Spring 2021 PA Forest Health Report

Report from the PA DCNR Division of Forest Health's annual monitoring program for insects, pathogens, weather stress, and other forest health issues, including forecasted issues for the upcoming year.

Updated: March 18, 2021

Gypsy moth is likely to be one of the most significant forest insect stressors in 2021. Photo credit: Jim Altemus

About This Document

As a forest landowner or forest manager, you've probably seen a wide variety of forest health issues (like insects, diseases, and weather stressors) pop up and fade away in your woods, some that do a lot of damage and some that are barely noticeable. Monitoring, charting, and responding to those stressors is more complicated in forests than in backyards where we are better able to do intensive management on one plant at a time. Truthfully, in many cases, the best thing to do is monitor and wait. It can feel frustrating to "do nothing," but there is tremendous value in understanding and tracking stressors in your forest over a number of years. Stressors that

negatively affect the same trees multiple times in one season, negatively affect certain trees significantly, or negatively affect the same groups of trees over multiple years cause cumulative stress for those trees. Often, these cumulative stressors rather than any one stressor are what cause larger issues in our woods.

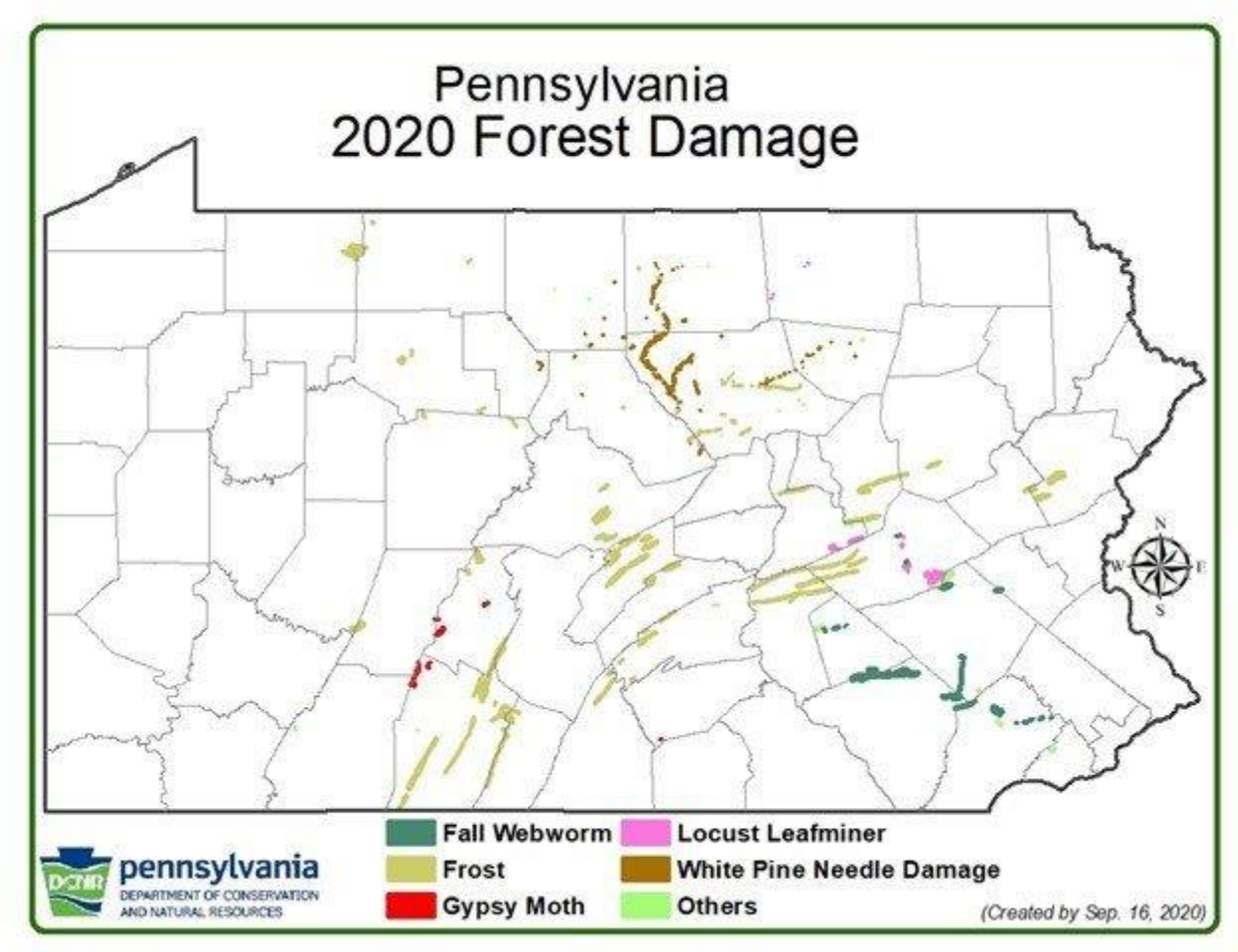
Knowing and tracking the "stress history" of your forest can help you do things like adapt planned management activities to consider those higher-stress times, understand possible reasons behind changing ecological dynamics, preempt mortality events through salvage, and prevent the spread of pests and pathogens to healthy areas through your actions. Because of this, it is recommended that you keep notes each year on stresses in your forest. Certainly, sometimes detection of a forest health threat spurs us to direct management action, but even if keeping tabs is the only action you take, you will build a "stress history" record for your forest that can be very useful to you in the future.

At a larger scale and in addition to its other work, the Bureau of Forestry's Division of Forest Health within the Department of Conservation and Natural Resources does the same thing across the state each year: monitoring and detecting forest health threats, providing advice to managers and landowners, and conducting and directing major control and research activities. This article briefly summarizes reflections on the annual, statewide program of monitoring, including a forecast of likely forest health issues in the upcoming year. This is not a comprehensive documentation of every pest, pathogen, and stress issue recently faced by Pennsylvania forests, but it highlights a few key, timely issues in focus at the state level. Even if your forest faced a slightly different set of issues this year, you should store this update with your "stress history" notes in the documents accompanying your forest management plan and discuss it with your consultant forester.

2020 Season

2020 Season Reflections

Fall webworm (*Hyphantria cunea* (Drury)), locust leafminer (*Odontota dorsalis*), frost, white pine weevil (*Pissodes strobi*), and orange striped oakworm (*Anisota senatoria*) were the leading causes of damage detected in 2020.



Keep in mind that not all of the state was surveyed for damage; the 2020 Forest Damage Map is not a comprehensive account of forest health issues but rather shows patterns of damage where surveying took place.

Typically, a considerable portion of damage detection information is collected by DCNR Forest Health via aerial forest damage survey; however, aerial surveys were not conducted in 2020 due to COVID-19. To compensate for the loss of air-based survey, 2020 damage data were primarily collected from ground surveys and reports from staff, complementing satellite data from the USDA Forest Service. You may recall that anthracnose (a fungal pathogen whose damage is more easily detected from the air) was the leading damage-causing agent detected in previous aerial surveys of 2018 and 2019 when moisture levels were high in spring. With lack of typical aerial monitoring in 2020, it was not possible to detect major damage from anthracnose, though anthracnose may still have been active.

In 2020, we also saw multiple outbreaks of native pests of stressed trees. While native insect pests are often in balance with our forest systems, causing low-level or acceptable damage, other stresses on native trees can cause a "release" of these native pests, and their impact becomes more apparent and significant. For example, stress from drought, which affected much of the state last season, may have increased trees' susceptibility to damage from other forest health

issues. Hemlock borer (*Melanophila fulvoguttata* (Harris)), observed at some sites this year, is a native beetle that attacks stressed eastern hemlock. Woodpeckers pull the bark off to eat the larvae of this beetle, resulting in a brightly colored dead hemlock. Apple wood stainer (*Monarthrum mali*) was also seen in residual trees at two sites that had been recently logged. Slightly elevated numbers of peach bark beetle (*Phloeotribus liminaris* (Harris)) were also observed in the western and northern parts of the state. This native pest of black cherry and related species attacks stressed trees but can build up populations in leftover slash materials and attack otherwise healthy trees.

In 2020, brown spot needle blight (*Lecanosticta acicola*) was the primary pathogen of white pine, being more severe in the central and north central parts of Pennsylvania. Oak wilt (*Bretziella fagacearum*) is confirmed in over half the counties of the state, but outbreaks have recently increased across the north central portion. Oak wilt can be transmitted locally via grafted root systems from an infected tree to a healthy one. It can also be spread overland by specific insect vectors such as sap feeding beetles that transmit oak wilt after landing on fungal mats formed on dying or dead red oaks in the spring. These beetles transport the spores of the pathogen to fresh wounds on a healthy tree. All pruning should be avoided between April and June to prevent the beetle from transmitting the pathogen at the time when potential for infection is highest. A technique for managing oak wilt using herbicide was recently developed in Wisconsin and is being assessed by DCNR and Penn State Extension for use in Pennsylvania. In the meantime, foresters may consider cutting down an oak wilt tree and determine an appropriate buffer of sacrifice trees by using Bruhn and Heyd's (1992) table (a component of this document); for further guidance on this, reach out to the DCNR Forest Health Division or Penn State Extension.

Some good news: Four stream baiting sites for *Phytophthora ramorum*, the cause of sudden oak death were completed in 2020, carrying on with work that has been done since 2006. To date, no sudden oak death has been reported from stream baiting surveys in Pennsylvania.

2020 Threat Highlight: Biological controls and pest resistance in ash, hemlock

Three species of wasps that parasitize emerald ash borer (*Agrilus planipennis*) (EAB) eggs and larvae continue to be released in hopes of establishing a biological control program. Trapping at three sites recovered all three species in 2020, meaning wasps have established and are surviving, feeding on EAB. Establishment will have to occur at many more sites before any conclusions can be made regarding long-term control of EAB.

Left: A release of predator beetles (*Laricobius nigrinus*) that target hemlock wooly adelgid (Photo credit: Sarah Johnson). Right: Field study assessing survival of wasps (*Oobius* and *Tetrastichus*) that parisitize emerald ash borer (Photo credit: Jim Altemus).

Populations of HWA were dramatically reduced in 2018 throughout Pennsylvania and other states due to excessive moisture causing a fungal disease in the insect, but more recent surveys have found increased numbers of hemlock woolly adelgid (*Adelges tsugae*) (HWA) than in the last couple of seasons, likely due to mild winters in 2019 and 2020. Biological control of HWA is following a similar track to that of emerald ash borer, but with predatory beetles instead of parasitizing wasps. Predatory beetles were recovered in 2020 at three release sites (a fourth site is awaiting confirmation) but more widespread establishment will be needed before any conclusions can be made regarding HWA control. Releases of beetles were made at six sites in 2020 (five were new sites, one was an augmentation). DCNR is also participating in a project involving a species of silver flies, a new biological control of HWA.

Research attempting to identify trees that exhibit some tolerance to EAB damage or resistance to HWA damage (evidenced by survival years after most other trees of the same species on site have died from those issues) has been conducted for several years and is ongoing. If you live in areas that have had one of these pests for many years, have seen mortality (death) of 95% of trees of the affected species, but have located survivors that are mature and look healthy, the DCNR Division of Forest Health would be interested in assessing them for potential inclusion in these projects; contact Dr. Houping Liu, Forest Entomologist, for more information.

2021 Season

2021 Season Forecast

A few insects to watch for in 2021 include cicadas (*Magicicada spp.*), oak shothole leafminer (*Japanagromyza viridula*), and a cynipid wasp (*Neuroterus tantulus*). Brood X of the 17-year cicada is due to emerge in southeast Pennsylvania in 2021, starting in approximately mid-May. While largely a thing of fascination, these insects can damage smaller and particularly newly planted trees. Oak shothole leafminer caused damage to oak trees across much of Pennsylvania for the second year in a row last year; while mostly a cosmetic problem, activity may have reached damaging thresholds in 2020. Natural controls may finally catch up in 2021, causing a crash in populations and lessening potential damage. Finally, it has been three years since we have seen defoliation on white oak that may be related to outbreaks of a cynipid wasp. This is usually seen from mid-June to early July, involves browning of all or part of the crown, and may include small disk-shaped galls on the underside of the leaves.

Oak shothole leafminer (left), cicadas (middle), and cynipid wasps (right) are a few insects that may cause damage to forest trees in the 2021 season. Photo credit: Jim Altemus.

In 2020, newly confirmed detections of beech leaf disease in Butler, Cambria, Clarion, Clinton, Indiana, Jefferson, Lycoming, Luzerne, Somerset, and Tioga Counties (raising the total to 22 counties) raises concern over new detections in 2021 outside the known 22 counties in PA where it has yet been observed. All beech trees in the forest can be affected (seedlings, saplings, mature trees). Fifteen permanent beech monitoring plots have been established in Pennsylvania since 2019. 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.

Recent seasons with high moisture levels have led to an outbreak of white pine needle damage (WPND) in the north central and central areas of the state; the issue remains a focus of 2021 monitoring efforts by DCNR. Five long-term monitoring plots have been established to date to

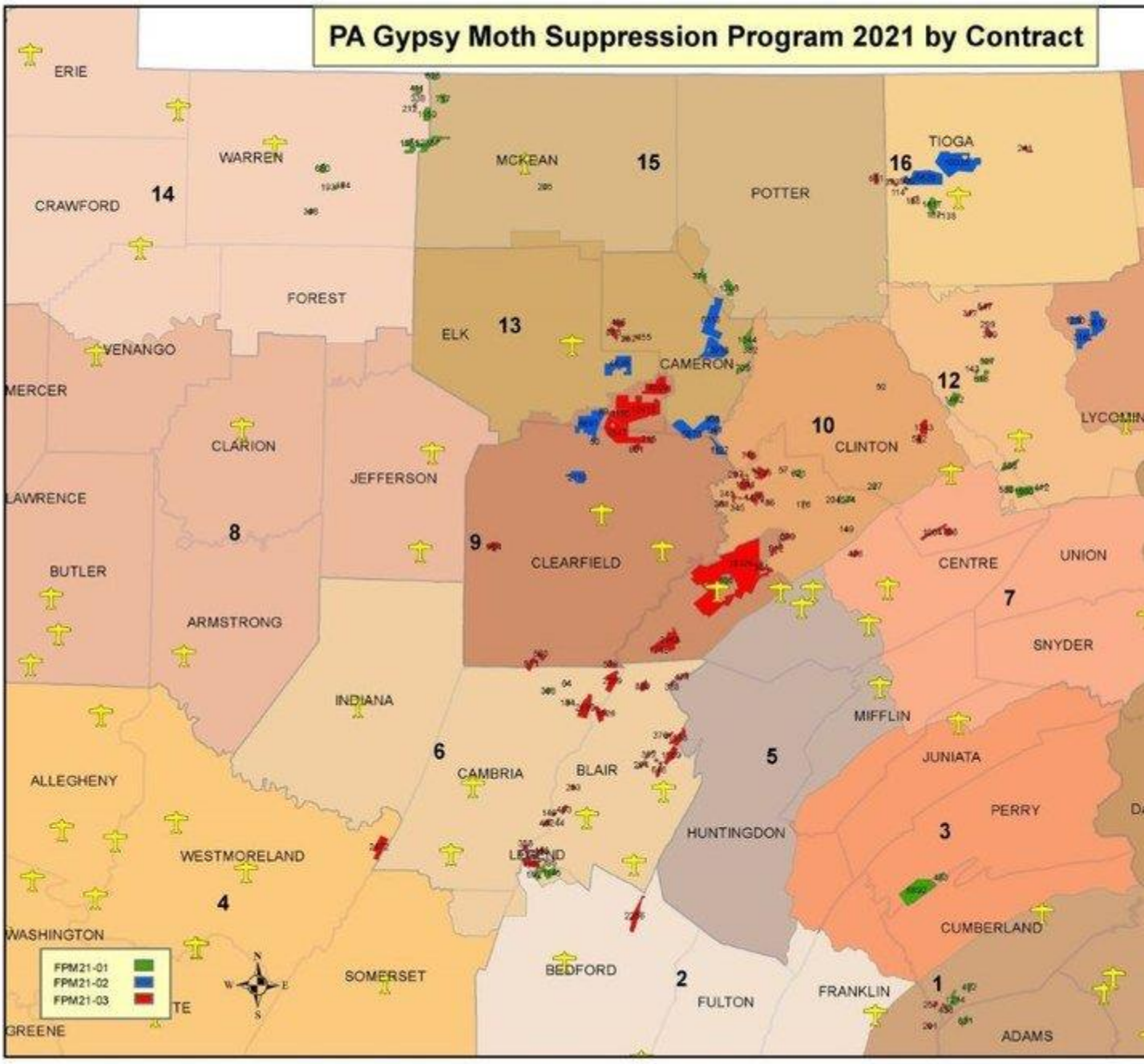
determine the impact of WPND on eastern white pine in the state. The establishment of more plots are planned for this spring and summer.

2021 Threat Highlight: Gypsy moth

Gypsy moth (*Lymantria dispar*) caterpillar populations will surge in 2021 based on the high number of egg masses observed on trees in the fall of 2020. Forests in PA experience cycles of damage from gypsy moth populations, but high population years can cause large defoliations that constitute major stress events, particularly when other stresses have recently acted on that species. Gypsy moth affects a large number of species but favors oaks. Considering other recent oak stresses in the past few years and the high egg mass observations from last season, damage from gypsy moth may be significant in 2021.

Left: Adult gypsy moth females laying eggs (Photo credit: Jim Altemus). Center: Gypsy moth caterpillar (Photo credit: Jim Altemus). Right: Severe defoliation of oaks in late May to early June of 2007 in the Moshannon State Forest. Egg mass densities were similar at that time to what may hatch in 2021 (Photo credit: PA DCNR).

A large gypsy moth suppression program involving spraying by helicopter and airplane will occur this year. Over 200,000 acres are proposed for treatment in 2021, which is the largest spray program in Pennsylvania since 2008 when over 221,000 acres were treated. The two control agents used will be: 1) *Bacillus thuringiensis* subspecies *kurstaki (*Btk), a bacterium that kills lepidopteran caterpillars upon ingestion, and 2) tebufenozide, which causes the gypsy moth caterpillars to prematurely molt and stops them from feeding. Both control agents only affect lepidopteran species of caterpillars feeding at the time of spraying; they do not impact other species of insects, birds, mammals, or arthropods. The suppression program will span 19 counties, with the bulk of spraying in Blair, Cameron, Centre, Elk, Tioga, and Lycoming County on state forestland, state gamelands, state parks, and federally owned land in the Allegheny National Forest. Treatments will begin in early May and will be conducted throughout the entire month.



Map courtesy of DCNR showing planned locations for the gypsy moth suppression program, color coded by activity. Green: helicopter/Foray 76B (Btk) 45 spray blocks; 30,808 acres. Blue: Fixed-wing aircraft/Foray 76B (Btk) 18 spray blocks; 58,366 acres. Red: Fixed-wing aircraft/Mimic 2LV (tebufenozide) 83 spray blocks; 114,395 acres. Totals: 146 spray blocks; 203,569 acres.

The program is designed to reduce damage to Pennsylvania's forests and keep trees from becoming stressed and/or dying until the naturally occurring (*Entomaphaga maimaiga*), and

gypsy moth NPV virus (nuclear polyhedrosis virus) rise to levels sufficient to cause a crash in the gypsy moth population. A cool, wet spring will aid the establishment of the fungus; the virus becomes prominent once gypsy moth populations are high. Both are very effective at controlling gypsy moth naturally once active, but spray activities offer a bridge of suppression until that time. If the public wishes to conduct a spray program on private land, the DCNR web page on gypsy moth contains information on how to conduct a spray program, a list of certified aerial applicators, factsheets on control agents, and other useful information. We suggest you contact potential applicators as soon as possible so they can make plans to treat your area at an ideal time (in May, once larval development and leaf expansion are optimal).

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