INVESTIGATING THE ONSET OF RADIAL GROWTH REDUCTION CAUSED BY BALSAM WOOLLY ADELGID DAMAGE ON BALSAM FIR IN RELATION TO CLIMATE USING DENDROECOLOGICAL METHODS

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Balsam woolly adelgid (BWA) (*Adelges piceae)* was first identified in Maine in 1908 and spread throughout the lower half of the state by 1950. Isolated patches of infestation occurred as far north as Westmanland in northern Aroostook County. After 1950, chronic infestations remained in coastal areas of Maine, while further inland damage became sporadic and widely scattered. Within the last decade, however, damage has increased in interior portions of the state with the worst damage in central Hancock and Washington Counties.

We are testing the hypotheses that reductions in radial growth of BWA infested balsam fir (*Abies balsamea*) in central Hancock and Washington counties was initiated within the last decade, and that distinct weather patterns such as warm winters and/or drought are associated with infestation changes. We are also confirming whether damage severity varies with soil drainage class and other stand parameters.

Circular, 0.08-hectare (1/5-acre) study plots were established in the area east of the Penobscot River where recent reports of BWA damage have originated. Twenty-nine plots, stratified by climate region and soil drainage class, were established on sites capable of commercial production of balsam fir. Several site and tree measurements were recorded on each plot and increment cores were taken from at least 12 host and 12 non-host trees. Measurements were taken as described in the Forest Inventory and Analysis Field Guide (USDA Forest Service 2003).

Chronologies will be developed from the increment cores for balsam fir and non-host species. These chronologies will be cross-dated, standardized, and compared with each other to remove stand-wide effects on growth patterns in an attempt to single out BWA effects on balsam fir. This examination will show whether reduction in radial growth of adelgid-infested fir is a recent event. The onset of growth decline will be compared with climate records to evaluate relationships between minimum temperatures, drought (as indicated by precipitation and stream flow), and BWA signals in fir chronologies. Relationships between soil drainage class, other stand parameters, and severity of BWA symptoms will be quantified using multivariate analytical techniques. The study's results will indicate if climate can explain the recent increase in BWA damage in Hancock and Washington Counties and how severity of BWA damage varies by drainage class and with radial growth reductions at DBH.

Literature Cited

USDA Forest Service. 2003. **Forest inventory and analysis national core field guide, volume 1: field data collection procedures for phase 2 plots, version 1.7.** USDA, For. Serv.-WO. Internal report.