TREE CONDITION CHANGES AND THE 1998 ICE STORM

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Introduction

The January 1998 Ice Storm impacted to some degree over 11 million acres in Maine. In order to prioritize recovery, the Maine Forest Service (MFS) contracted for large-scale, high-resolution photography and interpretation of damage on over 2 ½ million acres. This large-scale polygon mapping delineated eight damage levels, ranging from none to heavy.

Objective

Analyze whether the photo-interpreted damage polygons are reflected in either the frequency or magnitude of tree condition changes since 1995.

Methods

MFS supplied a shape file of damage level polygons to the USDA Northeastern Research Station (NERS) for an overlay and assignment of the exact P2 (FIA) plot location to a specific damage level. NERS returned to MFS a database containing the plot id information and the respective damage level code for all 5 panels.

The Maine Forest Service funded a separate data collection of equivalent P2 data on 493 plots over the period of 2001-2003. A sample of 392 plots are linked with an Ice Storm damage level and the available plot sample area is a 19/120-acre fixed area annular ring, inside and concentric to the 1995 1/5-acre plot area.

Aggregating the eight photo-interpreted damage levels created four generalized damage groupings. That aggregation and the resultant sample size is as follows:

1. None (includes None) – 149 plots
2. Trace (includes Zero – Trace) – 95 plots
3. Light (includes Trace – Light, Light, Light – Moderate) – 78 plots
4. Heavy (includes Moderate, Moderate – Heavy, and Heavy) – 70 plots

Tree condition is a two-stage coding stratification. The first stage identifies whether a tree is alive, dead, or a snag, and the second stage characterizes the condition of the tree's top as being a intact live top, intact dead top, broken top, or down. This analysis considered only live trees, ≥ 5.0″+ DBH, tallied in 1995 and then remeasured by MFS in 2001 - 2003.

Transition tables were developed, collapsing the multiple combinations of initial tree condition (1995) and current condition reflecting any Ice Storm damage, into just four distinct groups:

1. Tree Condition Improved
   - Initial live tree, intact dead top - Current live tree, intact live top
   - Initial live tree, broken top - Current live tree, intact live top/intact dead top
2. Tree Condition Maintained
   - Initial live tree, intact live top - Current live tree, intact live top
   - Initial live tree, intact dead top - Current live tree, intact dead top
   - Initial live tree broken top - Current live tree, broken top
3. Tree Condition Degraded (Still Live)
   - Initial live tree, intact live top - Current live tree, intact dead top/broken top
   - Initial live tree, intact dead top - Current live tree, broken top
4. Tree Condition Degraded (Dead)
   - Initial live tree, intact live top/intact dead top/broken top - Current dead tree, intact top/broken top/down or a Current snag, intact top/broken top

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Results

In 1995, the frequency distribution of initial tree condition, by the damage groupings, is similar regardless of the pending 1998 Ice Storm (Table 1). Live trees with an intact live top represent 96% of the available 9,186 live trees.

Table 1.—Frequency distribution of 1995 initial tree condition, by ice storm damage grouping.

	Tree Condition Class			
Ice Storm Damage Grouping	Live Tree Intact Live Top	Live Tree Intact Dead Top	Live Tree Broken Top	Total
None	95.9%	3.1%	1.1%	
Trace	95.6%	3.5%	0.9%	
Light	96.6%	1.8%	1.6%	
Heavy	97.3%	1.3%	1.4%	
Overall	96.2%	2.5%	1.2%	100%

The increasing intensity of the Ice Storm damage is reflected in the gradual erosion of trees that maintained their tree condition coding over the approximately 7-year period (Table 2). The None and Trace groups maintained tree condition on 87% of the sample trees, compared to 84% for the Light group and 81% for the Heavy damage grouping. The damage inflicted by the 1998 Ice Storm within the Light group mainly resulted in a 2% higher increase in dead trees compared to the two lesser damage groupings. The Heavy damage grouping had the most change in the transition category of Tree Condition Degraded (Still Live), with at least a 4 percent increase over the other three categories. Finally, compared to the minor damage groupings of None and Trace, the Heavy grouping also had at least a 1% increase in dead trees.

Table 2.—Transition category and the distribution of change, by ice storm damage grouping.

	Transition Category			
Ice Storm Damage Grouping	Tree condition Improved	Tree condition Maintained	Tree condition Degraded	Tree condition Dead
None	1.1%	87.4%	4.3%	7.2%
Trace	2.0%	87.0%	2.9%	8.1%
Light	1.1%	84.5%	4.5%	9.9%
Heavy	1.4%	81.1%	8.3%	9.2%

Conclusions

The current FIA annualized inventory design can provide an alternative, consistent, and accurate analysis of damage inflicted by various disturbances. The tree level analysis of tree condition can be structured to assess the immediate damage and more importantly, the long-term implications of this damage to the tree's growth and product quality potential.