

Impacts of Precommercial Thinning on Observed Versus FVS-Projected Diameter and Height Increments in the Inland Northwest

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Overview:

- In the Inland Northwest region of the U.S., precommercial thinning (PCT) of conifer stands typically increases individual tree diameter growth at a faster rate than height growth.
- The Inland Empire variant of the Forest Vegetation Simulator (FVS-IE) allows for effects of reductions in stand density, but links diameter and height growth.
- Region 1 of the U.S. Department of Agriculture, Forest Service (Forest Service) established a broad network of PCT trials that offer a basis for estimating PCT effects and calibrating FVS-IE PCT response.

Summary:

Precommercial thinning is commonly used in mixed conifer forests of the inland northwest region of the U.S. It is widely understood to increase diameter growth of crop trees, and on some sites can also elicit a height growth response, but growth models are needed to quantify these effects. In principle, FVS-IE can capture PCT effects through reductions in crown competition factor (CCF). However, the model was calibrated to reflect gradual, mortality-driven reductions in CCF as opposed to abrupt changes from active management. Additionally, diameter and height growth are linked in both the small- and large-tree submodels of FVS-IE to an extent that it is unclear whether PCT effects on tree taper can be adequately projected.

The Forest Service Region 1 Permanent Growth Plot (PGP) network was established in the 1980s with randomized PCT and control plots monumented in over 300 stands. Initial analyses based on a subset of the PGP trials remeasured by the Inland Northwest Growth & Yield Cooperative indicate that (1) diameter growth projection errors for Douglas-fir (*Pseudotsuga menziesii*) and western larch (*Larix occidentalis*) are significantly larger for PCT conditions, but that (2) projections errors in height growth are similar under control and PCT conditions. Further work is needed to characterize FVS-IE projection error in diameter growth as a function of PCT timing and intensity, as well as of site productivity and species composition. It is also an open question whether separate small- and large-tree model calibrations would be useful, or if a single calibration function could be applied.

Key Concepts for FVS Users:

- In the Inland Northwest region of the U.S., precommercial thinning (PCT) of conifer stands typically increases individual tree diameter growth at a faster rate than height growth.
- The Inland Empire variant of the Forest Vegetation Simulator (FVS-IE) allows for effects of reductions in stand density, but links diameter and height growth.
- Region 1 of the Forest Service established a broad network of PCT trials that offer a basis for estimating PCT effects and calibrating FVS-IE PCT response.

Management Applications/Future Directions:

- The USFS Region 1 PGP program provides a basis for specifying and estimating post-PCT diameter (and, if necessary, height) growth calibration functions using the multi-step method (Weiskittel and others 2011, Ch. 11). Potential effects of PCT intensity, stand age at the time of PCT, time elapsed since PCT will be explored, in addition to effects of initial stand density, site productivity, and species composition.
- Calibration functions for diameter and/or height growth could be implemented outside the core FVSie engine using the event monitor system as is done in the Acadian variant of FVS.

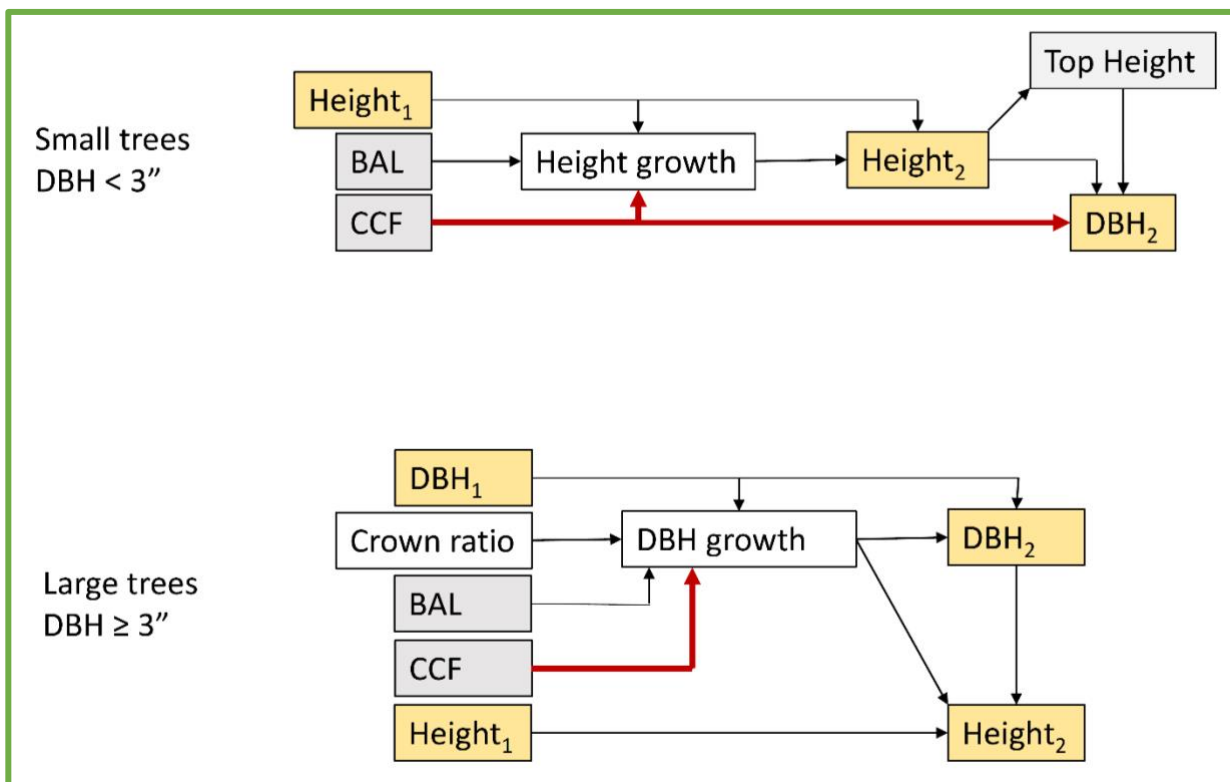


Figure 1—Logic underlying tree diameter and height increment in the FVS-IE small- and large-tree growth models. The direct effects of CCF are highlighted in red (DBH: tree diameter at breast-height; BAL: aggregate basal area per acre in trees larger than the subject tree).

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