

### Threats Template Matrix – BLACK CHERRY DECLINE

- 1. Threat:** Black cherry health and regeneration in the Allegheny Plateau ecoregion have undergone dramatic changes in the 21<sup>st</sup> century. Black Cherry is highly valued for its economic and ecological values. It is a significant portion of area tree cover, comprising around 25 percent of the overall basal area on the ANF, for example, and important on the surrounding landscape as well.

**Overstory mortality** has increased much more in this species than in all other species combined, and many surviving trees have thinning crowns. Hypothesized causes include defoliation by native insects (cherry scallop shell moth and fall webworm), sometimes repeatedly, as well as changes in nutrient inputs from the atmosphere. While not demonstrated, there is reason to be concerned that declining cherry will become increasingly vulnerable to peach bark beetle infestation and associated quality degrade and value loss.

  - **Seed production** has become irregular and infrequent, seedling establishment less common, and the health and competitiveness of seedlings has also declined. Hypothesized factors include spotted wing drosophila and pollinator asynchrony affecting seed production, pythium (a root rotting fungus demonstrated to limit cherry seedling establishment near overstory cherry), cherry leaf spot fungal disease of seedlings, changes in nutrient inputs from the atmosphere, and potentially changes in climatic factors.
  - The result is that areas with a high proportion of black cherry in the overstory are at risk of **value loss and regeneration failure**. This is especially significant where other overstory species, like ash and beech, are themselves declining. These stands are at risk of very poor regeneration outcomes unless regeneration processes are begun while there is still adequate seed source available.
  - Black Cherry from the Allegheny Plateau has historically been recognized as the best cherry in the world and demanded high prices. Since 2010, the values of cherry have declined. **Without strong domestic and international markets** for black cherry, it becomes harder to support the cost of forest management. Improving markets for cherry and all Pennsylvania hardwoods would financially improve options for forest management on the ANF and support a stronger forest products industry in the region as well as improve local communities through the 25% fund.
- 2. Location:** Black cherry has been declining across the High Allegheny Plateau, which includes the ANF and a variety of other ownerships. The areas of highest modeled risk are in the central eastern part of the Forest, which is also where the most recent cherry scallop shell moth defoliations have been most severe.

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3.	<p><b>Impact or Severity:</b> The most recent estimates of mortality in black cherry are more than twice as high as the average mortality in all other species combined (22.5% standing dead trees in black cherry vs. 10.0% in other species based on remeasurements of 92 plots sampled 3 times since 1998). Monitoring on other ownerships has indicated similar results, with continuous forest inventory data collected on the Pennsylvania High Plateau (ANF region) by the Pennsylvania DCNR Bureau of Forestry indicating more than 30 percent of dead black cherry stems were dead in the most recent remeasurement cycle, compared with 17% dead for other species.</p> <p>According to the 2016 USDA Forest Inventory Analysis, black cherry represents 11.4% of the standing sawtimber in Pennsylvania – third highest after soft maple (15.2%) and northern red oak (12.8%). With a higher concentration of cherry in northwestern Pennsylvania, cherry decline threatens to become a major financial loss to the local communities, the region, and the state.</p> <p>Black cherry seed production has also decreased in regularity and abundance, based on assessments of stands sampled in the 70s and at present. While evidence about seedling survival, growth, and competitiveness is more anecdotal, these all appear to sharply decline as well.</p>
4.	<p><b>Desired Outcome:</b> Sustain high value, diverse, resilient, and well stocked forests on the Allegheny Plateau, that continue to contain a cherry component.</p> <p>Regenerate stands with abundant declining black cherry (and other species such as American beech and ash) in the overstory to a mix of species, featuring red maple, tulip polar, cucumber tree, oaks, hemlock, pine, and birch, while recovering optimal value from black cherry wood for community and industry benefit. Strive to regenerate a black cherry component to the extent possible.</p>
5.	<p><b>Strategies to Achieve the Desired Outcome</b></p> <p><b>Strategy 1:</b> As ANF focuses on achieving better age class balance in suited Management Areas, prioritize stands with either declining overstory black cherry or abundant healthy black cherry advance regeneration for creating younger age classes with a diversity of high quality hardwood species, while recouping value of existing black cherry value and regenerating black cherry to the extent that is possible.</p> <p>Apply the following definitions for successful regeneration:</p> <ul style="list-style-type: none"> <li>• Desirable Outcome = &gt;70% stocking with “preferred” species; cherry, oaks, maples, tulip, cucumber, hemlock, pine, etc.</li> <li>• Acceptable Outcome = &gt;70% stocking with “commercial” species; this adds birch into the mix.</li> </ul> <p>The amount of birch that is acceptable can be analyzed by the site quality, and the pre-existing conditions of the mature overstory when the regeneration process began.</p> <p><b>When:</b> As soon as possible</p> <p><b>Who:</b> ANF and collaborative participants</p> <p><b>Cost:</b> If completed while majority of black cherry is alive, should be profitable, even at lower cherry prices</p>

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**Strategy 2:** Develop adaptive silvicultural Decision Guides for more effectively regenerating forest stands with declining overstories. Emphasize retaining a component of black cherry in the regen to the extent feasible through adaptive management. While it is notoriously difficult to project future timber values, that of black cherry has been consistently high and it is the signature species of our region and our commonwealth. Black cherry also has very high wildlife values.

- Develop adaptive regeneration strategies for various forest types/overstory conditions- decision charts with trigger points/range of conditions for treatment selection.
- Incorporate strategic approach to packaging herbicide treatments and overstory removals to optimize contractor participation and reduce overall costs
- Implement structured program to monitor (adaptive) prescription effectiveness in achieving broad forest plan desired conditions, sustaining healthy forests, and achieving stand level objectives.
- Collaborate with partners in the forest health collaborative on this task.

Current strategies for adaptive management to retain black cherry in regenerating stands include NPK fertilization of stands with a significant cherry component after overstory removal and lower residual densities after shelterwood seed cuts. Develop a communication strategy for regularly sharing success stories.

**When:** Begin immediately

**Who:** ANF, collaborative participants (especially PA DCNR Bureau of Forestry), and research scientists.

**Cost:** \$50,000/year for 5 years; includes regular meetings of cooperating foresters and scientists; formal and informal research studies.

**Strategy 3:** Develop adaptive, innovative strategies for understory treatment (weight-scaled biomass sales, for example, where an understory of beech and or birch is interfering with mixed species regeneration establishment and growth) and develop management guidelines for various proportions of birch in regenerated stands where other seed source is not available.

**When:** Begin immediately

**Who:** May require partnerships with industry and state to certify weight-scaling and implement some test stands. ANF collaboratively develop management guidelines with NRS scientists, State agency, and industry staff.

**Cost:**

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<p><b>Strategy 4:</b> Work with the Northern Research Station, State and Private Forestry, and university cooperators to sustain a research-management partnership to understand black cherry stressors and test adaptive management strategies. Develop short and long term research strategies focused on understanding current black cherry health and regeneration challenges on the Allegheny Plateau.</p> <p>These could include collaborative approaches to better understand black cherry interaction with pythium fungus, cherry leaf spot, and spotted wing drosophila. There is a need to better understand the impact and relative abundance of fungal pathogens (cherry leaf spot, Pythium) in stands with different overstory cherry densities and differing environmental and soil chemical conditions.</p> <p>Continue the dominance probability study initiated by NRS in 2013 to follow competitive status of different species of seedlings; Install several new blocks of that study with smaller seedlings.</p> <p><b>When:</b> Begin immediately</p> <p><b>Who:</b> ANF, collaborative participants (especially PA DCNR Bureau of Forestry), Northern Research Station, Northeastern Area State &amp; Private Forestry, university cooperators, granting agencies</p> <p><b>Cost:</b> From multiple partners (not just ANF) \$3 million/year</p>
<p><b>Strategy 5:</b> Develop a flexible planning/NEPA process that allows rapid response when new hot spots of decline or mortality occur, or when abundant healthy advance regeneration is found. Options may include categorical exclusions and newer Farm Bill categorical exclusions (for insect and disease treatment and regeneration), or perhaps more programmatic approaches.</p> <p><b>When:</b> Within six months.</p> <p><b>Who:</b> ANF</p> <p><b>Cost:</b></p>
<p><b>Strategy 6:</b> Develop a marketing program for black cherry at the regional, state, national, and international levels that includes participation in consumer based trade shows, home builder shows, and architect/design shows or seminars. With increased consumer demand for cherry domestically and internationally, the values of cherry will improve.</p> <p><b>When:</b> Immediately</p> <p><b>Who:</b> Pennsylvania Hardwoods Development Council, Allegheny Hardwood Utilization Group, Keystone Wood Products Association, Northern Tier Hardwood Association, and Regional and state forest product companies</p> <p><b>Cost:</b></p>

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<p>6. <b>Monitoring Strategies</b></p>	<p><b>Strategy 1:</b> Continue to monitor Forest Health Plots with high proportions of black cherry, including monitoring of crown health, peach bark beetle, and regeneration.</p> <p><b>When/Frequency:</b> Five-year intervals would imply next cycle of remeasurement to begin in 2019</p> <p><b>Who:</b> University partners with State and Private Forestry Forest Health Program funding. There is a need to identify a new principle investigator for this work to continue, starting in 2018.</p> <p><b>Cost:</b> \$25,000 year for three years.</p>
	<p><b>Strategy 2:</b> Develop systematic monitoring approach on the Allegheny Plateau for more closely monitoring insect and disease trends (more intensive than FHM plot network), including monitoring of defoliation events. Include analyses to detect correlations among stressors and relationships to predict vulnerability and sustainability, such as age of stands, site factors, etc.</p> <p>Establish all lands network for monitoring and consider development of drone technology for aerial surveillance.</p> <p>Continue collaboration with the U.S. Forest Service Forest Health Technology Enterprise Team (FHTET) on use of satellite imagery and remote sensing (e.g. FORWARN and Forest Disturbance Mapper) for monitoring forest canopy health and disturbances.</p> <p><b>When/Frequency:</b> Annually and as needed during defoliator outbreaks</p> <p><b>Who:</b> ANF, NRS, S&amp;PF, State and larger landowner partners.</p> <p><b>Cost:</b> \$15,000 per year for one monitoring technician and 15,000 per year for traditional aerial surveillance.</p>
<p>7. <b>Additional Information Needs:</b></p>	<p>Continued monitoring of dominance probability study initiated by NRS in 2013 to follow competitive status of different species of seedlings; Installation of several new blocks of that study with smaller seedlings. Also need study to understand the impact and relative abundance of fungal pathogens (cherry leaf spot, Pythium) in stands with different overstory cherry densities and differing environmental and soil chemical conditions.</p>
<p>8. <b>Other:</b></p>	