

Riparian Microclimate and Stream Temperature: Thinning and Buffer-Width Influences

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Presentation Abstract

Thinning of 30- to 70-year-old Douglas-fir (*Pseudotsuga menziesii*) stands is a common silvicultural activity on federal forest lands in Washington and Oregon west of the Cascade Range crest. Decreases in forest cover lead to alterations of site energy balances resulting in changes to understory and stream channel microclimates. Uncut vegetative buffers are commonly used to mitigate upland harvest effects on aquatic and riparian habitats and functions. To create effective buffers, we need to better understand the relationships among thinning treatments, different riparian buffer widths, channel topography, and riparian and aquatic microclimates.

As a component of the Density Management and Riparian Buffer Study (DMS) we investigated buffer width and thinning effects on riparian microclimates of headwater streams in western Oregon. Spatial variations in stand density, canopy cover, and microclimate were measured 2–4 years following harvest along transects extending from stream center upslope into thinned stands, patch openings, or unthinned stands, with riparian buffers ranging from ~5–150 m width. For treated stands, the summer mean daily maximum air and soil temperatures increased and mean daily minimum humidity decreased with distance from stream. Small headwater streams exerted a distinct cool, moist influence on riparian microclimate that extended about 10 m upslope from stream center. Thinning resulted in subtle changes in microclimate as mean air temperature maxima were ~1–4°C higher than in unthinned stands. With variable-width buffers 17 m or wider, daily maximum air temperature above stream center was less than 1°C greater, and daily minimum relative humidity was less than 5 percent lower than for unthinned stands. In contrast, air temperature was significantly warmer within patch openings (+6–9°C), and within buffers adjacent to patch openings (+3°C) than within unthinned stands. Variable-width buffers defined by the transition from riparian to upland vegetation or topographic slope breaks appear sufficient to mitigate the impacts of upslope thinning on the microclimate above headwater streams.

Intensive studies such as DMS, combined with broader-scale operational monitoring can provide much-needed empirical data and analyses to inform management and regulatory strategies to conserve important aquatic and riparian functions of headwater streams in managed forests west of the Cascades.

Keywords: riparian buffers, thinning, air temperature, streambed temperature, relative humidity, canopy cover, headwater streams, forest structure.

Editors' suggestion:

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