

Pennsylvania Forest Health Highlights 2024

Forest damage surveys

Forest damages were mapped through aerial detections (Figures 1 and 2) and reported via ground observations. In 2024, over 794,000 acres of wooded areas, primarily in central and northeastern Pennsylvania, were reported with damages. Of all damage causal agents documented in 2024, spongy moth (*Lymantria dispar dispar*) was the dominant defoliator, causing almost three quarters of total damage acreage (Figure 3). Also notable was the outbreak of fall cankerworm in the southwestern part of the state.

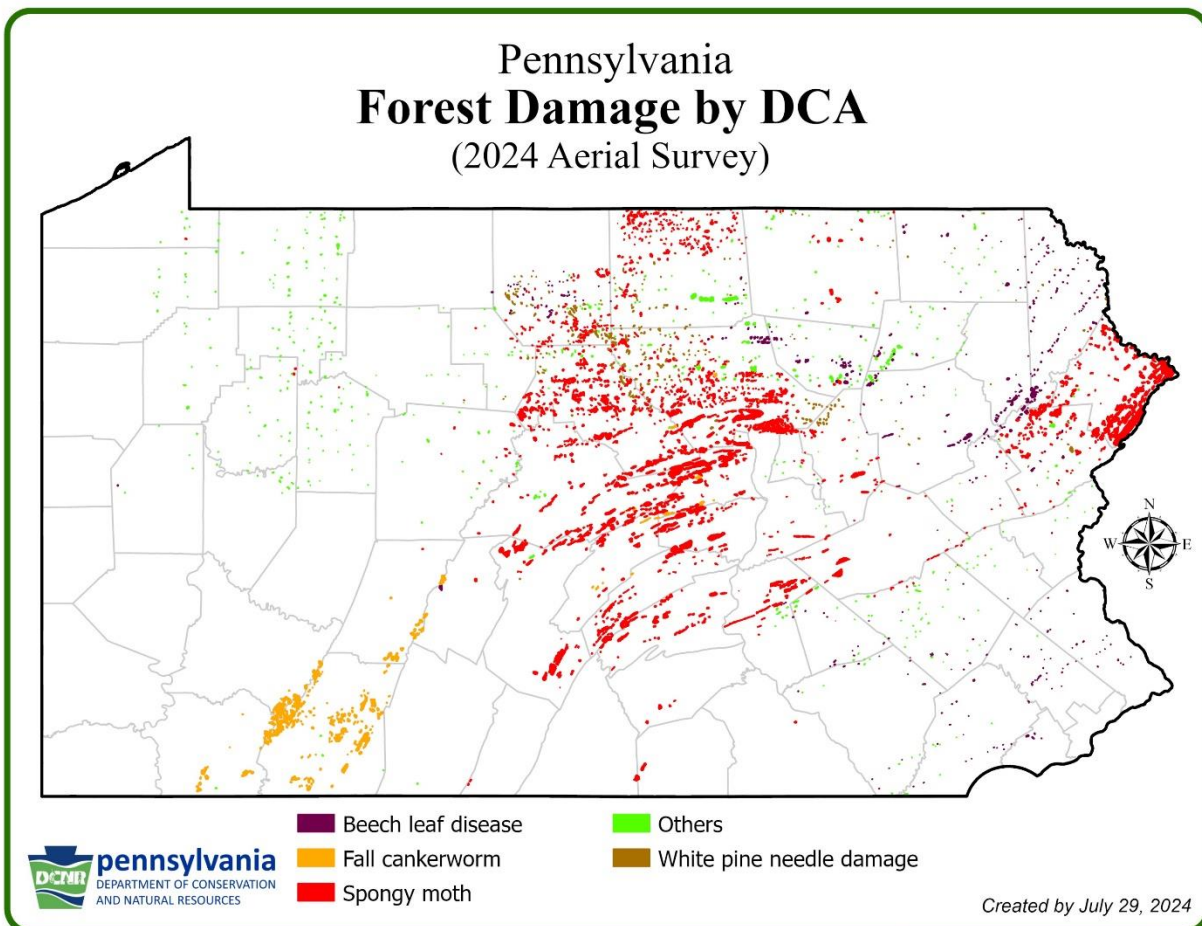


Figure 1. 2024 forest damages mapped through aerial survey.

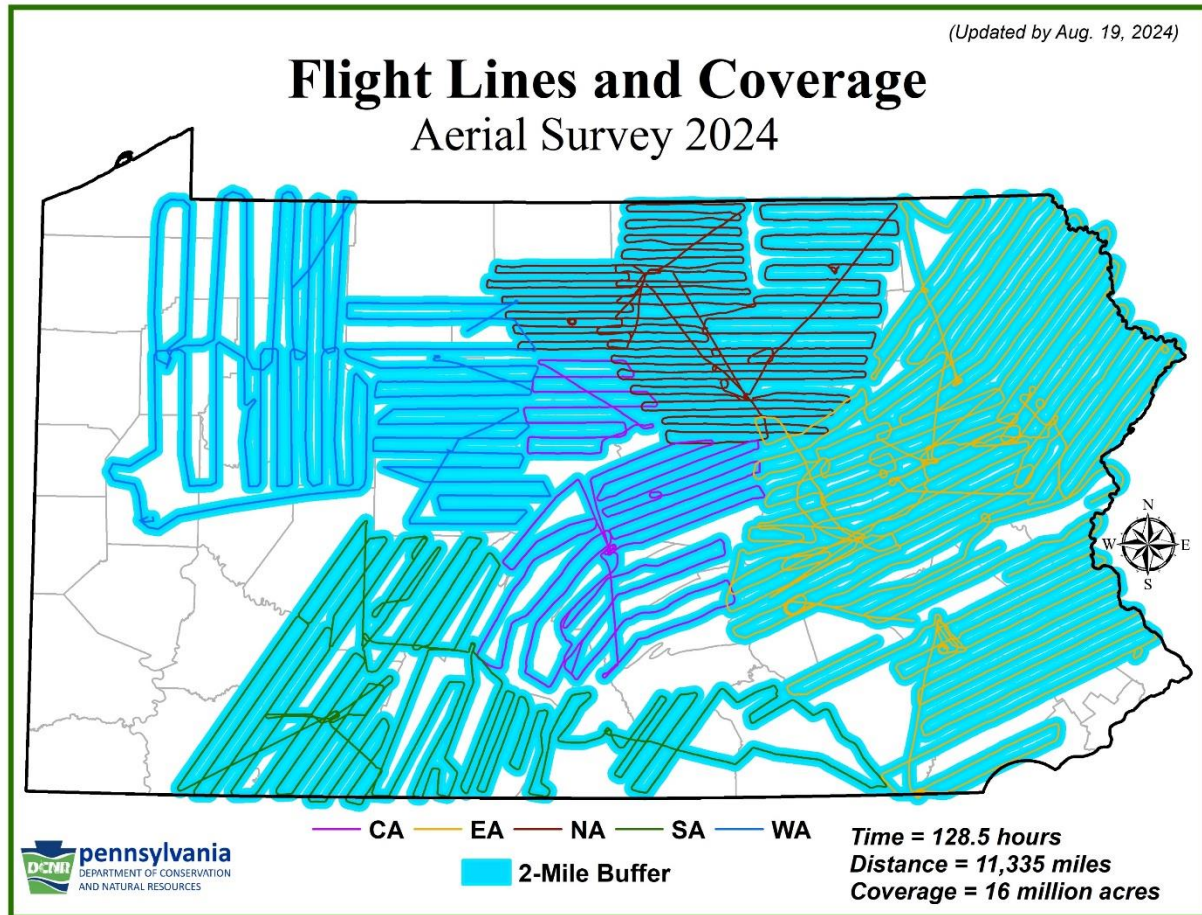


Figure 2. Aerial survey coverage in 2024.

DCA	ACRES
beech leaf disease	34,862
fall cankerworm	98,828
spongy moth	595,324
white pine needle damage	24,500
Others	41,129
Totals	794,642

Figure 3. List of major damage agents and the acreage impacted in 2024.

DCA	DAMAGE TYPE	ACRES
anthracnose	Crown Dieback	511
beech leaf disease	Other Damage (known)	34,862
cherry scallop shell moth	Defoliation 50-75% of leaves defoliated	1,101
emerald ash borer	Mortality	984
fall cankerworm	Defoliation >75% of leaves defoliated	49,395
	Defoliation 50-75% of leaves defoliated	49,432
hemlock woolly adelgid	Crown Discoloration	706
	Mortality	416
locust leafminer	Defoliation 50-75% of leaves defoliated	2,099
southern pine beetle	Crown Discoloration	224
spongy moth	Defoliation <50% of leaves defoliated	47,847
	Defoliation >75% of leaves defoliated	104,226
	Defoliation 50-75% of leaves defoliated	255,280
	Mortality	187,971
unknown	Crown Dieback	930
	Crown Discoloration	12,907
	Defoliation >75% of leaves defoliated	730
	Defoliation 50-75% of leaves defoliated	2,497
	Mortality	12,117
	Unknown Damage	5,906
white pine needle damage	Crown Discoloration	21,434
	Defoliation 50-75% of leaves defoliated	1,235
	Mortality	1,831
Grand Total		794,642

Figure 4. Greater detail on DCA's from 2024.

Hemlock woolly adelgid

At the end of 2023 hemlock woolly adelgid (HWA) was detected in Crawford County. With that detection, HWA has been identified in all 67 counties in PA (Figure 5).

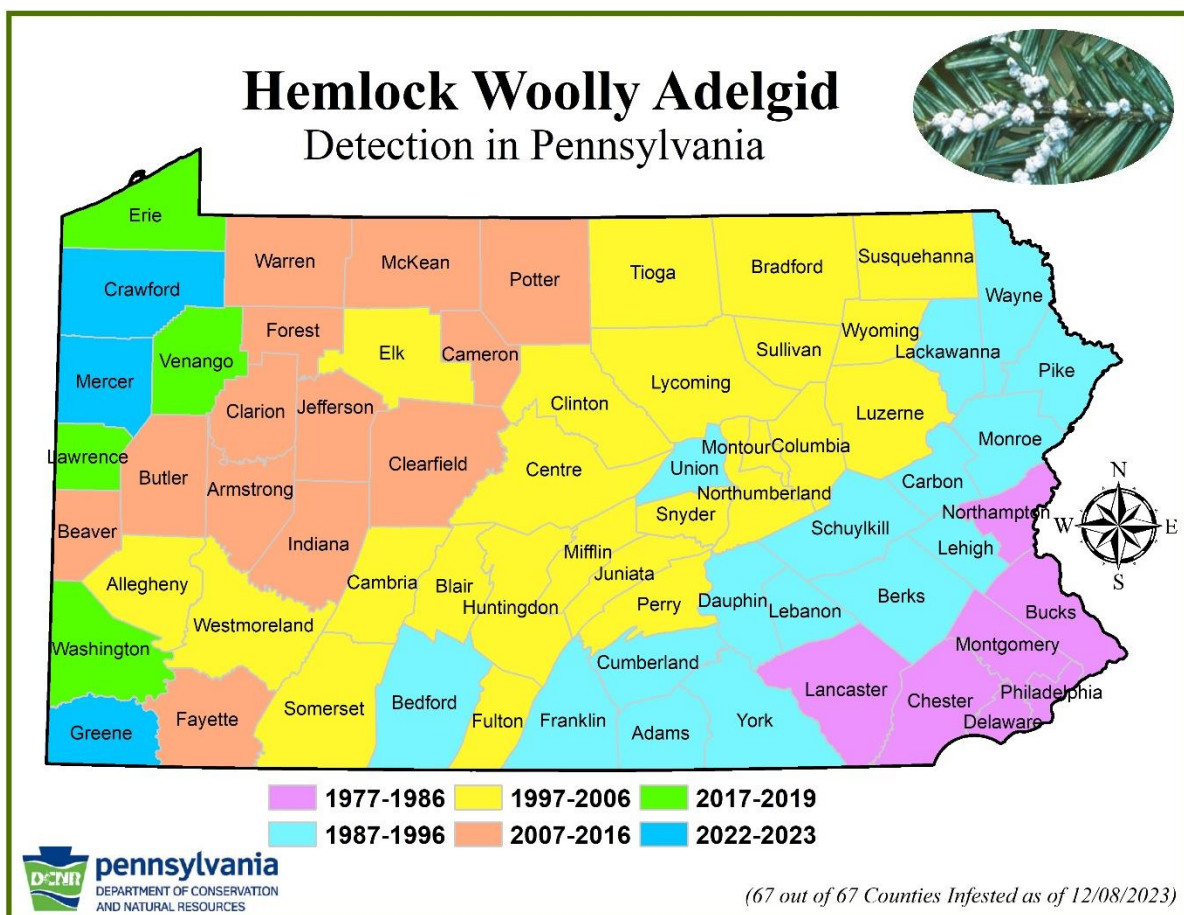


Figure 5. County map of Pennsylvania showing year counties recorded positive for HWA.

The winter of 2023-2024 did not include significant killing temperatures. HWA mortality estimates ranged from almost 0 up to 44%, with most sites below 10%. Overall, PA continues to see increased impacts from HWA, especially on marginal sites.

HWA/ elongate hemlock scale (EHS) suppression treatments are ongoing at the time of this publication but so far in the fall of 2023, 92,059" of hemlock have been treated with soil injection of imidacloprid; 24,784" with soil injection with dinotefuran; and 5,982" with CoreTect. A total of 122,825" have been treated so far, with about another 84,000" of imidacloprid and about 53,000" of dinotefuran planned or in progress in fall of 2024.

In 2024, there were 600 *Laricobius osakensis* (Lo), 2,153 *Laricobius nigrinus* (Ln) and 2,977 *Leucoteraxis piniperda* released at five sites to continue efforts at establishing a biological control program. During 2024, 44 sites in PA yielded recoveries of *Laricobius* adults.



Figure 6. Recovery *Laricobius nigrinus* adult by Jim Altemus.

We continue to monitor a potentially HWA 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. These trees are being sampled for terpene analysis at the University of Michigan, and RNA analysis at the University of Connecticut. Forest Health staff will begin searching for hemlock potentially resistant to HWA's impacts in the southeastern and south central portions of PA, to hopefully supply material to genetic resistance breeding programs. The Forest Health Division has supported further research into the effects of EHS (*Fiorina externa*) on hemlock health in the absence or presence of HWA. Several districts will also be participating in hemlock habitat management/silvicultural trials, starting winter 2024-2025. Goals of these trials will be to maintain hemlock on that site as long as you can – which means focus on getting hemlock regen; increasing structural diversity and species diversity in the regen; maintain what other species are there in the overstory; increase the vigor of residual hemlocks in the overstory – whether this means because they have increased resources and/or HWA pressure reduces; creating more habitat/food for wildlife.

Emerald ash borer

All counties in Pennsylvania are now positive for emerald ash borer (Figure 7). In 2024 212 ash trees were treated with emamectin benzoate.

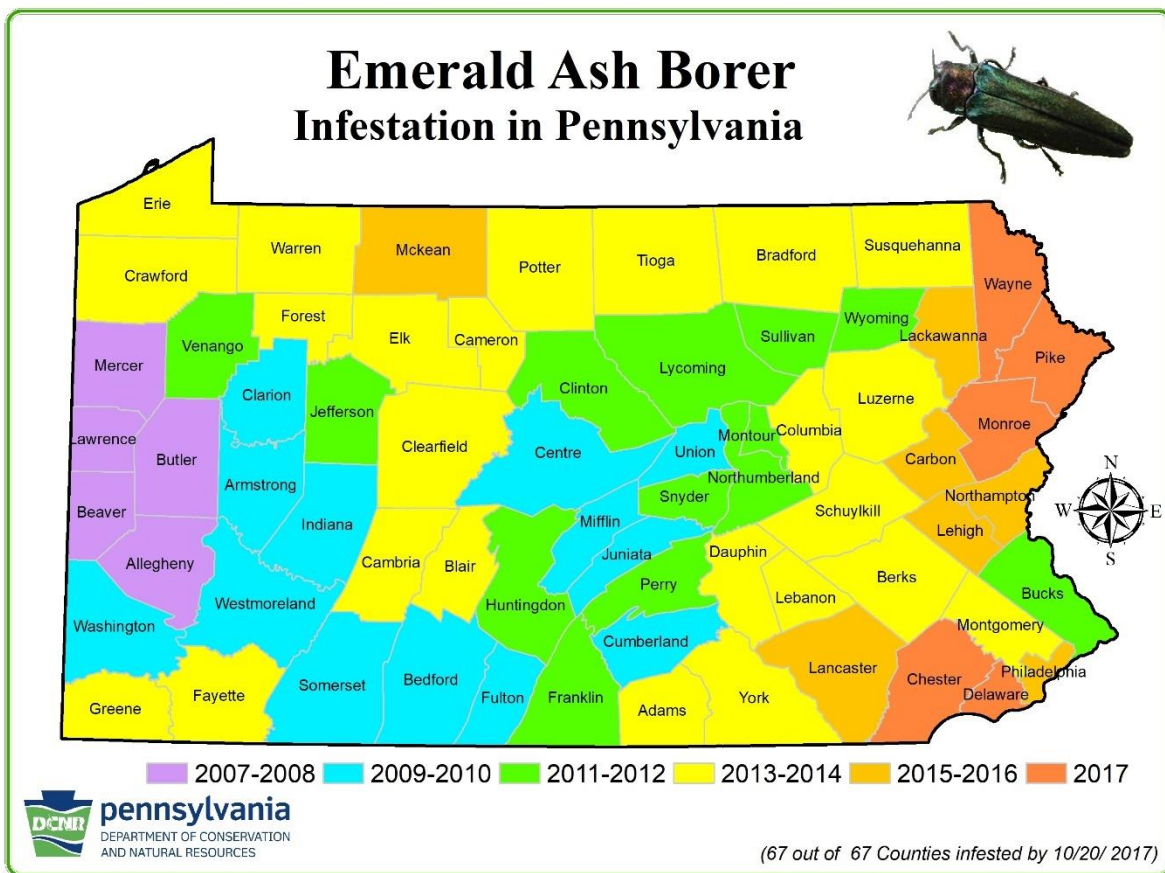


Figure 7. County map of Pennsylvania showing year counties recorded positive for EAB.

Forest tent caterpillar

Forest tent caterpillar moth was monitored at 6 sites in Pike, Potter, and Wayne counties (2 sites/county) with no moths caught in 2024

Southern pine beetle

Southern pine beetle (SPB) was monitored at 12 sites in 11 counties with traps (Figure 8). There was one positive trap catch in York County. Generally, however, SPB populations are only present in the very southeastern corner of the state.

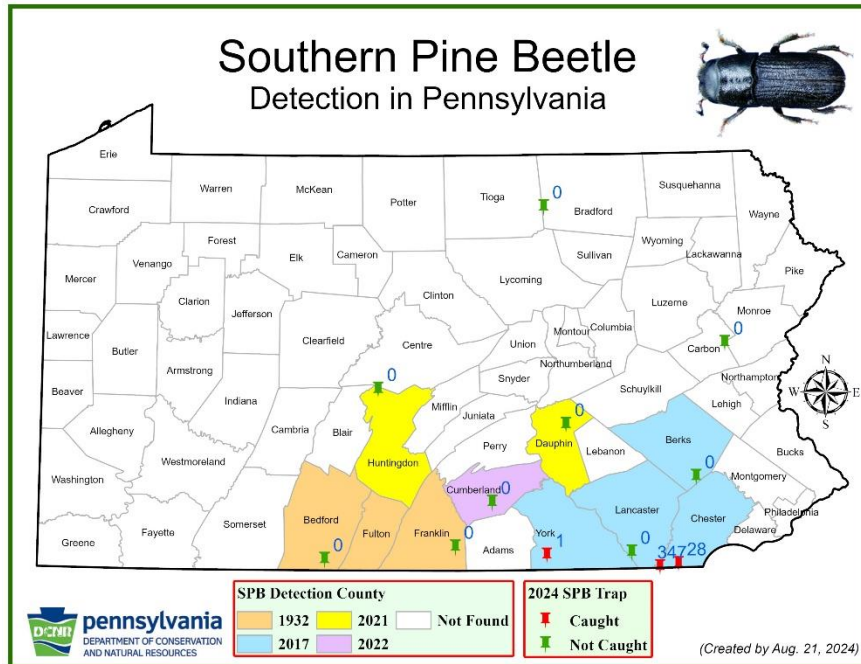


Figure 8. Southern pine beetle trap detection in Pennsylvania.

Spongy moth (*Lymantria dispar dispar*)

Pennsylvania has continued monitoring spongy moth population through evaluating its egg mass density. In 2023-2024 season, a total of 6,679 plots were sampled state-wide and the sites with 800 egg masses per acre or above located primarily in central and northeastern areas, forecasting a moderate to heavy defoliation in those areas (Figure 9).

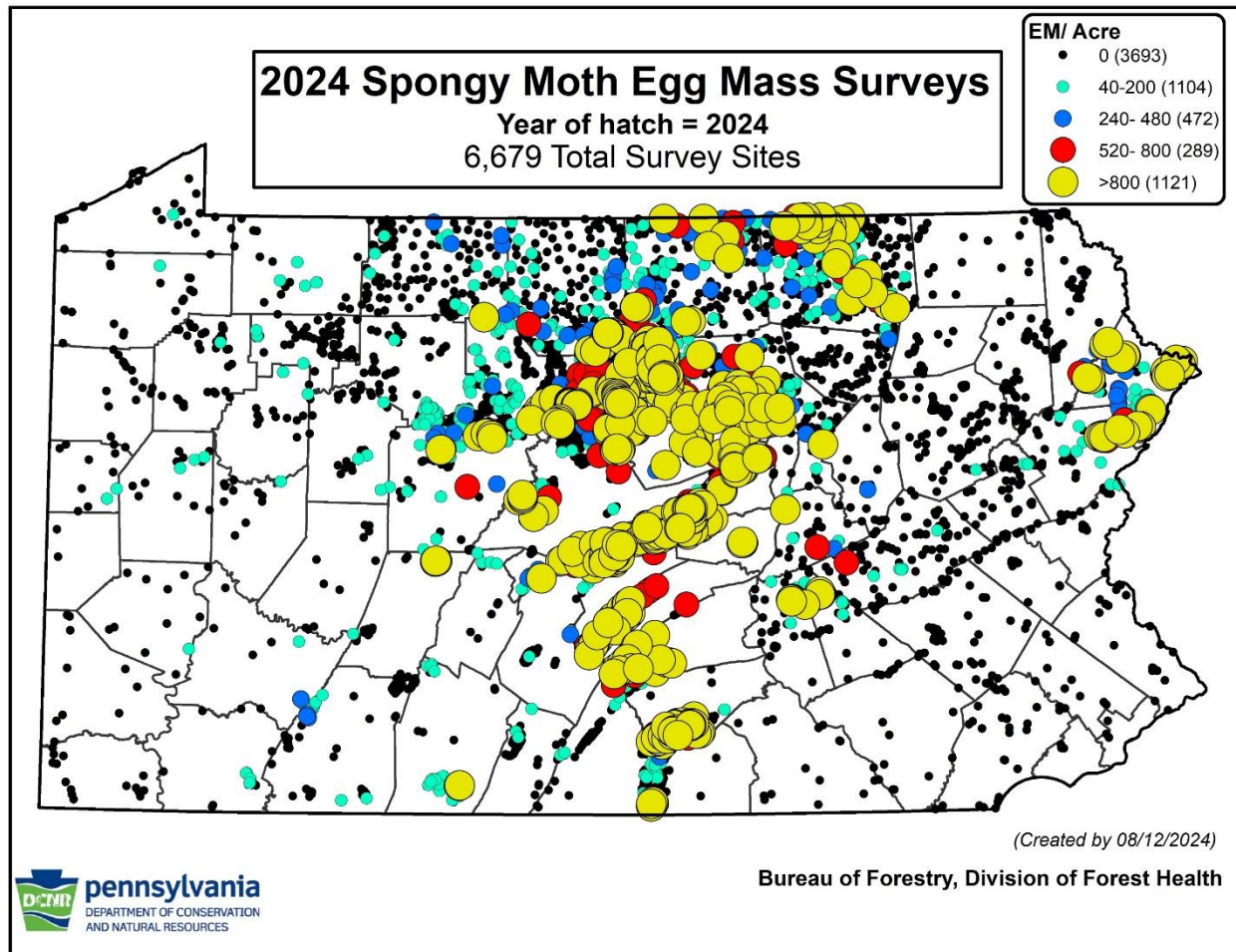


Figure 9. Map of 2024 spongy moth egg mass survey.

Pennsylvania Department of Conservation & Natural Resources (DCNR) had implemented an aerial spongy moth suppression program in 2024. The operational period for the suppression program was April 29 through May 17 and included aerial applications within 19 counties. A total of 173 spray blocks totaling 22,617 acres were treated with either *Bacillus thuringiensis* subspecies *kurstaki* (Btk) or tebufenozide (Mimic 2LV). Participants included State Forest lands and State Parks (Figure 10 - 11).

A separate suppression program on spongy moth was also conducted in the same period by Pennsylvania Game Commission (PGC) in 2024. A total of 136 spray blocks totaling 123,276 acres were treated on PGC lands.

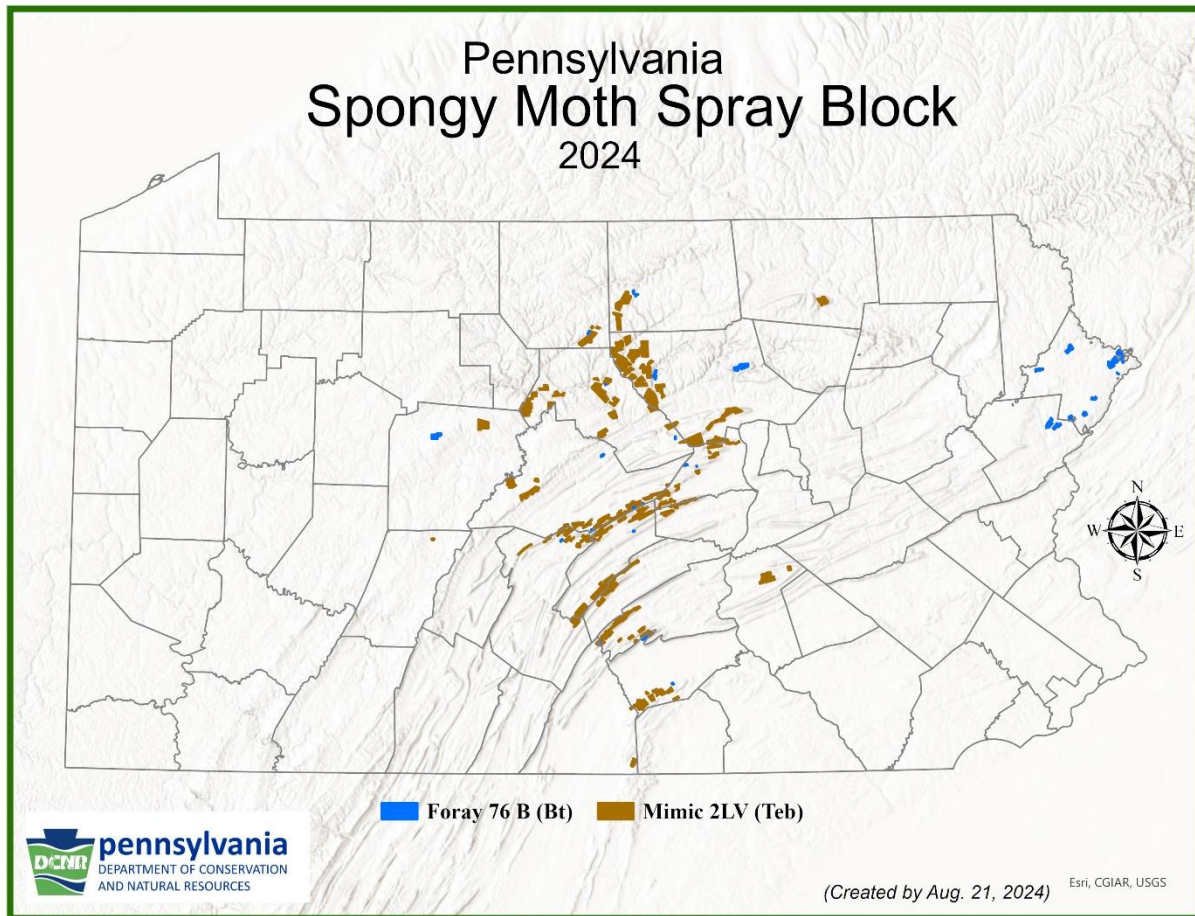


Figure 10. 2024 Spongy moth spray blocks by DCNR.

2024 <i>Lymantria dispar dispar</i> spray acreage			
Ownership	Helicopter Bt	Fixed Wing Mimic	Total Acres
State Forest	15,018	204,553	219,571
State Parks	2,740	227	2,967
Federal	79		79
Total Acres	17,837	204,780	222,617

Figure 11. 2024 DCNR spongy moth spray acreage by ownership, aerial craft, and insecticide.

Beech Leaf Disease

Beech leaf disease (BLD) has been confirmed in all 67 counties in the state. Three of the 6 monitoring plots established in 2020 were remeasured again in 2024. The 3 plots that were due for remeasurement will be done in Spring 2025 (Fig. 12).

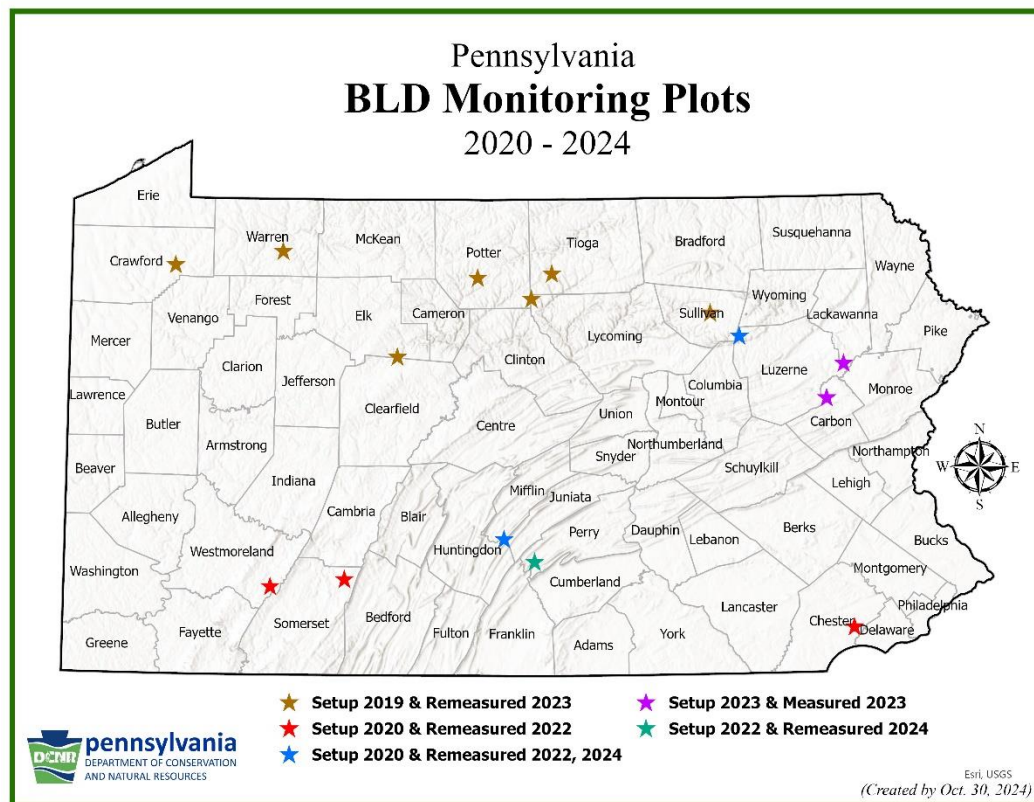


Figure 12. Beech leaf disease monitoring plot locations.

Polyphosphite 30 fertilizer treatments were conducted at Nolde Environmental Education Center in June and again in August (Fig. 13). This is the second year of treatments. The same protocols were followed that are being done in Cleveland Metro Parks and Davey Tree Company for experimental consistency. Each treated beech tree was paired with an untreated tree (control) of same DBH and severity of symptoms. The fertilizer was applied using a soil drenching method around the base of each selected treatment tree. The rate used was 2 oz of product + 14 oz water / inch DBH.

Efficacy of Polyphosphite 30 can't be determined at this time since the trees are large, mature trees and it is thought that it will take several years to see any improvement in the tree health (if at all). Another unfortunate factor that has taken place at Nolde Environmental Education Center this year is the colonization of the beech scale insect. In time, we expect to observe a buildup of the scale population on the beech resulting in feeding injury in the bark and *Neonectria* fungi colonization shortly after and eventual tree death.

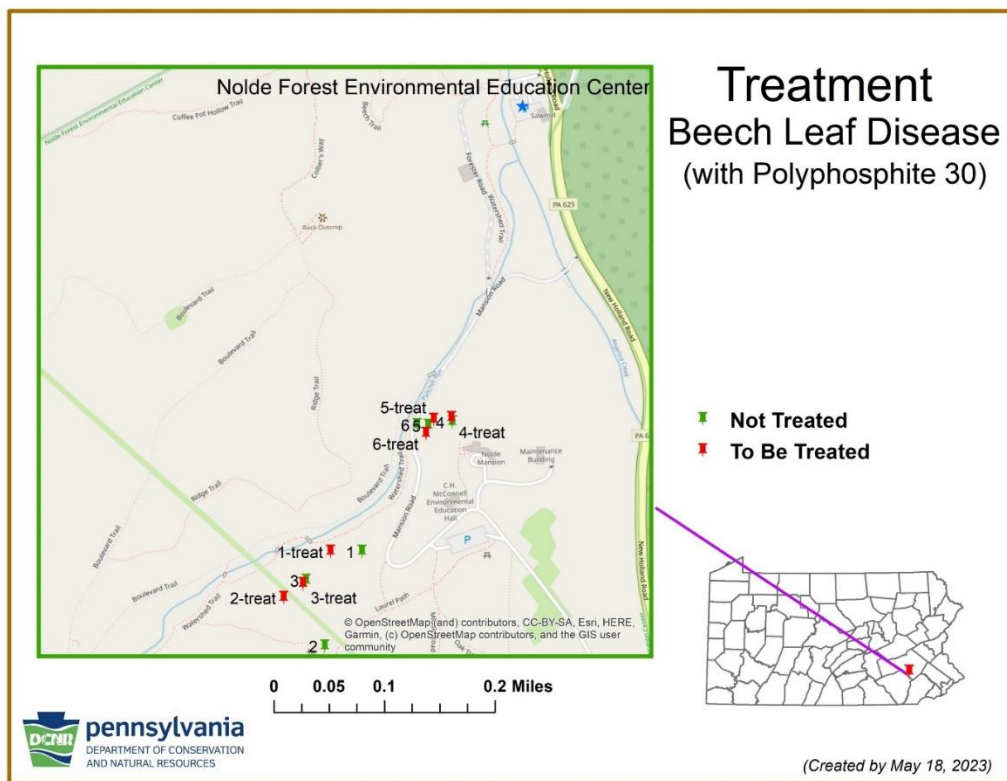


Figure 13. Polyphosphite 30 treatment locations.

Oak Decline Long-term Monitoring Plots

More oak decline areas are manifesting across the state and include many species of oak such as white, chestnut, red, black, and scarlet. Given what is known about oak decline, most likely a variety of past stressors are contributing to the decline. However, a multi-state effort is in place to set up long-term monitoring plots document the decline and its contributing factors over time and capture the change in oak volume and how much deviation there is from accepted baseline mortality. Five monitoring plots were established in 2022 and 4 more monitoring plots were established in 2023. Two new monitoring plots were established in 2024 (Fig. 14).

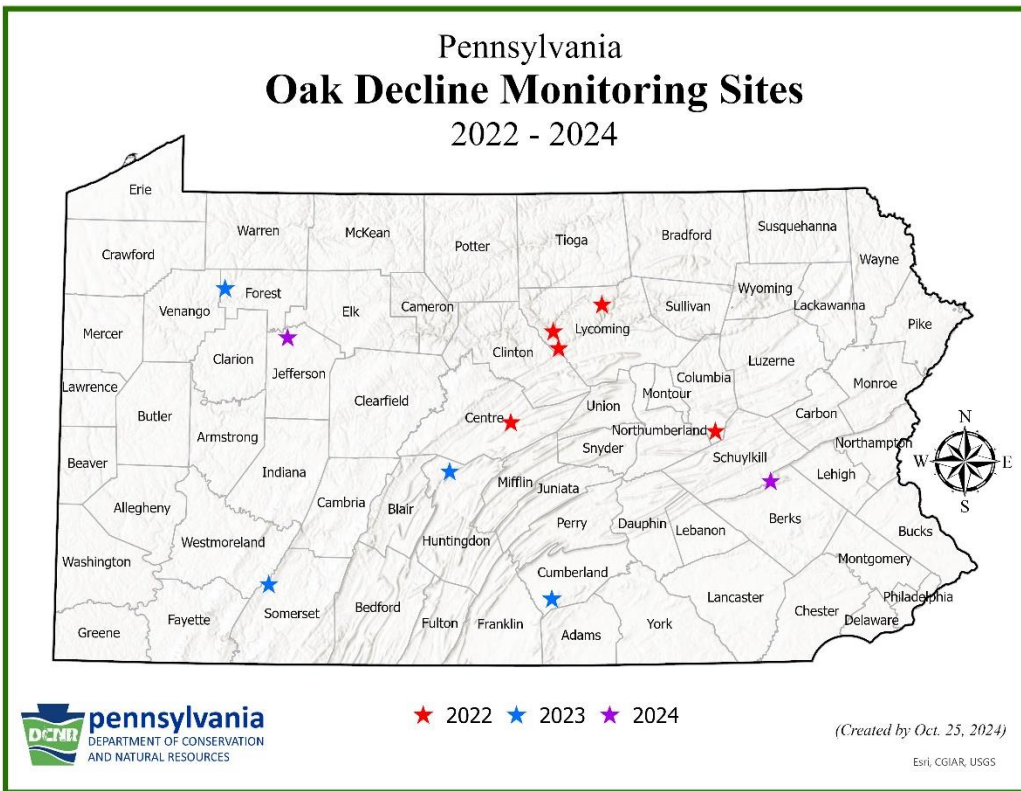


Figure 14. Long-term oak decline monitoring plot locations.

Forested environments with streams near retail stores involved trace forward confirmations were targeted. Past trace forward information was provided by the PA Department of Agriculture. Four stream locations (Fig. 15) were sampled every two weeks in the spring when water temperatures were between 15-25C/59-77F. The bait-of-bottle (BoB) method was used for all sampling efforts. No *P. ramorum* was detected.

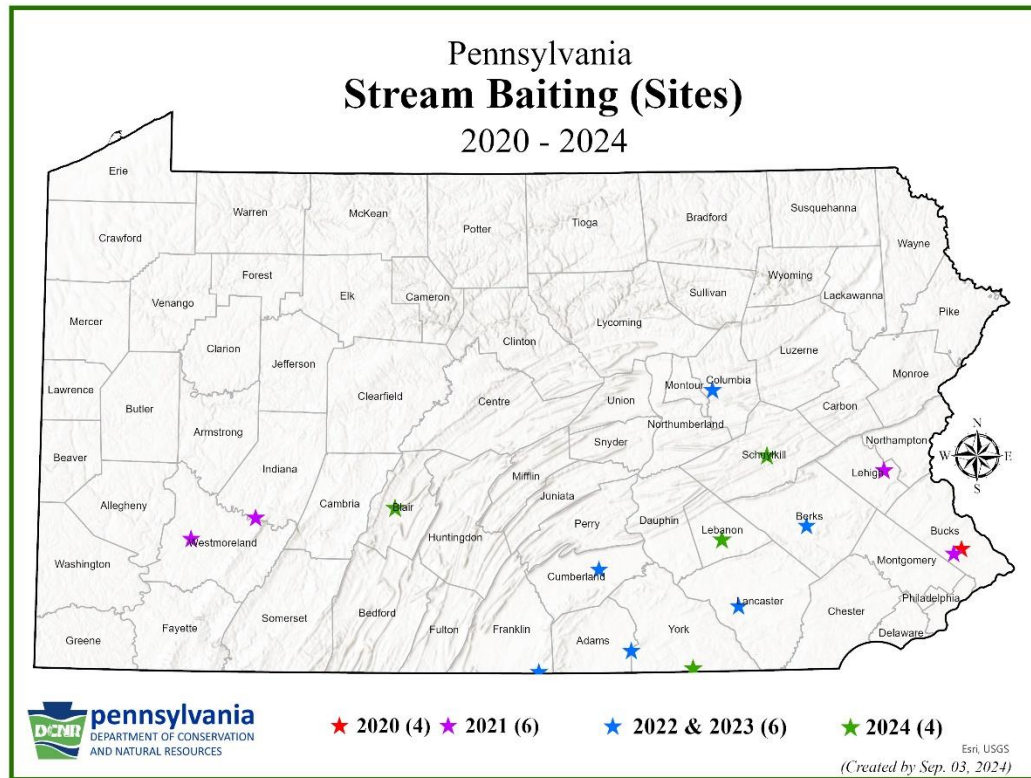


Figure 15. *P. ramorum* stream baiting locations.

Oak Soil Microbiome Project

The objective of this project is to determine if there are differences in the soil microbiome in the rhizosphere of 4 healthy oaks compared to the soil microbiome in the rhizosphere of 4 declining oaks. For example, are there more beneficial microbes in the rhizosphere soil surrounding healthy oaks and is there a shift to more pathogenic microbes in the rhizosphere soil surrounding declining oaks? Last fall, five sites that are part of the long-term oak decline monitoring plots were selected for soil sampling (Fig. 16). Four subsamples of soil were collected in the rhizosphere of each tree in the 4 cardinal directions then bulked into one sample. One bulk soil sample was taken at each location to serve as a control. In Spring 2024, sampling occurred on these sites and followed the same sampling parameters. In Fall 2024, 2 new sites were sampled and one site from the previous sampling year was sampled again to see if there are any significant year to year changes in the microbiome (all these sites are part of the long-term oak decline monitoring plots). These sites will be sampled again in the spring. Soil moisture and temperature are being tracked by HOBO dataloggers specific for those two variables. This project is to provide baseline

information on what soil microbes are present in the rhizosphere. This information will serve as a springboard to more intensive studies if microbial species and patterns of interest are noted.

To date, Basidiomycota is the dominant fungal phylum and Ascomycota is the second across all oak species and health status at this point in the study. Biggest fungal lifestyle present are ectomycorrhizal fungi. Second fungal lifestyle is root saprotrophs. Trees are maintaining the battle below ground despite what is happening above ground. There isn't much variation in the fungal groups between the low/medium/high decline trees. With the bacterial community the big phyla are Proteobacteria and Actinobacteria. Both are major players (positively so) in the rhizosphere indicating things seem to be similar in the bacterial realm. However, this is a superficial glance, and more parameters need to be investigated along with any significant correlations with the soil physico-chemical properties.

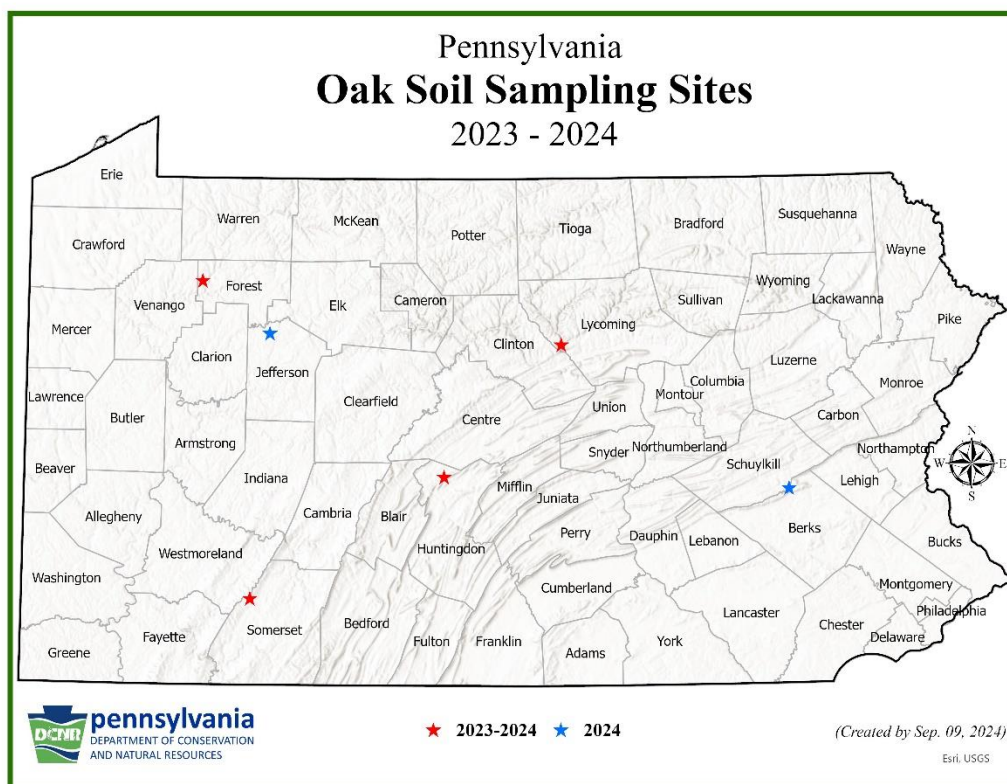


Figure 16. Oak soil sampling site locations.

Northern Walking Stick

Northern walkingstick population remained low at our Bedford County site with egg density <1 egg/m² in 2024. No defoliation on oaks and cherries were observed.

Elm Zigzag Sawfly

Surveys found elm zigzag sawfly in 11 counties in Pennsylvania (9 counties detected in 2023; 2 counties in 2024).

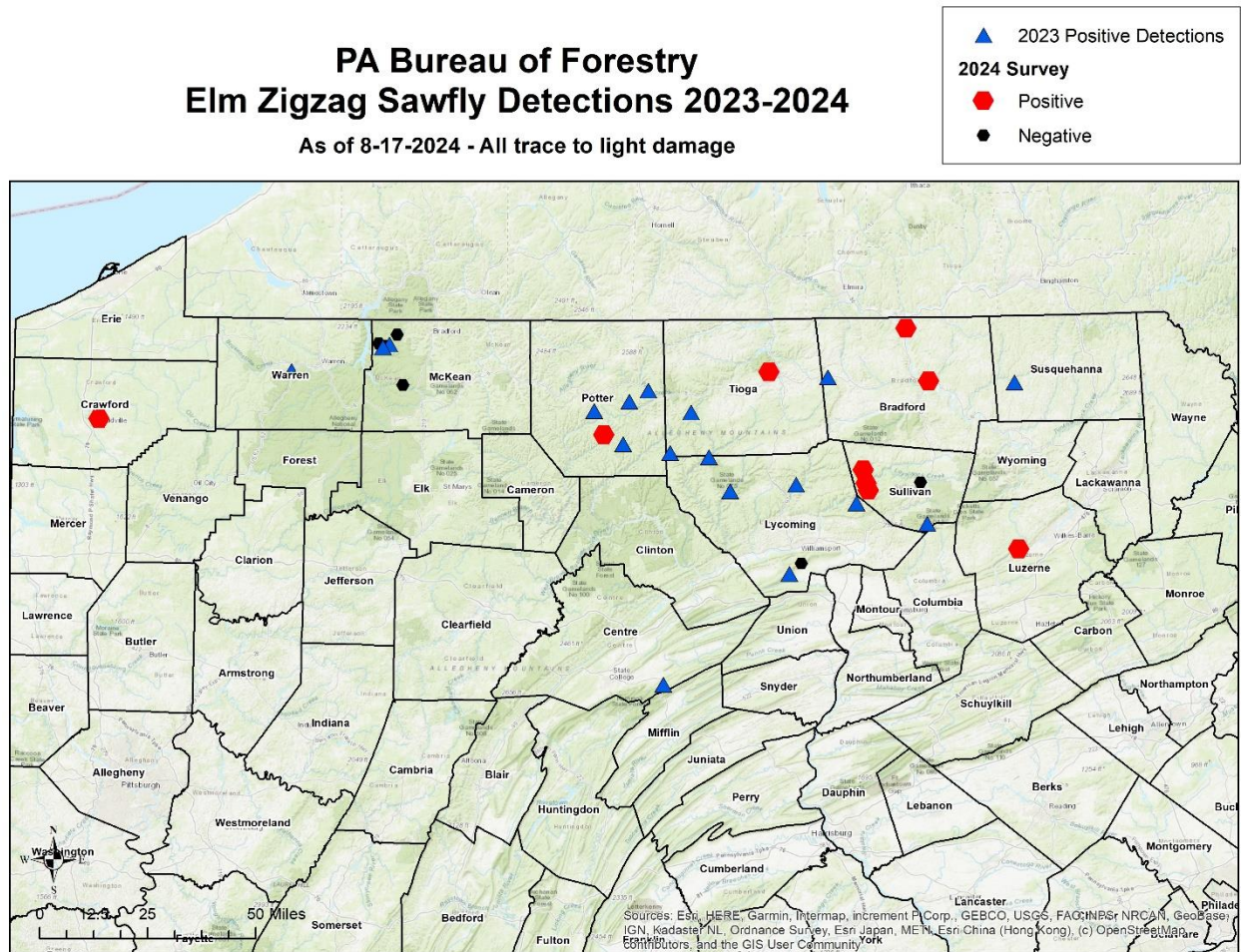


Figure 17. Elm Zigzag Sawfly Detections