

Hemlock Conservation Plan

A plan for conserving eastern hemlock in
Pennsylvania

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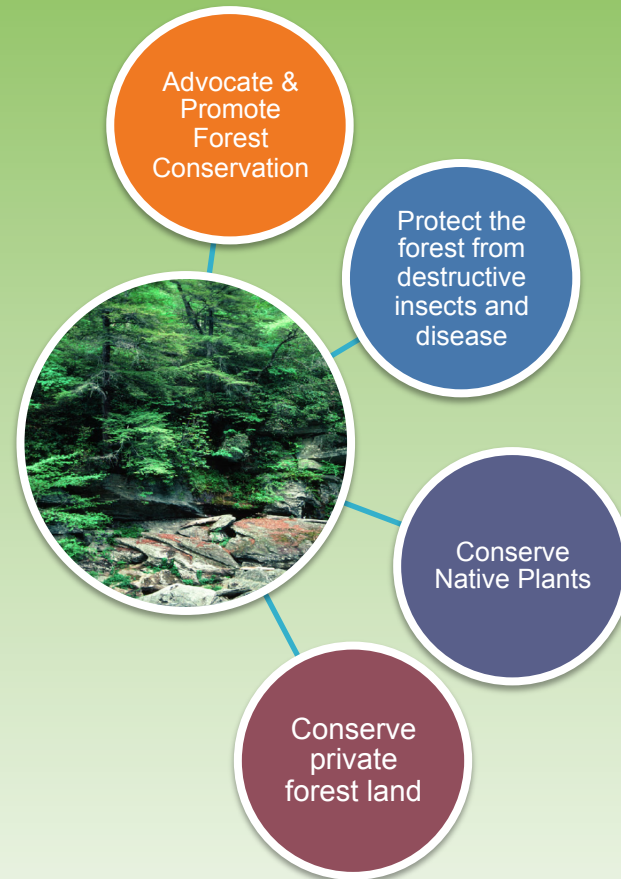
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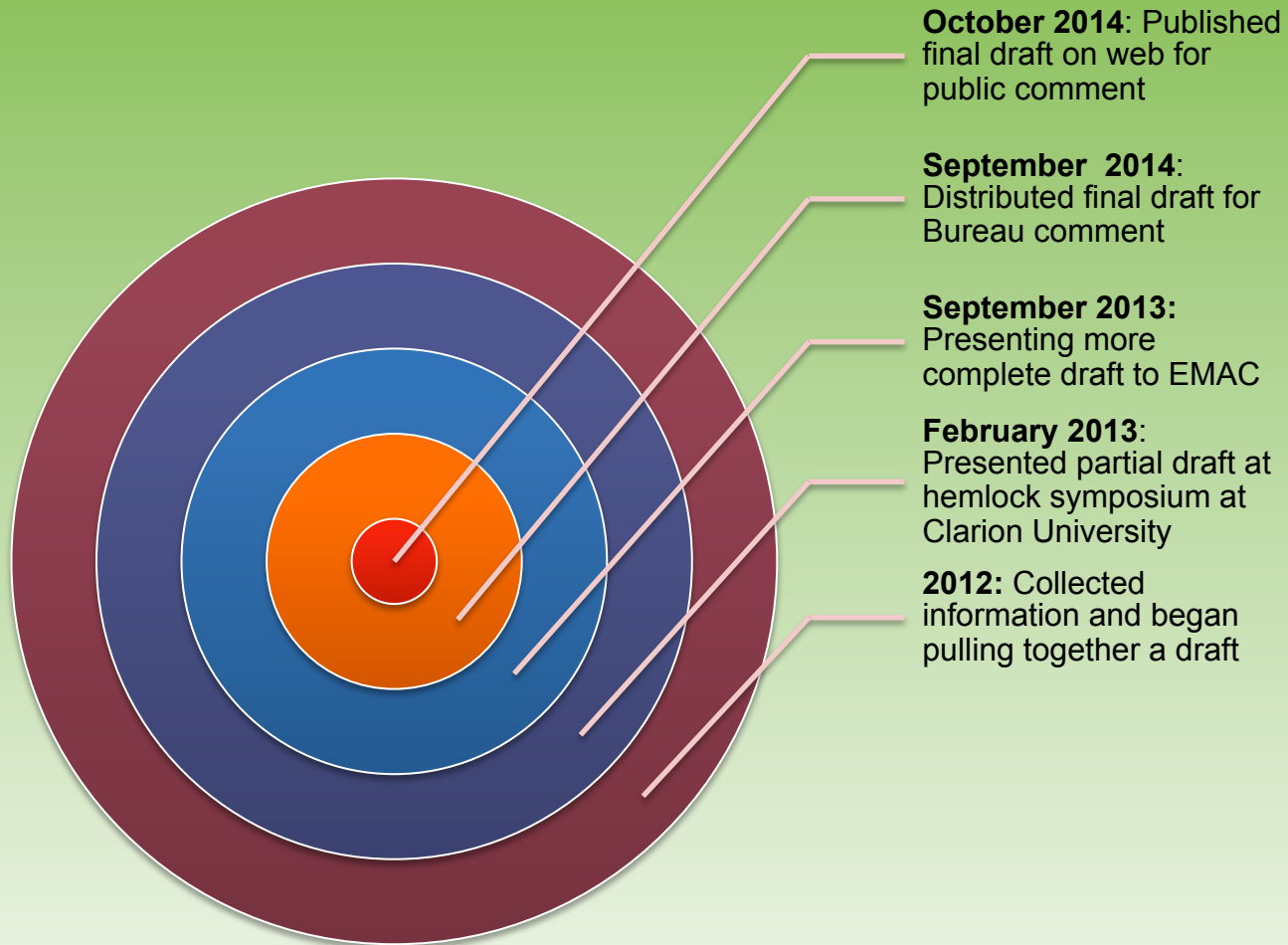
Why did we develop this plan?

It fits our mission: Ensure the long-term health, viability and productivity of the Commonwealth's forests and to conserve native wild plants.

It addresses several key Bureau functions



History and Timeline of Hemlock Conservation Plan



Purpose of Plan:

The purpose of this plan is to provide a sustainable conservation strategy for eastern hemlock, integrating all available information regarding the species and its associated threats into a comprehensive and science based approach.



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Applicable to public and private land.

Written for a broad audience

Citations provided for those wishing to delve deeper into the literature



Plan is divided into five main sections:



Eastern Hemlock

- biology
- life history
- ecological, economic, cultural significance



Stressors, Threats & Control Tools

- Abiotic
- Biotic
- Control tools



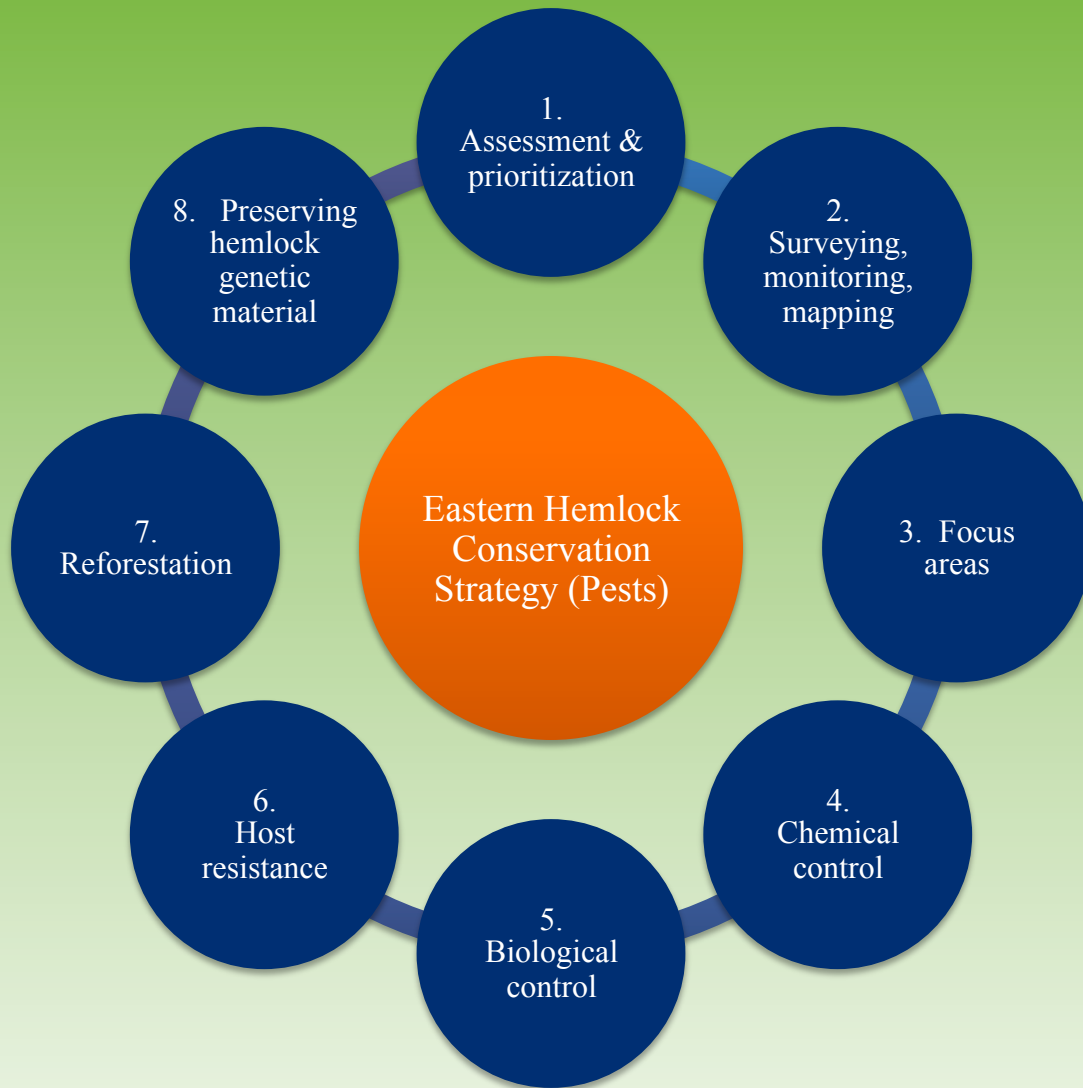
Conservation Strategy



Implementation Strategy



Critical Research Needs



Conservation Strategy (Threat 1: Hemlock Pest Management)

1. Assessment and Prioritization of Sites:

- Perform landscape level hemlock assessments
- Determine extent and health of hemlock on property
- Assess sites and prioritize them for treatment

Low Priority Sites

High Priority Sites

Low Priority Sites	High Priority Sites	High Priority Sites (recreational/aesthetic)
1. areas that have already suffered heavy insect pest induced mortality or decline (~ >70% defoliation)	1. old growth present	1. old growth present
2. hemlock growing in shallow, excessively drained soils (high drought stress susceptibility)	2. potential habitat of refuge for hemlock (e.g., north facing slopes, riparian areas)	2. hemlock of historical or cultural significance
3. hemlock growing on waterlogged soils	3. hemlock providing habitat for species or resources of greatest conservation need	3. areas known for or defined by their characteristic hemlocks
4. sites not easily accessible for treatment	4. hemlock shading exceptional value (EV) or High Quality (HQ) streams as designated by the Pennsylvania Department of Environmental Protection (including HQ designated trout streams)	4. hemlock in high use areas (e.g., hiking trails, campgrounds)

2. Surveying, monitoring, mapping

Public land strategy

- a) (*Permanent plots*)
- b) (*General hemlock surveys*)

Private land strategy

- a) Inspect annually Nov-May
- b) Presence/Absence HWA
- c) Determine proportion of infested branches
- d) Set threshold for treatments



3. Focus Areas

- I. Cook Forest State Park
- II. Tionesta Scenic & Research Areas
- III. Heart's Content Scenic Area
- IV. Snyder Middleswarth Natural Area
- V. Detweiler Run Natural Area
- VI. Alan Seeger Natural Area
- VII. Bear Meadows

4. Chemical Control: pockets of designated hemlocks treated with insecticides until longer term solution developed

- a) imidacloprid
- b) dinotefuran

Utah State University Cooperative Extension



www.forestryimages.org

5. Biological Control:

- a) *Scymnus camptodromus*
- b) *Laricobius nigrinus*
- c) *Laricobius osakensis*



6. Host Resistance:

- a) Identify any hemlocks that appear resistant to HWA
- b) Contact Alliance for Saving Threatened Forests and Bureau of Forestry Division of Forest Health

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7. Silviculture:

- a) Remove dying, heavily damaged hemlocks, or ones that have little chance of survival
 - a) <30% live crown ratio (low chance of survival)
 - b) >30% crown dieback (mortality within a year likely)
 - c) >35% foliar transparency (mortality within a year likely)

- b) Promote conditions favoring desired tree species already on site

- c) If conifer presence still desired, promote conditions favorable for establishment of conifers already on site, and supplement with plantings of appropriately adapted species

8. Preservation of hemlock genetic material: The Bureau has aided Camcore to collect eastern hemlock seeds from Pennsylvania

Among many other projects Camcore currently has four gene conservation programs:

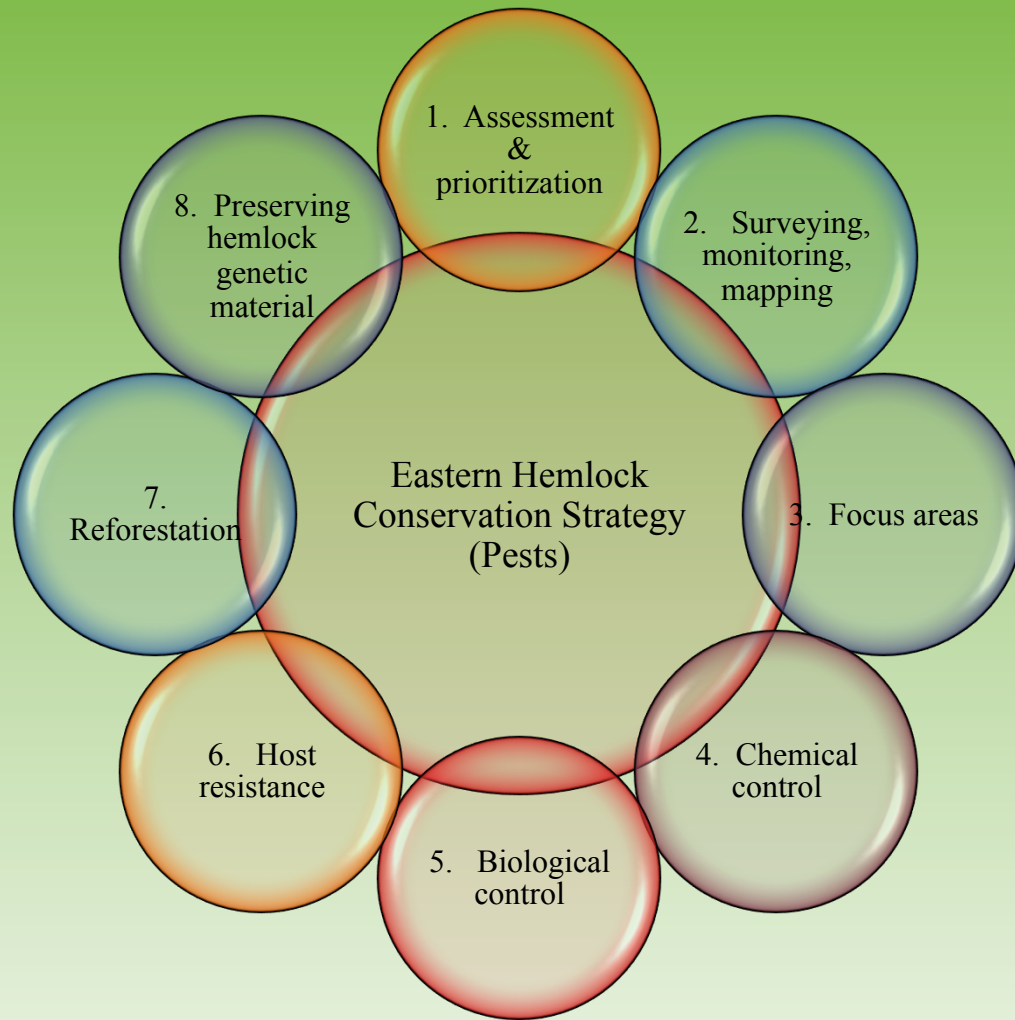
eastern hemlock
Carolina hemlock
table mountain pine
Atlantic white cedar

Ensure private forestry sector has access to a broad genetic base of the best-adapted and productive species for use in plantation forestry programs in the tropics, subtropics and subtemperate regions.



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Conservation Strategy

(Threat 2: Climate Change)

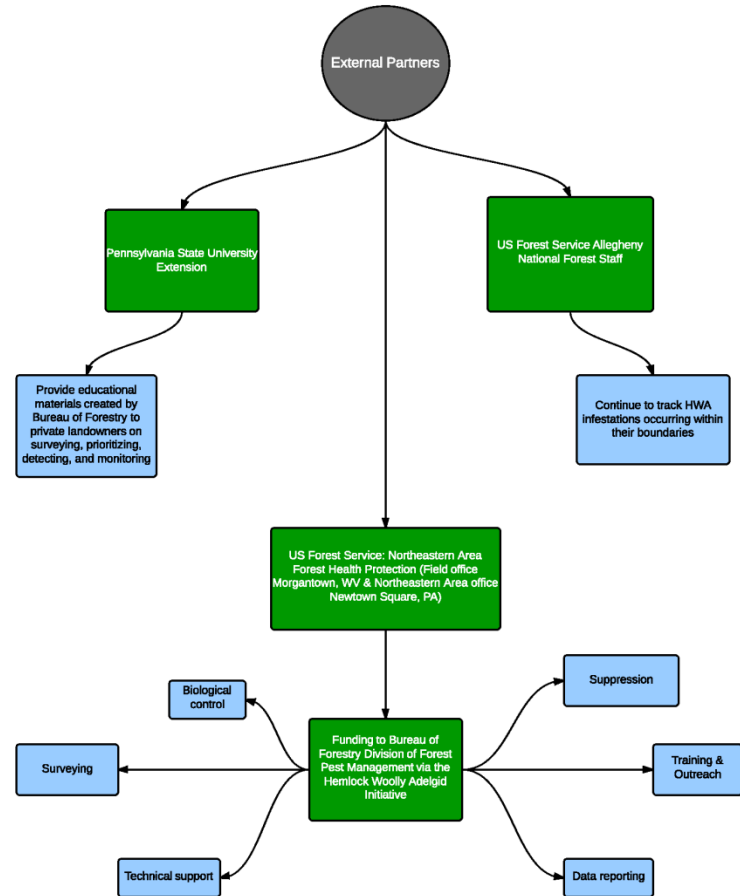
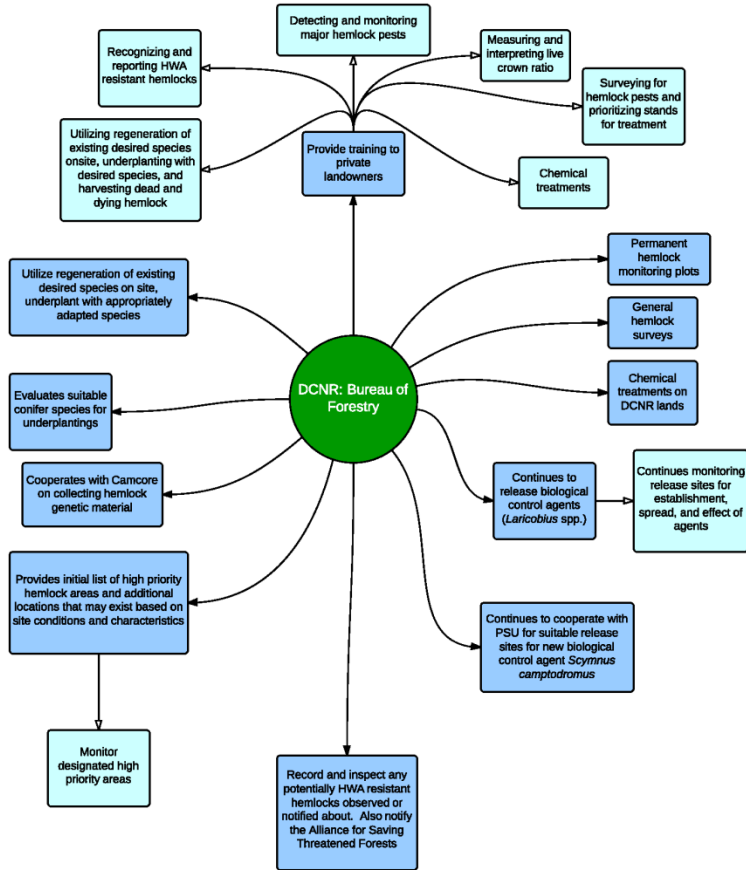
1. Identify potential refugia sites for eastern hemlock as these may be more able to resist changes in climate. This allows for small relict populations to exist, preventing complete disappearance.
 - cooler, wetter sites
 - riparian areas
 - north facing slopes
 - lake edges and wetlands
2. Adapting control measures above current levels to compensate for expanded range of hemlock woolly adelgid
3. Ensuring any potential replacement species will be suitable for anticipated climate conditions in the future

Implementation of Strategy

Collaborative effort:

- US Forest Service (Hemlock Woolly Adelgid Initiative)
- Division of Forest Health
- Division of Conservation Science and Ecological Resources
- State Forest Districts

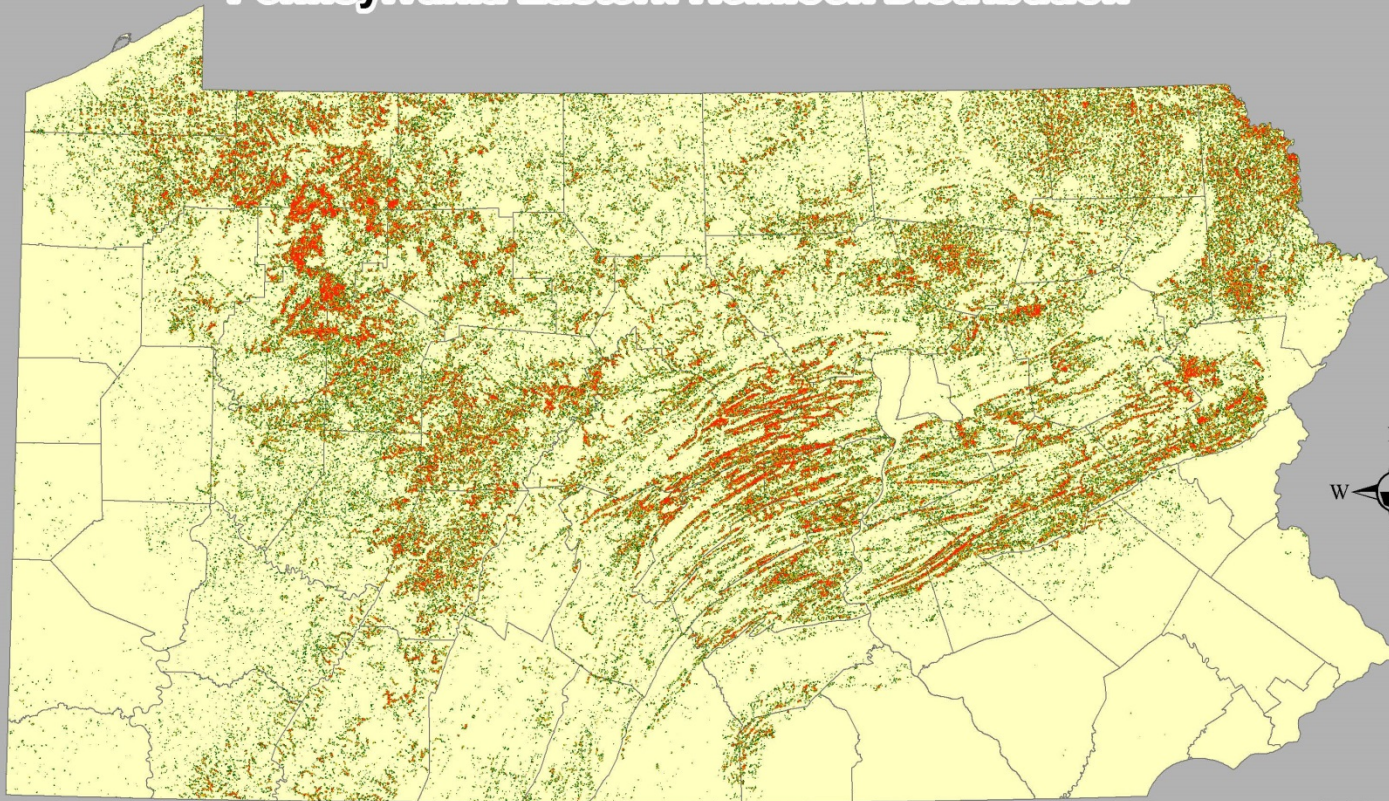




Critical Research Needs

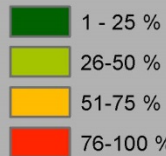
1. Identifying sites with longstanding HWA infestations for any hemlock that appear healthier than neighboring trees or stands. Document and describe sites extensively, identifying potentially resistant hemlock and analyzing landscape factor(s) that may have contributed to survival.
2. Better understanding of how hemlock sites in Pennsylvania respond several years after being treated with insecticides (HWA)
3. Using integrated pest management techniques to develop methodology that best utilizes available resources to treat or preserve hemlock habitat.

Pennsylvania Eastern Hemlock Distribution

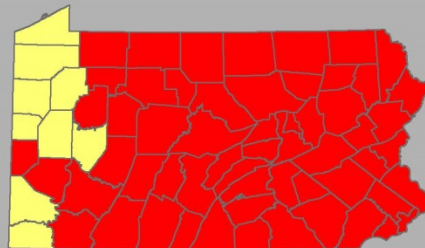


0 20 40 80 Miles

Eastern Hemlock Frequency



Eastern hemlock distribution data courtesy of:
US Forest Service: Forest Health Technology
Enterprise Team (FHTET)



Counties with known hemlock woolly adelgid
infestations as of 2014 shown in red

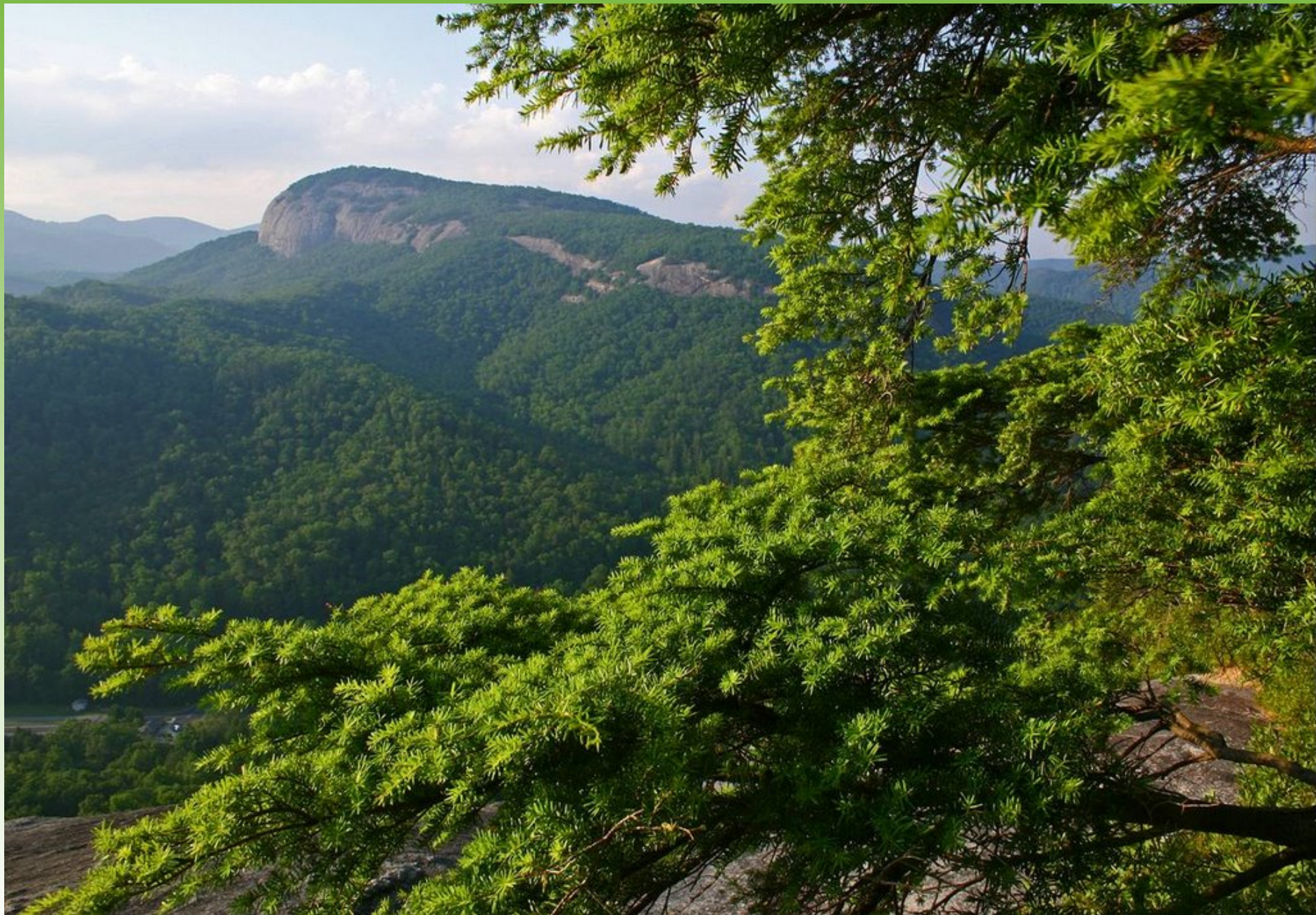
by: Dr. Mark S. Faulkenberry



Public Interest

The final draft was released to the public on October 2014 and has generated a lot of public and media interest.

- Many suggestions or nominations for focus areas on private land
- General hemlock treatment and diagnosis questions
- Several interviews with reporters and news articles written
 - Post Gazette
 - NPR
 - Morning Call
 - Washington Observer Reporter



<http://savethehemlock.blogspot.com>