Study of the Utilization Options for Dead and Dying Eastern Hemlock in the Southern Appalachians

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ABSTRACT

The hemlock woolly adelgid (*Adelges tsugae* Annand) is a non-native pest that is decimating the eastern hemlock (*Tsuga canadensis* L.) population in the forests of the eastern United States. The Southern Appalachian region, which falls entirely within the natural distribution of eastern hemlock, has reported adelgid infestations in nearly half of its range. If the infestations continue to spread at the current rate, the entire Southern Appalachian region will be affected within a decade. The majority of the current research effort focuses on preventing the spread of the adelgid. Unfortunately, the damage is already done in many areas and little research has been done on examining the utilization potential for the dead hemlocks. The purpose of this study is to examine the current markets for hemlock, determine at what stages of decline hemlock wood can still be used for various products, determine product yield lost when processing dead material, and to make management and harvesting recommendations based on the findings.

CURRENT INVENTORY AND TIMBER PRODUCT OUTPUT

The U.S. contains more than 2.8 billion cubic feet of hemlock sawtimber, of which approximately 10% (280 million) is found in the Southern Appalachians. The majority of hemlock sawtimber in the Southern Appalachians is found on private land (53.8%) and national forest land (44.0%). North Carolina has the largest inventory of sawtimber-size hemlock trees (9.3 million), followed by Virginia (7.8 million) and Tennessee (7.4 million). Hemlock trees in the Southern Appalachians have an average breast-height diameter of 9.3 inches and an average volume of 13.0 cubic feet (based on trees with 6 inches or greater DBH).

According to Forest Service timber product output (TPO) data, approximately 4.4 million cubic feet of hemlock is harvested annually in the Southern Appalachians. Eighty-five percent of the harvested timber is used for sawlogs and the remainder is used for pulpwood, composite products, fuelwood, and veneer logs (Figure 1).

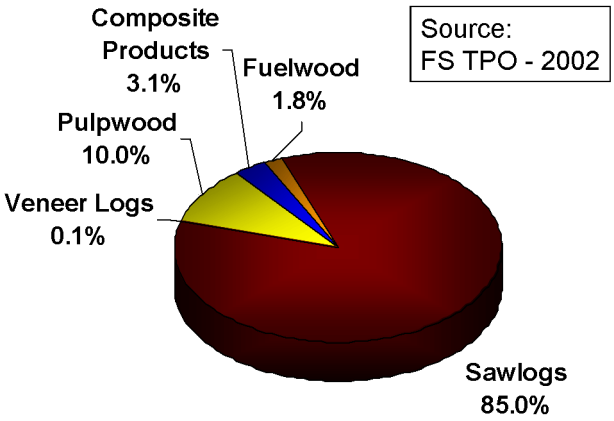

Figure 1. Total Eastern Hemlock Timber Use in the Southern Appalachians.

WOOD PROPERTIES

Wood of eastern hemlock is coarse and uneven in texture, moderately lightweight, moderately hard, moderately low in strength, moderately stiff, and moderately low in shock resistance (Alden 1997). Though these characteristics may appear to be unfavorable, ponderosa and lodgepole pine (highly preferable species) share quite similar properties (Forest Products Laboratory 1999). The most unfavorable characteristic of hemlock is that it's prone to ring shake (a lengthwise separation of wood between and parallel to growth rings) (Gardner and Diebel 1995). Ring shake is probably the most significant deterrent to widespread hemlock utilization.

CURRENT HEMLOCK MARKETS

In order to assess the current markets for hemlock, a localized study area was first established in Virginia, West Virginia, and North Carolina. Primary wood manufacturers in the study area are currently being contacted to determine use of hemlock timber. The following information is being collected from each mill: mill type, volume of hemlock processed, type of products purchased, type of products sold, delivered cost of products purchased, and end-product value. Preliminary results indicate that there is a demand for hemlock lumber (Figure 2) for local construction, and there also appears to be a demand for hemlock logs in the log home industry (Figure 3).

Figure 2. Local use hemlock lumber.

Figure 3. Three year old hemlock farmhouse.

DEAD HEMLOCK DECAY RATE

An important factor to consider when discussing the utilization of dead timber is the maximum length of time between tree death and harvest that will still yield a useable and profitable product. Therefore, an attempt is being made to determine the decay rate of dead hemlock trees measured as the wood's specific gravity loss over time since death. Half-inch increment core samples are first collected from dead hemlock trees within the study area (Figure 4). Core samples from adjacent live hemlock trees are also collected. Other information gathered from each tree includes: DBH, branch and bole structures retained (primary branches, secondary branches, etc.), GPS coordinates, aspect, and slope. Core samples are then brought back to the lab and analyzed to determine specific gravity.

Figure 4. Half-inch diameter hemlock core sample.

For the second part of the decay rate equation, it's necessary to determine the time-since-death for each sample tree. Because stand history is usually not available, an attempt is made to cross-date core samples of dead hemlock trees with core samples from live, adjacent hemlock trees. Cross-dating involves matching the growth ring patterns of the live tree samples with the growth ring patterns of the dead tree samples. Once they are matched, an estimate of time since death can be determined by counting the outer rings missing on the dead tree samples (Figure 5).

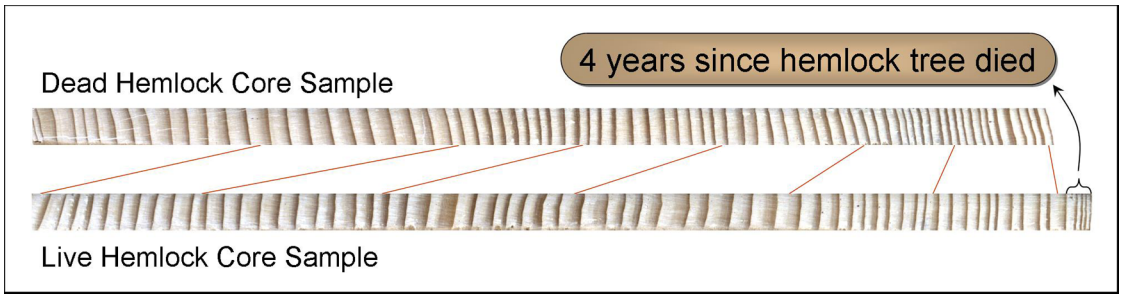

Figure 5. Cross-dating method used to determine time since death for dead hemlock trees.

LIVE AND DEAD PRODUCT YIELDS

Because of the physical deterioration associated with dead trees, the product yields from dead timber are expected to be lower when compared to the utilization of live trees (Cahill 1980, Snellgrove and Cahill 1980). In order to determine the volume of useable material lost when processing dead timber, a yield study will be conducted. Both live and dead hemlock trees will be followed from standing to final product (Figure 6). Final products will include lumber, log home timbers, etc. Volume measurements will be taken at each stage of processing, from bucking the tree length logs to the final product. Tree and log yields will be calculated for both live and dead timber, and the average yield lost will be determined.

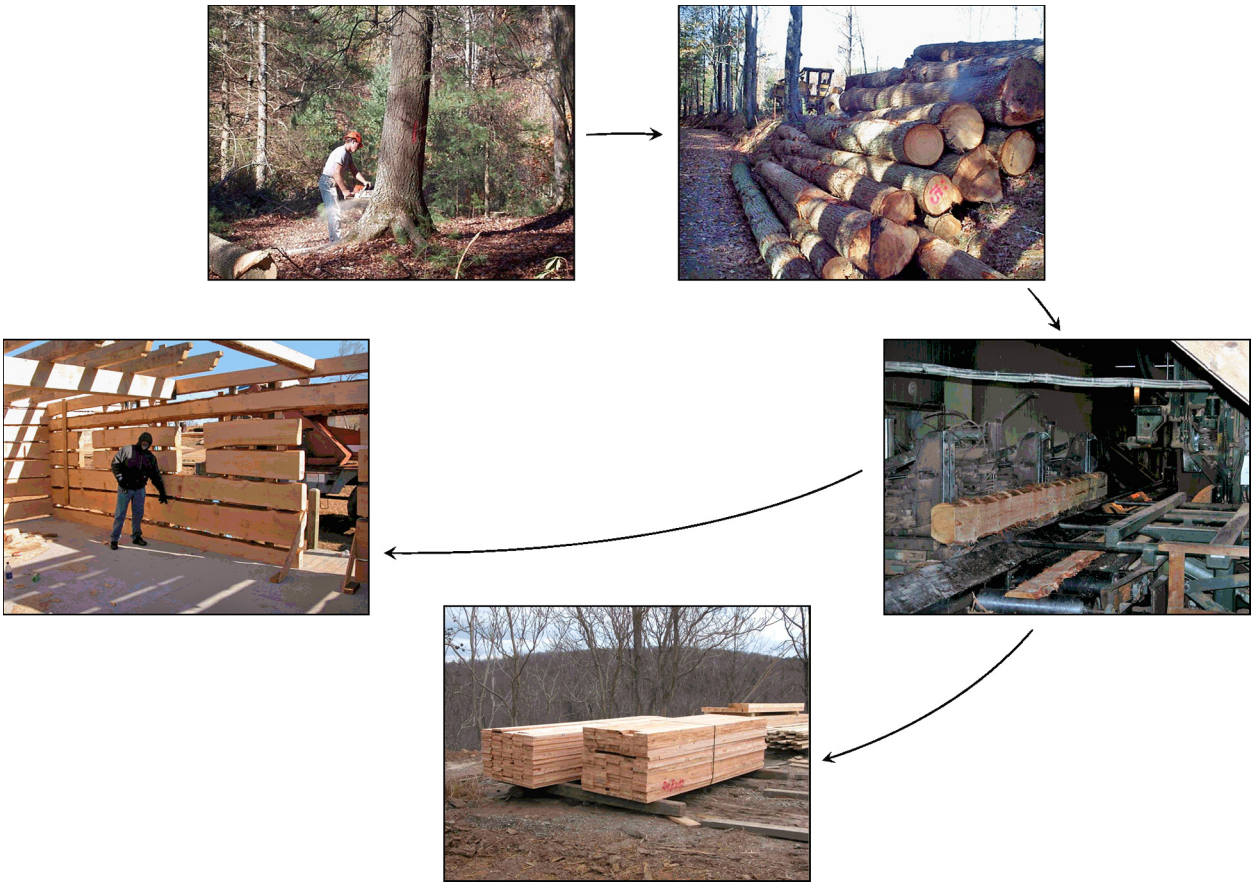

Figure 6. Production process from standing hemlock tree to final product.

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Hemlock Woolly Adelgid

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ASHEVILLE, NORTH CAROLINA
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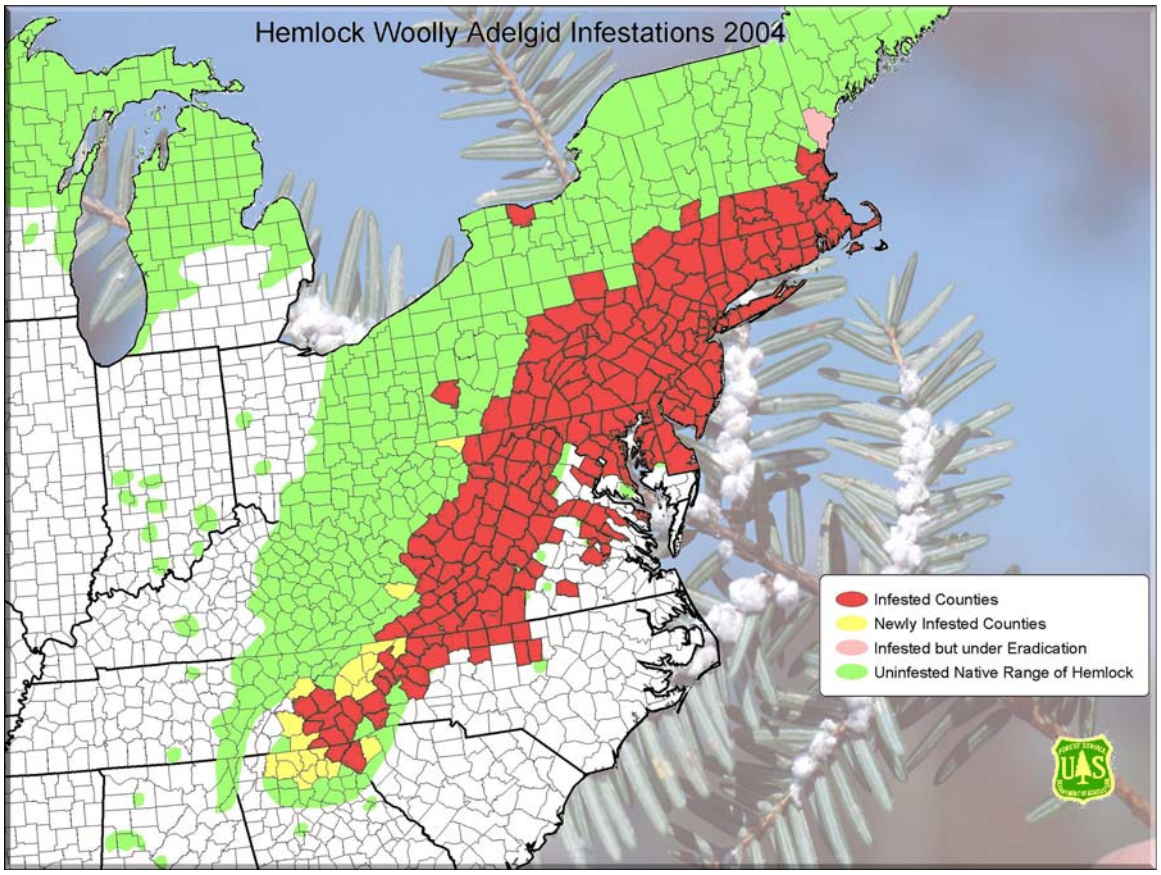

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