growth can be expected to build crown, leaf area, and growing stock rapidly. Vigorous trees in older stands may also respond to thinning. Higher average tree growth rates and lower mortality in thinned stands maintain rapid growth rates and flatten out the annual increment curve and push culmination of mean annual increment to older ages.

Growth-growing stock relationships have been studied in the Pacific Northwest since the 1960s and demonstrate the trade-off between individual tree growth and stand growth. Thinning to variable densities (growing space) and gaps will also follow these basic growth-growing stock principles. Understanding these relationships is important for foresters to achieve desired stand production, economic, and structural development goals.

Keywords: thinning, site resources, self-thinning mortality, individual tree growth, stand growth.

David Marshall is a biometrician for Weyerhaeuser NR Company, WTC 1A5, PO Box 9777, Federal Way, WA 98063-9777; david.marshall2@weyerhaeuser.com.