Pennsylvania Forest Health Highlights 2020

Aerial survey

Aerial survey was not conducted in 2020 due to Covid-19. Detection data this year are from limited ground surveys, Forest Insect and Disease reports (FID), and other related projects. The majority of the damage reported is from fall webworm, locust leafminer, frost, white pine weevil, and orange striped oak worm (Figure 1-2). The list of damage agents classified as "others" was extensive (Figure 3).

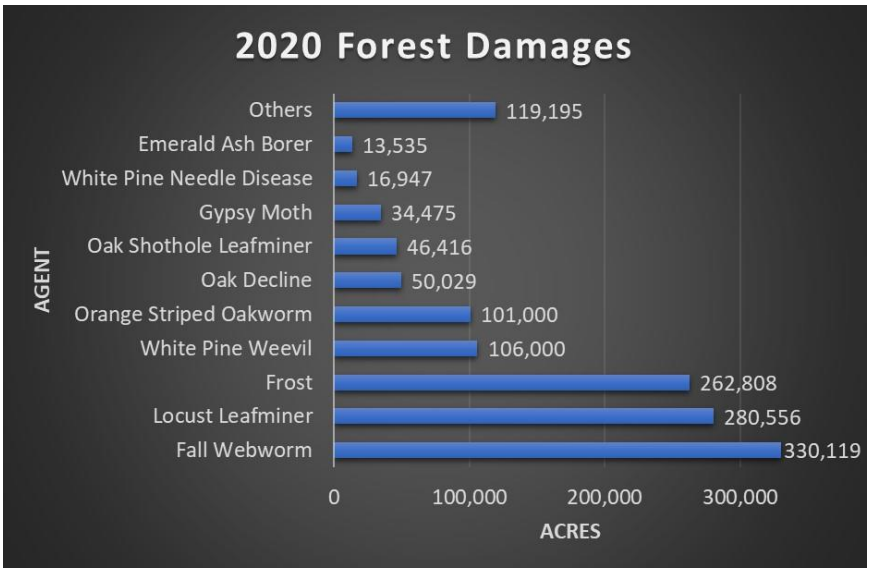

Figure 1. Top forest damage agents recorded in 2020 by acres impacted.

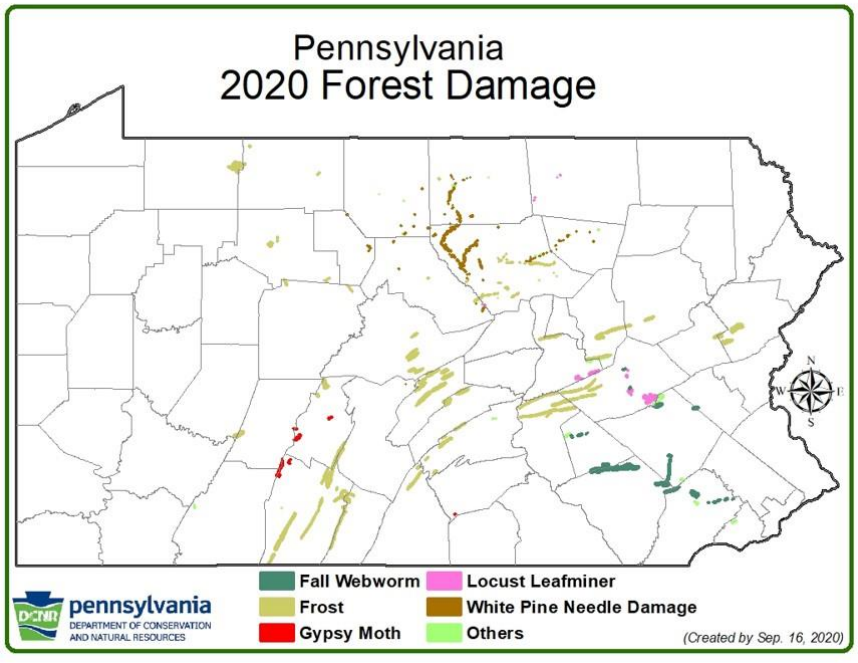

Figure 2. Map of 2020 forest damage agents.

Others (pest list)	
Anthracnose	Hemlock Woolly Adelgid
Apple wood stainer	Hypoxylon canker
Armillaria	Leaf Spot(s)
Aspen leaf miner	Mites
Bacterial Leaf Scorch	Musclewood decline
Beech Bark Disease Complex	Needlecast (Rhizosphaera)
Beech Leaf Disease	Neotelphusa querciella
Beech Scale	Oak leaf miner
Botryosphaeria dieback	Oak leafroller
Brown Spot	Oak Sawfly
Brown spot	Oak Wilt
Caliciopsis Canker	Peach bark beetle
Cane blight of blackberry	Pine Bark Adelgid
Caterpillar feeding	pine bark beetles
Cedar-hawthorn rust	Saddled Prominent
Cherry leaf spot	Septoria leaf spot
Cherry Scallop Shell Moth	Sirococcus Blight
Chionodes fuscomaculella	Southern Pine Beetle
Dothistroma Needle Blight	Spotted Lanternfly
Drought	Staghorn sumac aphid
Eastern Tent Caterpillar	White Oak decline
Elongate Hemlock Scale	White Pine Blister Rust
Faberella Neddle Cast	Wind-Tornado/Hurricane
Fall Cankerworm	Witch hazel leaf miner
Hemlock Looper	

Figure 3. List of damage agents included in "other" agents included in Figure 1 and 2.

Hemlock woolly adelgid

Spring insecticide treatments were postponed until Autumn due to Covid-19. Approximately 80,000 inches was either planned or completed with imidacloprid treatments (soil tablets, soil injections) and 10,000 inches for dinotefuran (soil injections). There were no HWA bio-control predator releases in 2020, but 510 *Laricobius osakensis* and 1,096 *Laricobius nigrinus* were released in 2019. Small numbers of *Laricobius osakensis* larvae and adults have been recovered at two release sites in 2020. We continue to monitor a potentially hemlock woolly adelgid resistant test plot of hemlock in Tiadaghton State Forest District, from trees provided to us by the US Forest Service and researchers at the University of Rhode Island. We also funded research by the University of Rhode Island looking for additional HWA resistant hemlock in Pennsylvania.

Emerald ash borer

All counties in Pennsylvania are now positive for emerald ash borer (Figure 4). There were 246 ash trees treated with emamectin benzoate in 2020 as part of DCNR's Emerald Ash Borer Management plan. In attempts to establish a successful biological control program for emerald ash borer, parasitoid releases (all wasps) have been conducted since 2011. In 2020 there were 5,200 *Oobius agrili*, 4,915 *Spathius galinae*, and 14,236 *Tetrastichus planipennisi* released. *Tetrastichus planipennisi*, *Spathius galinae, and*

Oobius agrili have been recovered from release sites in Pennsylvania in 2020. The communities participating in the emerald ash borer community grants program are Philadelphia, Lancaster, State College Borough, Pottsville, Easton, Reading, Lewisburg, and Newtown Township.

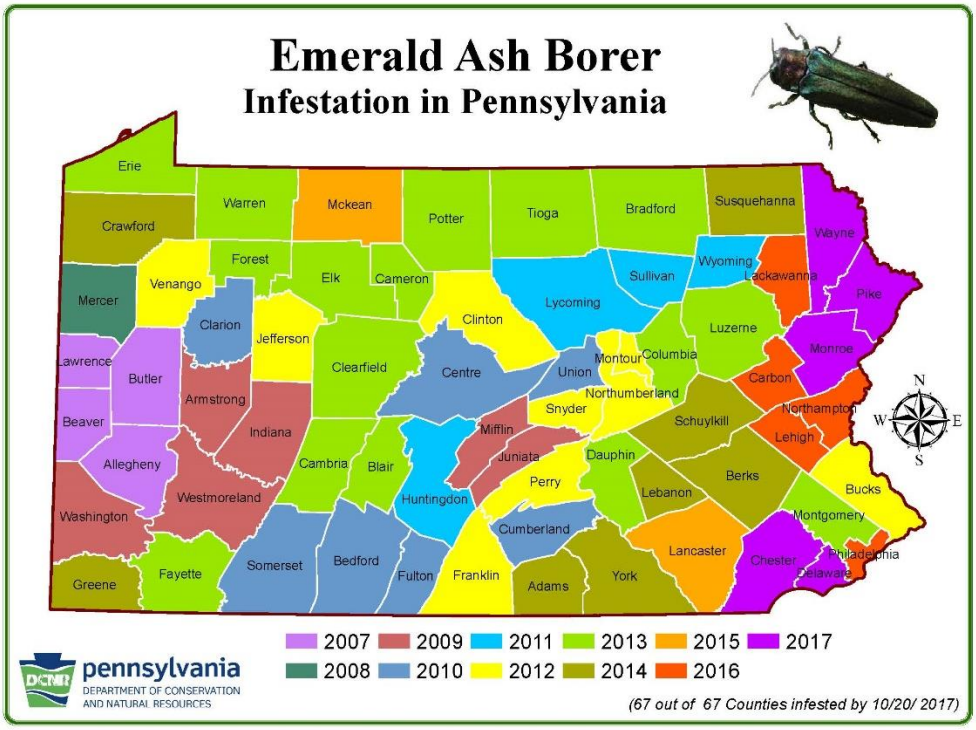

Figure 4. County map of Pennsylvania show year counties recorded positive for EAB.

Forest tent caterpillar

There was no forest tent caterpillar trapping program this year due to Covid-19. Surveys will resume in 2021.

Southern pine beetle

There was no southern pine beetle trapping program this year due to Covid-19. Surveys will resume in 2021.

Gypsy moth

There was no gypsy moth suppression program in 2020 but the spray program in 2021 will be the largest since 2008, with around 200,000 acres planned for treatment. State Forests, State Parks, Game Commission, and federal forestlands will be treated in 2021.

White pine

Brown spot needle blight (*Lecanosticta acicola*) was the primary pathogen of white pine, being more severe in the central and north central parts of the state (Figure 5). Bifusella needle cast (*Bifusella linearis*) was also present but limited and not currently a major factor. Permanent white pine monitoring plots are being established across the state.

Figure 5. White pine damage due to brown spot needle blight (*Lecanosticta acicula*).

Oak wilt

Oak wilt (*Bretziella fagacearum*) is confirmed in over half the counties of the state, but outbreaks have recently increased across the north central portion (Figure 6). A technique for managing oak wilt using herbicide in lieu of trenching was recently developed in Wisconsin and is being assessed by DCNR and Penn State Extension for use in Pennsylvania.

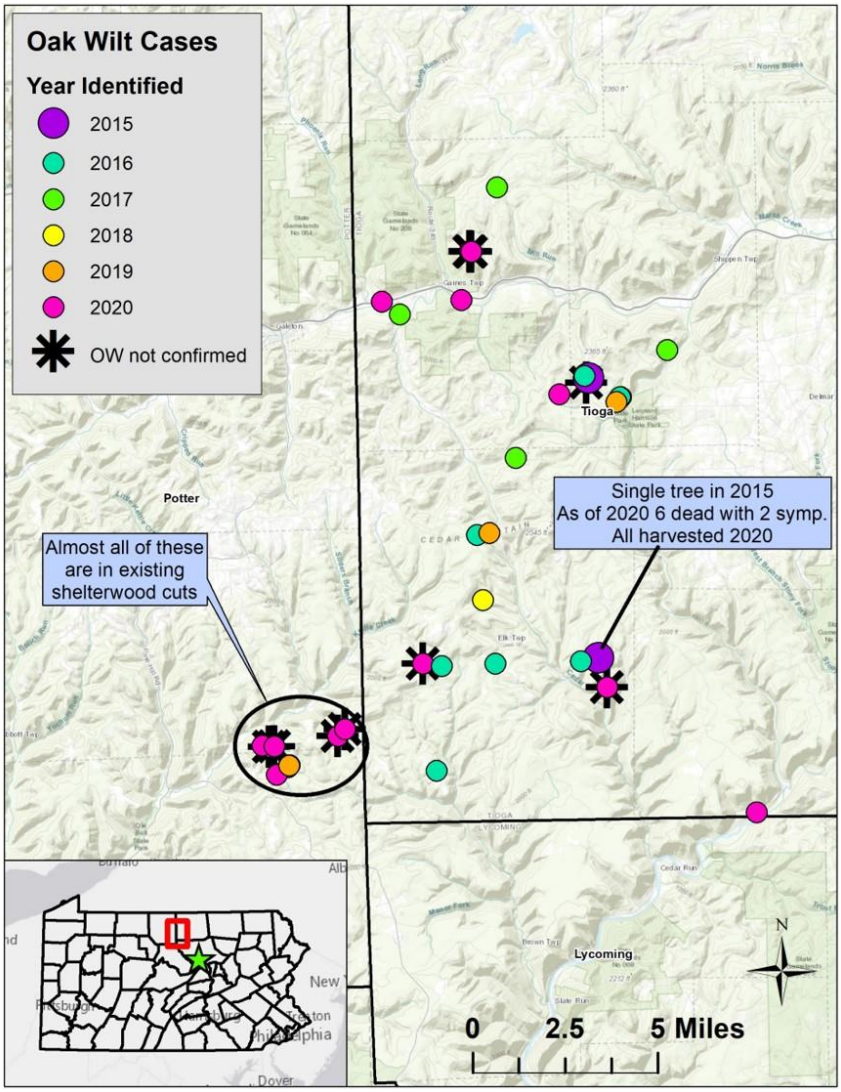

Figure 6. Oak wilt locations identified by year in north central Pennsylvania.

Other Oak Mortality Issues

There is concern with white spongy rot associated with chestnut oak mortality but currently there is no specific diagnosis available. There is also concern with Diplodia canker, bacterial leaf scorch, and associated declines on red oak. Damage has also occurred due to excess moisture in early spring followed by drought and frost events later that season.

Beech leaf disease

Beech leaf disease has been confirmed in 22 counties in Pennsylvania, with Butler, Cambria, Clarion, Clinton, Indiana, Jefferson, Lycoming, Luzerne, Somerset, Tioga counties all being added in 2020 (Figure 7). All beech trees in the forest can be affected (seedlings, saplings, mature trees). Observed symptoms are leaf curling and necrosis followed by twig and branch dieback, or tree mortality within 2-3 years (Figure 8-9). Seven additional permanent beech monitoring plots were set up in 2020, with 15 total plots now established. A non-native nematode (*Litylenchus crenatae*) has been linked to beech leaf disease and research is ongoing to further illuminate the relationship of this organism to the pathogen.

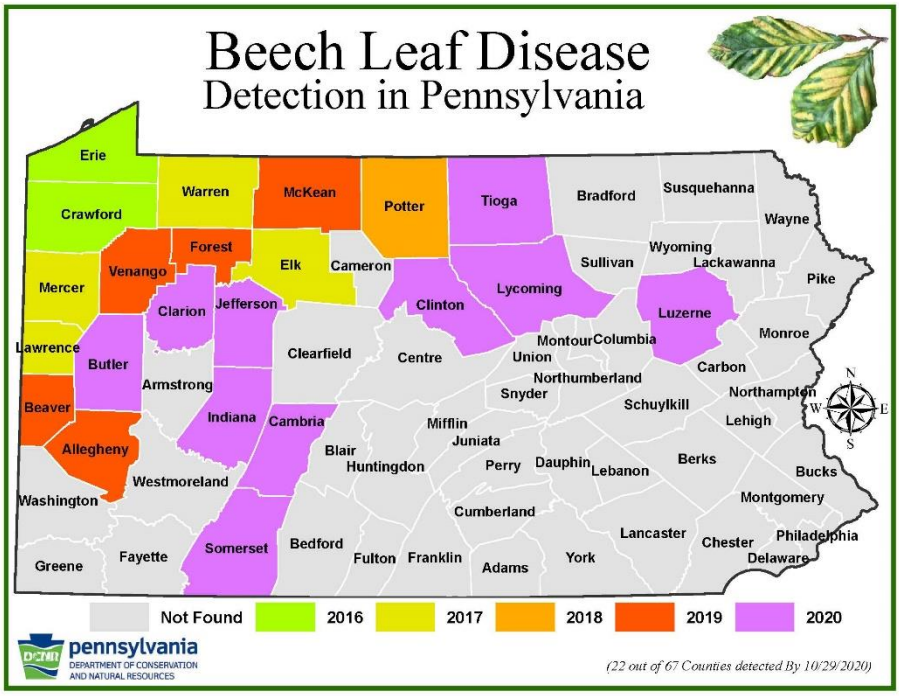

Figure 7. Pennsylvania counties with positive with beech leaf disease by year of detection.

Figure 8. Beech leaf disease striping,

Figure 9. Leaf necrosis caused by beech leaf disease.

Anthracnose

High moisture and precipitation levels have led to a major increase of anthracnose (a fungal pathogen), throughout the growth period (Figure 10). Damage is heavy to severe statewide and has been observed on oak, maple, beech, birch, and sycamore. Weakened by infestations of anthracnose during previous two years, chestnut oaks in certain areas were killed or suffered from severe dieback due to invasions of two-lined chestnut borer along with armillaria and other damage factors.

Figure 10. Increase infections of anthracnose in 2020.

Abiotic Factors: Frost & Drought

Two significant frost events in May of this year caused damage to several species in a large area of central PA. Oak species on ridge slopes, beech throughout northcentral PA, as well as a variety of understory species were affected. The frost effects varied by species based on topography and latitude gradients. Trees had stunted and deformed leaves, and flowering of some species in certain areas was affected, leading to low seed abundance. Northcentral PA also experienced a drought in 2020, leading to Drought Warnings and Watches being issued for several counties. This stress caused early senescence in many species (mostly Northern Hardwoods) and possibly some canopy dieback in sugar maple.

Spotted Lanternfly

Research by DCNR found that spotted lanternfly (*Lycorma delicatula*) and tree-of-heaven (*Ailanthus altissima*) are closely connected in natural habitats. Tree-of-heaven was involved in every life stage of spotted lanternfly, and a preferred species for egg laying and adult feeding. Spotted lanternfly fed on a wider variety of plant species when the insects were immature (black walnut, black birch, maples, American beech, multiflora rose, tree-of-heaven), but preferred tree of heaven as adults.

The Pennsylvania Department of Agriculture is the main agency managing this pest and more information can be found at their website, (http://www.agriculture.pa.gov/protect/plantindustry/spotted_lanternfly/Pages/default.aspx).

Northern Walking Stick

A northern walking stick (*Diapheromera femorata*) outbreak is in its second year in Bedford County (Figure 11-12). Outbreaks have traditionally occurred here every 9-10 years, lasting 2-3 years each time.

Figure 11. Walking stick in Bedford County Pennsylvania

Figure 12. Walking stick defoliation recorded in Bedford County, Pennsylvania in 2020.