

# Post-Disturbance Forest Management Protocols

Forests in the northeastern United States are increasingly shaped by a range of climate-driven disturbances, from heavier rain and stronger wind events to more frequent insect outbreaks, fires, and ice storms. Over the past century, these changing disturbance patterns have led to higher tree mortality, declining forest health, disruption of ecosystem services, and a reduction in long-term resilience of forest ecosystems. A suite of post-disturbance management strategies that emphasize conservation, active management, risk reduction, and regeneration can help sustain forests under rapidly changing conditions.

## DISTURBANCE TRENDS IN THE NORTHEAST



### Heavy Rain & Flooding

Over the past century, there has been a 15% increase in total annual precipitation.<sup>6</sup>

Intense storms that historically occurred at a rate of one per year are now 8% more frequent.<sup>12</sup>

During the period from 1901 to 2014, there was a 50-55% increase in heavy rainfall events (from the wettest 1% of days).<sup>5</sup>



### Ice Storms

The Northeast experiences 5-7 freezing rain days per year, among the highest in the U.S., with increasing frequencies expected in New York, Pennsylvania, and New Jersey.<sup>1,8</sup>

Ice storms can result in significant damage to forests; in 1998 a single storm in New England caused \$1 billion in tree damage alone.<sup>11,2</sup>



### Storm Damage

Since 1940, the strongest nor'easters—those in the upper range of wind speeds—have shown increasing trends in both maximum wind speed and hourly precipitation, suggesting a rising potential for damage from extreme storms.<sup>3</sup>

Even small increases in wind speed can have huge effects: a study found that an 8–10% rise in hurricane winds could cause 10 to 20 times more severe damage to New England forests.<sup>16</sup>



### Insect Outbreaks

Hemlock woolly adelgid, emerald ash borer, southern pine beetle, and spongy moth now occur at higher frequencies and increasingly drive tree mortality.<sup>17,15,9</sup>

Some outbreaks have intensified with recent range expansions and higher rates of tree mortality as winters become milder and new introductions accelerate.<sup>17</sup>



### Large Fires

Fire trends are mixed in the region, but large fires are expected to increase in some areas including the Atlantic Coastal Pine Barrens and portions of western New York and Pennsylvania.<sup>4</sup>

## MANAGEMENT STRATEGIES

<h3>Conservation &amp; Protection</h3>	<p>Expand protected areas and connectivity, limit fragmentation, and prioritize keeping forests as forests.<sup>12</sup></p>		<p>Control or prevent the spread of invasive species.<sup>12,14,7</sup></p>		
<h3>Reduce Fire Risk</h3>	<p>Reduce fuel loads through prescribed burning or removal of ladder fuels and dead or dying trees.<sup>14</sup></p>		<p>Establish fuel breaks using roads, powerlines, or natural features.<sup>14</sup></p>		
<h3>Manage Water</h3>	<p>Assess water flow and flood damage immediately after storms.<sup>7</sup></p>	<p>Use water diversions, culverts, and natural depressions to slow, spread, and absorb water.<sup>7</sup></p>	<p>Place deadwood strategically to retain water.<sup>7</sup></p>		
<h3>Silvicultural Strategies</h3>	<p>Establish a forest management plan that incorporates climate mitigation and adaptation.<sup>12</sup></p>	<p>Adopt silvicultural practices that increase growth and carbon storage, for example use of longer harvest intervals or reduced harvest levels.<sup>12</sup></p>	<p>Mimic natural disturbance through multi-age continuous canopy treatments, incorporating small-to moderate sized gaps, and retention of legacy trees for habitat, seed sources, and microclimate regulation.<sup>13</sup></p>		
<h3>Regeneration for Future Conditions</h3>	<p>Plant diverse, well-adapted species, with consideration for species best suited for future conditions.<sup>7,10,14</sup></p>	<p>Promptly regenerate to reduce erosion and deter invasive species.<sup>7</sup></p>	<p>Incorporate wildlife management strategies that protect young trees from animal browsing.<sup>14,7</sup></p>	<p>Encourage natural regeneration to identify climate-resilient species.<sup>14</sup></p>	<p>Monitor regeneration success to inform future decisions.<sup>14</sup></p>

## LITERATURE CITED

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