ANTIOCH UNIVERSITY
NEW ENGLAND

Monadnock Ecological Research and Education Project
MERE
Antioch University New England

Investigating Ice Storm Damage on Mount Monadnock

Environmental Studies Department
MERE Project
February 20, 2020
Issue #0001

Technical Bulletin

Abstract:
Ice storms have a significant role in the disturbance history of New England's forests. In December of 2008, an ice storm of substantial magnitude impacted NH forests. Significant damage occurred to Mt. Monadnock, closing some trails for an entire season.

To investigate and qualify the impact to canopy structure I sampled permanent forest plots established in 2007 by faculty and students at Antioch University New England. My results indicated that the 2008 storm was not a stand-replacing disturbance, but left a mosaic of patchy damage across the mountain, a similar pattern left in forests of northern New Hampshire from a severe ice storm in 1998. In 2008, damage occurred to 35% of the stems on Mt. Monadnock, primarily with less than 25% crown damage occurring to individuals. Again, this was similar to the 1998 storm impact to forestland. Although most of the plots in my study showed some damage, the greatest impact was located on the eastern and northern aspects and slightly greater impact between 2000' and 2300' in elevation. Pulses of severe damage were noted at 1900' and 2400', but in sum, only 16% of the trees on the mountain suffered greater than 50% of crown loss. Partly as a result of the canopy loss, the 2008 storm also produced an increase in the volume of coarse woody material deposited to the forest floor which tallied nearly two times that found of debris in more advanced levels of decay.

Introduction:
The impetus for this thesis was the occurrence of an ice storm on December 12, 2008 which severely impacted the Monadnock region of southern NH. Significant impact was observed by officials at Monadnock State Park and reported to faculty at

Antioch New England University. Trail crews working in the state park spent much of the spring clearing debris from the trails. Most of the trails were re-opened by June, but several remained closed all summer. The purpose of this study was to qualitatively characterize the impact of the ice storm to the forest canopy and to quantify the volume of coarse woody material added to the forest floor from the ice storm.

To appreciate the potential impact of this ice storm on certain aspects of forest structure a review of the literature on these topics follows. The methods used

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to sample the forest after the ice storm and are then described, followed by the results of the study and concluded with a discussion.

Methods:

This study was conducted under the umbrella of the Monadnock Ecological Research and Education Project (MERE) initiated by faculty and graduate students at Antioch University New England in 2007. The MERE project ultimately seeks to "promote informed use and foster appreciation of Mount Monadnock through ecological research, monitoring, and educational outreach" (http://www.antiochne.edu/mere/). This study falls within the scope of MERE's ecological research goals and builds on the baseline data from 8 transects which included a total of 88 permanent long-term forest research plots established in 2007 (Mallard, 2008). In 2009, I added two new transects on the eastern aspect which included 13 plots on each and added two new permanent plots to the existing transects at 1800' and 1900', following the original protocols (Mallard 2008) (Figure 2). In total, this study sampled forest conditions on a total of 100 plots located between 1800' and 2700' on the northern, eastern, southeastern, southwestern and northwestern slopes of Mt. Monadnock.

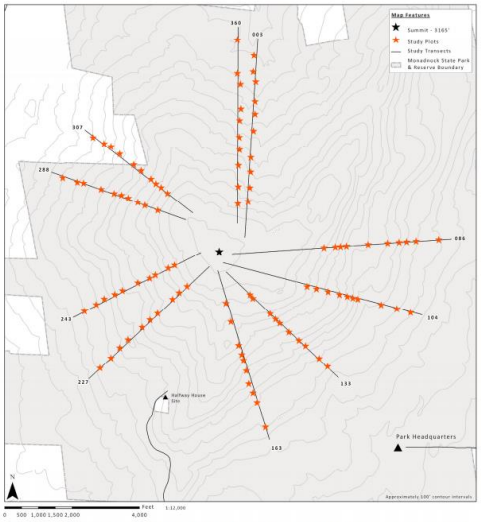

Figure 2. Map representation of the MERE Project transect locations within the Mt. Monadnock Reserve which, as illustrated, is owned and protected by the Society for the Protection of NH Forests, NH State Parks & Recreation, and the Town of Jaffrey.

Results:

The ice storm impact was observed to be patchy and variable across the mountain. Of the stems in my sample, 35% of the living trees were damaged to some degree. The cumulative damage was primarily mild, typically impacting 25% or less of the overall canopy structure.

Upon examination of each aspect class, the eastern aspect suffered the greatest ratio of impact with over half of the sampled stems damaged, 51%, with primarily mild damage. The northern aspect had the greatest ratio of stems with severe damage, and overall, nearly a quarter of the stems on the northern slopes had more than 50% crown damage. It should be noted that the picture of damage on the mountain changes when examining the relative frequency of damage across the mountain. This calculation shows that nearly 13% (n = 142) of the crown damage occurred on the northern slopes compared to 9% (n = 104) located on the eastern slopes.

Discussion:

My results indicated that over 31% (n = 457) of the plot trees in the forest canopy on Mt. Monadnock were damaged from the 2008 ice storm. A comprehensive and comparable study completed by the US Forest Service (Miller-Weeks & Eagar 1999) of the impact of the 1998 ice storm, which included an initial aerial survey followed by ground surveys of New England (NY, VT, NH & ME) found a similar mosaic of patchy and variable damage. Based on a calculated average from 10% crown loss categories, they found an overall average crown loss of 24% (included all sampled stands) in NH.

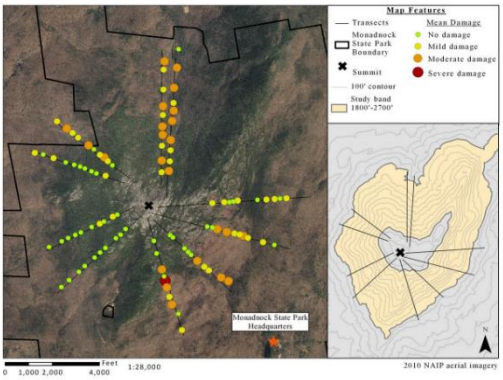

Figure 6. GIS map of the variable results of the 2008 ice storm between 1800' and 2700' on Mt. Monadnock. The information is based on the average of damage at each individual plot.

Thesis Citation:
Boland, A. (2012. *The impact of ice storm damage to forest structure and coarse woody material on Mt. Monadnock, Jaffrey, NH.* (Unpublished master's thesis). Antioch University New England, Keene, NH.

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