

Highlights

The rapid closure of multiple pulp and paper mills in a 15-year period resulted in a 75% decrease in employment in the forest industry of Maine and put several rural communities into economic peril.

The historical outlet for a significant amount of Maine's Eastern hemlock utilization has been into the pulp and paper industry. Unfortunately, changing consumer usage and global market pricing has resulted in the closure of 17 pulp and paper mills in Maine since 1980. As a result of these mill closures, the total amount of hemlock harvest in Maine has decreased significantly over the last decade. As hemlock ages, the probability of ring shake occurrence increases, resulting in decreasing marketable value in the standing timber not harvested.

The situation of excess standing hemlock inventory and utilization becomes more complex due to the continual spread of Hemlock Woolly Adelgid in the state, with quarantines in place for parts or all of nine Maine counties. Greater volumes of unharvested timber in these counties increases the opportunity for greater site mortality and spread, counteracting the control efforts of the Maine Forest Service.

The focus of this study was to assess the current Eastern hemlock resource and processors in Maine. The second phase of this study explores technologies to increase utilization of the resource beyond green sawn timber and pulp.

Contact:

Shane O'Neill
shane.r.oneill@maine.edu

Eastern Hemlock Resource in Maine: Inventory and Processing

UMaine examining the availability and consumption of Eastern hemlock in the state for insights into increasing use.

BACKGROUND

This research focused on the timber inventory and processing of Eastern hemlock (*Tsuga canadensis*) in the state of Maine. The purpose of this work was to 1) better understand the locations and volume of hemlock currently in the state, 2) evaluate the historical consumption of hemlock (both pulpwood and sawlog), and 3) actively collect information from the forest products community of relevant hemlock conditions and consumption. The second phase of this research explored technologies to increase utilization of hemlock and diversify market applications.

STANDING TIMBER INVENTORY

Table 1 outlines the 2018 aboveground biomass of Eastern hemlock in Maine. Each county was analyzed with both the current density per timberland acre and percent change since 2003 calculated. Overall, there has been a 13% increase in standing hemlock in the state since 2003 and is currently over 83.7 million short tons of green biomass available. The highest density of hemlock per acre on a county level were identified as Sagadahoc, Androscoggin, and Cumberland. The highest overall inventory counties were Penobscot, Oxford and Washington. The highest inventory increases since 2003 were observed in Waldo, Penobscot and Oxford. Based on this information, any new processors utilizing hemlock should target their draw radius inclusive of either Penobscot or Oxford Counties.

Table 1. Aboveground Biomass of Eastern hemlock in Maine, by County¹

Region	Timberland (1,000 acre)	2018 Inventory (1,000 sGT)	Density (sGT/acre)	% Change Since 2003
Maine	16,764	83,771	5.0	13%
Androscoggin	189	2,605	13.8	5%
Aroostook	3,779	5,824	1.5	-2%
Cumberland	372	4,471	12.0	-7%
Franklin	972	3,039	3.1	21%
Hancock	831	3,765	4.5	7%
Kennebec	388	4,590	11.8	20%
Knox	155	713	4.6	33%
Lincoln	194	2,096	10.8	1%
Oxford	1,181	12,312	10.4	26%
Penobscot	1,892	16,594	8.8	32%
Piscataquis	2,062	4,037	2.0	1%
Sagadahoc	111	1,578	14.2	11%
Somerset	2,333	4,400	1.9	3%
Waldo	394	3,854	9.8	58%
Washington	1,446	8,749	6.1	4%
York	463	5,145	11.1	-4%

Sources:

¹: USDA Forest Service, Forest Inventory and Analysis Program

²: Maine Forest Service

FUNDING AND SUPPORT

This effort was funded by USDA Agricultural Research Service project # 0204-41510-001-68S, focused on forest products research at the University of Maine.

Special thanks to our project's supporters, including:

- Maine Forest Products Council (*Augusta, Maine*)
- Maine Forest Service (*Augusta, Maine*)
- U.S. Forest Service: NRS (*Durham, New Hampshire*)

Listening Session Participants

- American Forest Management
- Baskahegan Company
- Downeast Lakes Land Trust
- E.D. Bessey & Son
- LandVest, Inc
- ND Paper
- New England Forestry Foundation
- Parker Lumber
- Pleasant River Lumber
- Robbins Lumber
- Wagner Forest Management
- Woodland Pulp LLC

ABOUT UMAINE

The University of Maine, founded in Orono in 1865, is the state's premier public university. It is among the most comprehensive higher education institutions in the Northeast and attracts students from across the U.S. and 65 countries. UMaine students directly participate in groundbreaking research working with world-class scholars. The University of Maine offers doctoral degrees in 35 fields, representing the humanities, sciences, engineering and education; master's degrees in nearly 70 disciplines; 90 undergraduate majors and academic programs; and one of the oldest and most prestigious honors programs in the U.S.

For more information about UMaine, visit umaine.edu

ABOUT THE SCHOOL OF FOREST RESOURCES

The Mission of the School of Forest Resources is to provide excellence in education, research, and public service that promotes the understanding, efficient use, and sustainable management of forest resources for the well-being of the people of Maine, the United States, and the World.

For more information, visit forest.umaine.edu

ANNUAL HARVEST & PROCESSING DATA

Figure 1 shows the annual hemlock harvest and processing data in Maine compiled from the Maine Forest Service Wood Processors reports. The data outlines a sharp decrease in sawlog harvesting coinciding with the 2008 housing crisis, holding steady near 150 thousand short green tons per year. Pulpwood harvesting dropped from one million short green tons in 2008 to less than 200 thousand short green tons in 2017, driven by the loss of softwood pulping capacity in the state.

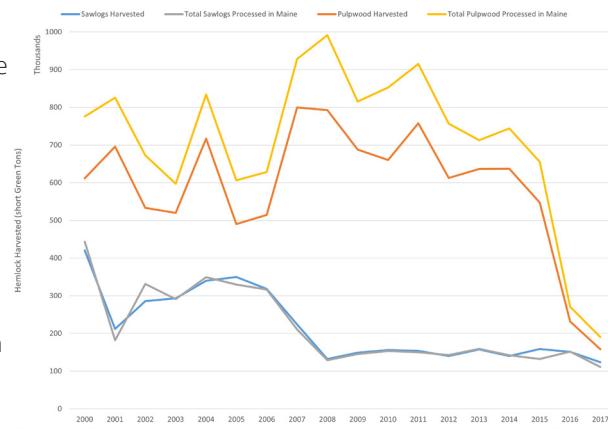


Figure 1: Annual hemlock harvest data in Maine (2000-2017)

PROCESSORS IN MAINE

Through an agreement with the Maine Forest Service, hemlock processor data (sites and relative ranked consumption) was obtained and examined

Table 2: Processors in Maine (by year)²

Year	Processors
2003	144
2004	139
2005	133
2006	127
2007	106
2008	85
2009	80
2010	78
2011	67
2012	67
2013	70
2014	57
2015	59
2016	53
2017	54

from 2003-2017. Table 2 outlines the number of reporting hemlock processors in Maine from 2003-2017. Within the state, the number of processors consuming hemlock reduced to a low of 53 in 2016 from a peak of 144 in 2003. From this data, GIS maps were created of all reporting processors (Figure 2) during the examined time to reference locations within the state. For each year, the top 10 processors in the state were aggregated and used as inputs into the USFS FIA database. For each sawmill, a 48-mile draw radius was used, with 124 miles used for all other processing operations. For each of the 28 sites examined, a relatively flat level of pulpwood diameter biomass was noted with increasing sawlog diameter biomass, indicating increasing growth in both hemlock sawlogs and pulpwood relative to local demand.

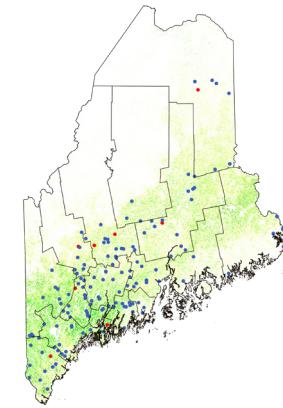


Figure 2. Eastern hemlock distribution and 2017 processors in Maine (top 10 in red)^{1,2}

INDUSTRY LISTENING SESSION

An industry listening session was conducted on April 2nd, 2019 at the University of Maine with 12 members of Maine's forest industry participated and provided feedback to discussion questions. Some of the key takeaways of this discussion included:

- The overall hemlock distribution maps from the USFS FIA data are accurate, but landowners in Eastern Maine are noting hemlock growth rates from FIA data underestimate field observations.
- Operating sawmills have had strong markets for products. The total sawmill volume is unable to keep up with harvest growth due to decreases in pulpwood consumption.
- Recent re-opening of a pulp mill in Old Town (and transition to softwoods) has reinvigorated several idled operations, including chip plants in neighboring areas to supply the facility.
- The current market price of hemlock has transitioned other landowners to retaining hemlock on the stump to use towards carbon credit programs. Until the market price of hemlock exceeds that of its value in carbon credits, these landowners see no value in harvest.

The University of Maine does not discriminate on the grounds of race, color, religion, sex, sexual orientation, including transgender status and gender expression, national origin, citizenship status, age, disability, genetic information, or veteran status in employment, education, and all other programs and activities. The following person has been designated to handle inquiries regarding nondiscrimination policies: Director, Office of Equal Opportunity, 101 North Stevens Hall, 581.1226, equal.opportunity@maine.edu.

