Forest Health Program
Invasive Forest Pests

Hemlock Woolly Adelgid

Emerald Ash Borer

Oak Wilt
Insects are cold blooded-They have no ability to regulate their internal temperature. They are simply at the ambient environmental temperature of their habitat.

**When** they mate, lay eggs, estivate, pupate or feed is driven by temperature.

Temperature triggers larvae to replace water with glycerol in the fall. Then heat is needed in the spring to trigger the conversion back to water. Each species (insects or plants) has it’s own unique amount of time and accumulated heat needed to get started in the spring

Bark beetles in the south have 3-6 generations a year. Bark beetles in NH struggle to get through two.

We often use “Growing degree days” as a way to measure this heat accumulation.
GDD = \( \frac{( \text{max temperature } °F + \text{min temperature } °F)}{2} \) – base temperature °F

On a nice April day it was 49 degrees in the morning and hits 68 degrees. \((68+49)/2 = 58.5\). Subtract the base 50 and you had 8.5 GDD that day.

On July 3rd it was 60 in the morning and hit 90 in the afternoon. \((90+60)/2 = 75\) Subtract the base 50 and you had 25 GDD that day.
Sugar maple flowers between 50-100 GDD

GM needs 100 GDD to hatch

Eastern tent caterpillar comes out at 100 GDD

Tomato’s start to ripen at 1300 GDD

Fall webworm needs 1500 GDD to emerge
Likely introduced in the mid 1990's.
Looking down into a Russian steel ship in the port of Philadelphia in 1996

“Dunnage. The famous wooden cribbing that had to be removed from the ship and burned”
2022 Emerald Ash Borer Management

- **2022 Biocontrol Release Site**
- **2022 Seed Collection Site**
- **2022 Insecticide Treatment Site**
- Previously Infested Towns
- Towns Newly Infested in 2022

Map of New Hampshire showing the distribution of biocontrol release, seed collection, and insecticide treatment sites, as well as previously and newly infested towns.
July-August: Eggs hatch into larvae & tunnel into tree

August-October: Larvae feed under bark creating s-shaped galleries. (Need 250 feeding days to get to 4th instar)

Mid-July-August: Adults lay eggs on bark

June: Adults emerge leaving d-shaped holes
Begins at 500GDD
Peak at 1000GDD

September to November: 4th instar larvae excavate chamber, curl up and wait to pupate. Instar 1-3 just stop feeding for the year.
500 Degree Days

Key
- June 15 - June 22
- June 22 - June 29
- June 29 - July 6
- July 6 - July 13
- July 13 - July 20
- July 20 - July 27
- July 27 - August 9
- Not applicable

Calendar dates by which 500 growing degree day thermal units (base 50°F) are reached in New Hampshire. Estimates are based on an interpolation of average seasonal daily accumulations (calculated by the Baskerville-Emm method) at 452 locations across the state, 1981 to 2010.

1000 Degree Days

Key
- July 10 - July 17
- July 17 - July 24
- July 24 - July 31
- July 31 - August 7
- August 7 - August 14
- August 14 - August 21
- August 21 - September 5
- Not applicable

Calendar dates by which 1000 growing degree day thermal units (base 50°F) are reached in New Hampshire. Estimates are based on an interpolation of average seasonal daily accumulations (calculated by the Baskerville-Emm method) at 452 locations across the state, 1981 to 2010.
Consequences of going from mostly two year life cycle to mostly one year.

Population grows and spreads exponentially faster.

Biocontrol less effective

Ash trees will struggle to regenerate
Emerald Ash Borer Adult Forecast
Threshold: 391 GDD(F), Base: 54F, Start: Jan 1
Generated on April 6, 2023
www.usapnn.org

Emerald ash borer adult emergence forecast
SO WHAT CAN WE DO?

1. Minimize your purchase of products outside North America and the Northeast if possible. (ie: “don’t move firewood” campaigns)

Marlborough, NH

Amethyst cedar borer (Semanotus amethystinus) from Sierra Nevada’s
2. Don’t plant non-native plants
Pests and pathogens are very host specific. If you plant something outside its current range you will invite a new suite of problems to find it.
   white pine blister rust
   Red pine scale

3. Diversify your forest types and size classes.
Many different native species and age groups is best

4. Reduce overstocking
   High basal areas equal elevated risk of forest health issues.
   FIA/FHM analyst (Joel Egan, Interior West) recent study of acres damaged by fire, insects, disease, declines. Coast to coast significant correlation between basal area and poor forest health.
Previous release sites by year

Ln collected on white pine 10/4/22