

2024 Indiana Forest Health Highlights

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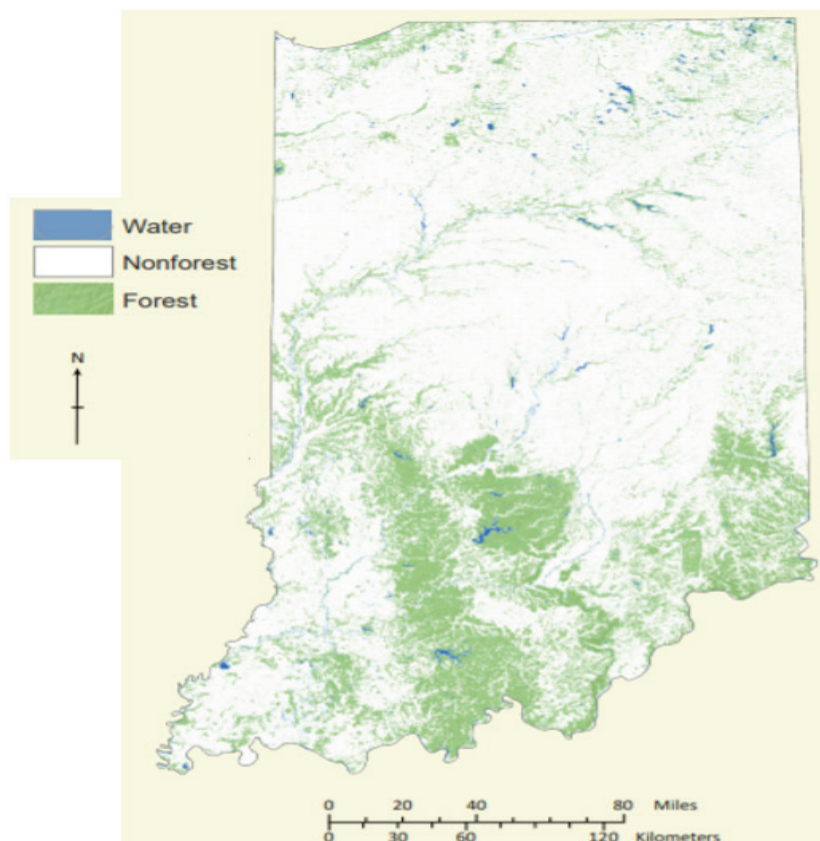
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1. Indiana Forests & Industry

1.1 Forest Trends

At the turn of the 19th century, Indiana’s forests were being rapidly cut, cleared, and burned with little thought to providing a heritage for the future. By 1900 Indiana forests only comprised approximately 1.5 million acres. The forestry profession in general arose to protect, plant, and nurture our forests...to ensure a continuity of growth for future generations. Now, largely due to the management guidance and example of the forestry profession, Indiana is home to approximately 4,893,382 million acres of forestland (Forests of Indiana, 2022 Annual Snapshot, https://public.tableau.com/views/FIA_OneClick_V2/Pageone?%3Aorigin=viz_share_link&%3AshowVizHome=no#2). Indiana is internationally renowned for producing high quality hardwood timber from its substantial and sustainable forest base, as well as providing recreation, wildlife habitat, environmental services, and quality-of-life benefits. Most forests are in the southern half of the state. Map 1 shows the current distribution of forest and non-forested.



Map 1: Distribution of forest in Indiana.

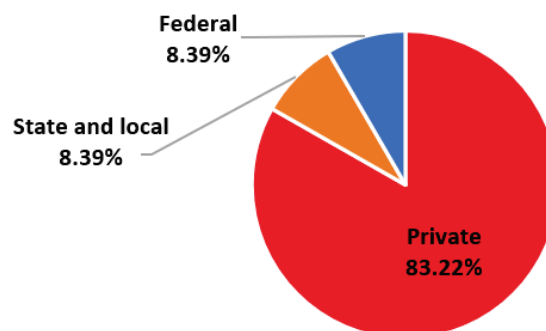


Figure 1: Forest land ownership

Figure 1 depicts how this forestland is distributed among ownership classes. Private landowners own 84 percent of the forestland, with federal and state/local governments comprising nearly equal amounts of the remainder. Interestingly, in 1978 there were only about 50,000 private forest landowners. Today, there are an estimated 85,000 private forest landowners, the vast majority of which own less than 50 forested acres. Each private landowner owns forests for a unique reason. This makes it difficult to explain and predict how landowners will manage their forest resources. As owners age and pass their land on to the next generation, many times these forested parcels are divided into smaller parcels, thus increasing the number of owners while reducing parcel size and additionally adding complexity to managing these forestlands.

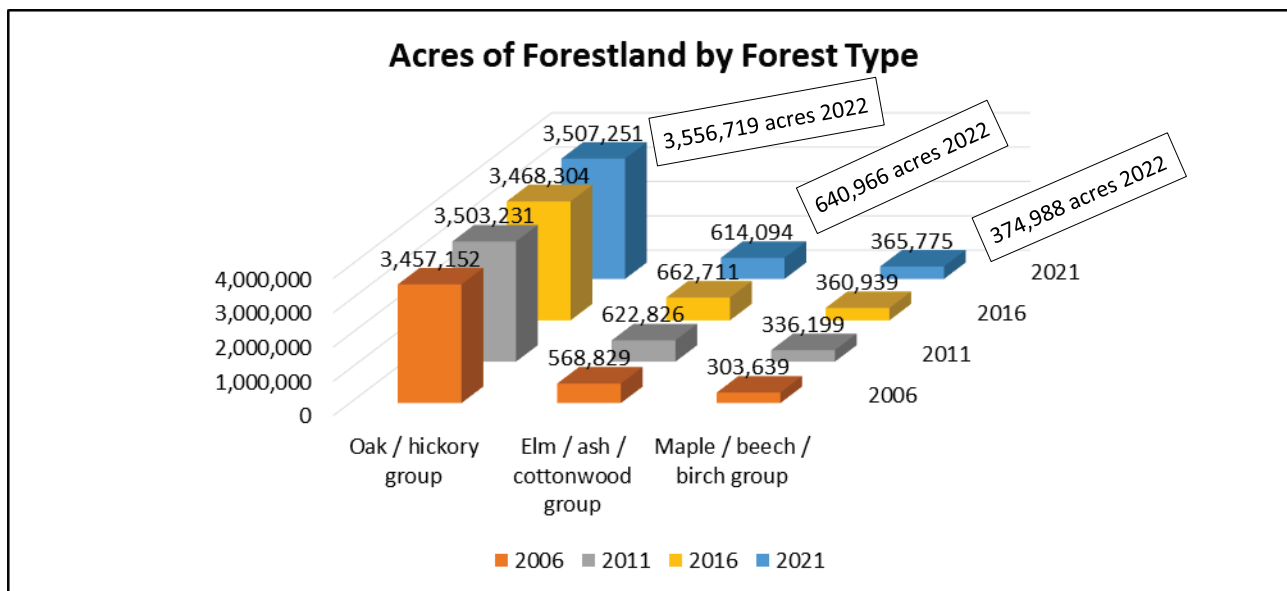


Figure 2: Acres of forestland by forest type

Indiana forests are dominated by the oak-hickory forest type (Figure 2), brought about through the history of forest management referenced above. Indiana forests are maturing and continue to shift to larger-sized individual trees and older-aged stands as shown in Figure 3.

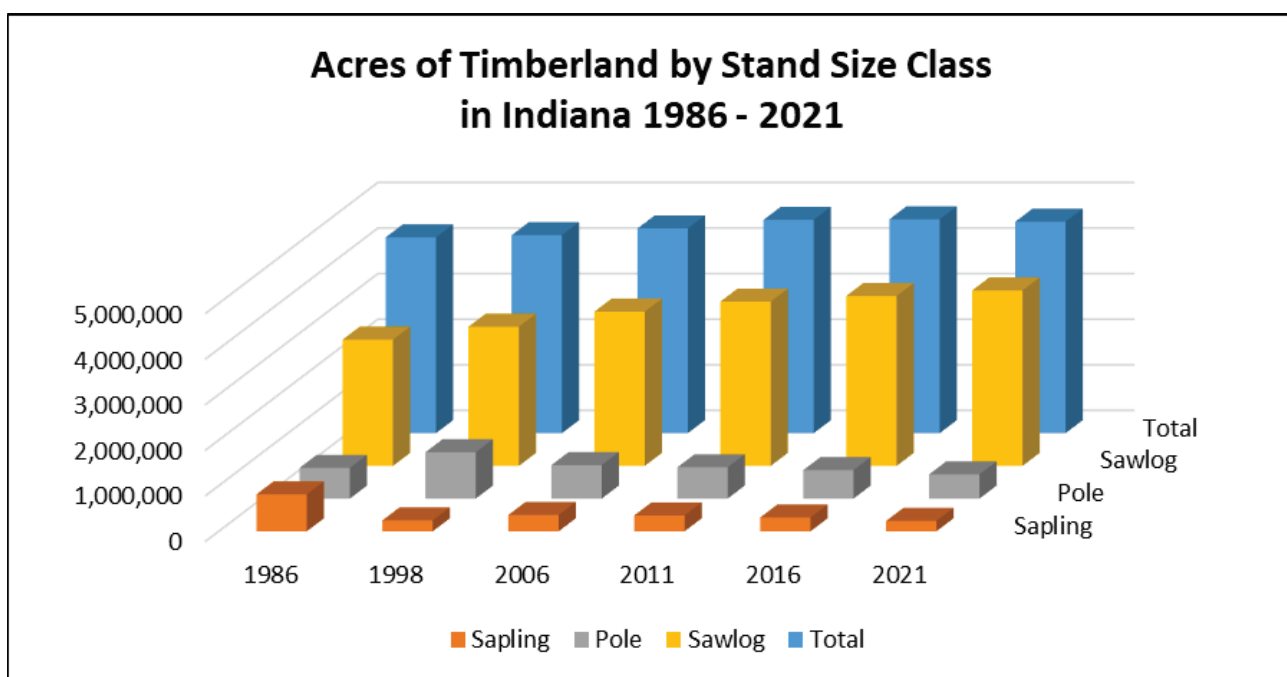


Figure 3: Acres of timberland by stand size class from, 1986 to 2021

As trees and stands mature, ecological processes change. Growth rates diminish. Stands become more susceptible to insect and disease infestation. Carbon sequestration slows. Managing these stands can keep them growing optimally.

Many stands are at a key turning point in time. Without manipulative intervention through forest management practices or major natural disturbances, these forests are primed to turn from our traditional oak-hickory forest types into the shade-tolerant beech-maple species mix. Forests are maturing, and through the process of forest succession, shifting to different forest types in many

places throughout Indiana and the entire Central Hardwood region (Abrams 2003, Aldrich et al. 2005, Schmidt et al. 2000, Woodall et al. 2005). As maturing oaks and hickories die, they often are replaced by other competing species, such as sugar maple and yellow poplar, rather than young oaks or hickories. Driving these shifts are significant reductions or even failures in oak/hickory regeneration (Aldrich et al. 2005, Gormanson et al. 2016, IN DNR 2008, Lorimer 1993, Woodall et al. 2005).

Figures 4 and 5 depict changes in recent years in the number of oak and maple trees in the pole size class (5–11-inch diameter range). Notice the difference in scale of the Y-axis, but also how the oaks are diminishing over time while the maples are increasing in numbers. This shows that the shade tolerant maples are poised to dominate the overstory in future years. If the perpetuation of the oak/hickory forest type is a primary goal for the forests of Indiana, natural resource managers will need new management strategies and practices to change the current trends, which could take decades to alter. (Source: DNR Division of Forestry 2024-2028 Strategic Direction.)

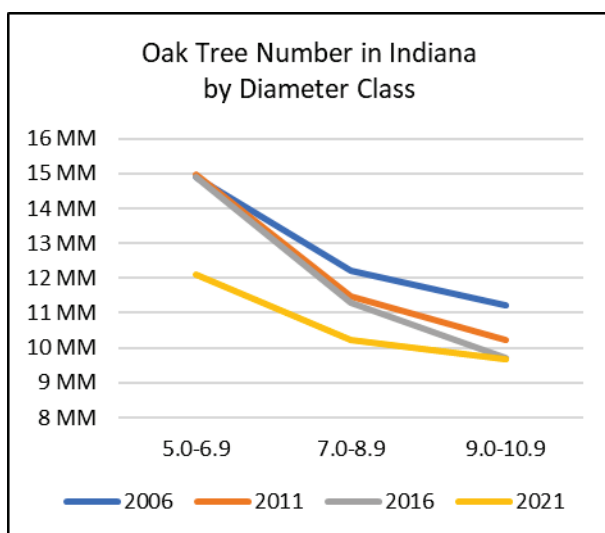


Figure 4: Change in oak numbers in pole classes.

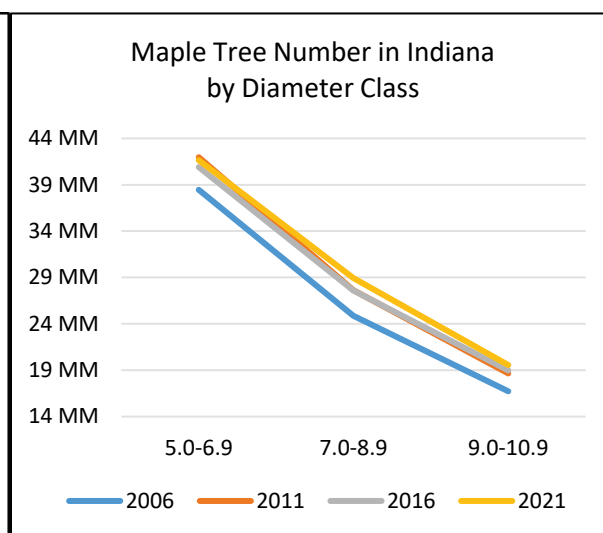


Figure 5: Change in maple number in pole classes.

Figures 6 and 7 show the number of live trees larger than 1.0-inch diameter and wood volume of trees larger than 5-inch diameter on forestland in 2022. Sugar maple is first in number and second in wood volume. Yellow poplar, Indiana state tree, has the most wood volume on forest land with white oak third. Combining sugar maple and American beech number of trees indicates

a shift of forest type to maple beech type.

(https://public.tableau.com/views/FIA_OneClick_V2/Pageone?%3Aorigin=viz_share_link&%3AshowVizHome=no#2).

Total number of live trees (≥1.0 in. diameter) on forest land: 2,077,381,235 trees (±2.54% SE)		Forest Composition: Indiana, 2022 Sound total-stem bark and wood volume of live trees (≥5.0 in. diameter) on forest land: 18,348,052,729 cubic feet (±2.11% SE)	
Top species by count	% of total	Top species by volume	% of total
sugar maple (<i>Acer saccharum</i>)	16.9%	yellow-poplar (<i>Liriodendron tulipifera</i>)	11.9%
American beech (<i>Fagus grandifolia</i>)	7.3%	sugar maple (<i>Acer saccharum</i>)	10.8%
sassafras (<i>Sassafras albidum</i>)	5.3%	white oak (<i>Quercus alba</i>)	7.6%

Figure 6: Number of live trees & top species by count.

Figure 7: Wood volume in live trees & top species by volume

1.2 Forest Product Industry

The Indiana forest products industry is the sixth-largest manufacturing industry in the state. Indiana ranks ninth nationally in total lumber production and third in hardwood lumber production. Indiana forests contribute over \$10 billion annually (2018) to Indiana's economy. In 2013, Indiana's primary wood-using industry included 130 sawmills, five veneer mills and two mills producing other products. Direct employment within the industry accounted for over 70,000 (2016) people and by indirect and induced effect, the industry supports around 60,000 jobs. Forest-based manufacturing provided \$5.5 billion (directly and indirectly) in value-added, \$8.7 billion in value of shipments, and a payroll of \$2.6 billion to Indiana's economy in 2016. Between 2008 and 2013, industrial round wood production increased by 8.3 percent to 69.1 million cubic feet. Saw logs accounted for 92 percent of the total harvest, with other minor products primarily veneer logs, pulpwood, handles, and cooperage making up the rest.

More information on Indiana Timber Industry:

1. Indiana Hardwood Assessment <https://www.in.gov/isda/files/IN%20Hardwood%20Assessment%20Final.pdf>

1.3 Maple Syrup — maple syrup report 2021 -2024 not produced.

Maple syrup is a product of Indiana's forests. In 2020, there were 200 maple syrup producers with 29 counties having at least one producer. Most are found in the northern half of the state. Of those, 78 responded to a survey with 53 indicating a total production of 24,139 gallons of maple syrup. This was up from 19,168 gallons in 2019. A total of 53,152 taps produced an estimated 1,079,013 gallons of sugar water with an average of 44.7 gallons to get one gallon of maple syrup. The 2020 retail prices for gallon, quart and pint are \$43.72, \$13.46, and \$8.39, respectively. Average dollars return per tap is \$24.45 compared to \$14.42 in 2019. The estimated statewide income is \$1,055,313 and can approach \$1.3M accounting for producer consumption, product given away and product not reported.

Source: [Maple syrup report 2020](#)

For information on maple syrup production in Indiana visit Indiana Maple Syrup Association.
<https://www.indianamaplesyrup.org/>

2. State Forest Health Issues – An Overview

The **growing season's forest health problems and concerns** begin with concern for the emergence of **Periodical Cicada - Brood 13 and 19**, since they last emerged together during Thomas Jefferson presidency. They arrived in Lake, Porter, LaPorte and St. Joseph counties in northwest Indiana from the Illinois line east to South Bend. They also emerged in southwest counties - Posey, Gibson, Vanderburgh and Warrick. Brood 14 will emerge in 2025 in southwestern Indiana.

The season also began with the continual concern for mis-shaped white oak and other oaks leaves from spring to late summer. Landowners see the mis-shaped leaves and asked what caused it and will it impact or kill the tree. The mis-shaped leaves are curled, twisted downward which are symptoms of **growth regulator herbicide** such as 2,4D or Dicamba.

Spongy moth traps captured less moths in 2024 than 2023 (25,293 down from 39,535) and were similar to moth capture of 23,457 in 2022. The decrease indicated 2023 capture occurred from a moth or larval blow-in as STS analysis showed moth lines receded north to their location in 2022. Thus, spread did not occur from 2023.

Spongy moth was not found in Dubois or Sullivan County in 2024. Sullivan County remains the only county with no detection of spongy moth life stage.

Spongy moth treatment to slow the spread occurred in 4 locations totaling 9,986 acres. Two sites treated with Btk and two with Splat. The eradication site in Wayne county treated 5,149 acres with Splat. A total of 15,135 acres were treated in 2024.

Spongy moth defoliation occurred in Allen, Laporte, Noble, Porter and Whitley counties and totaled an estimated 4,000 acres. It was the fourth consecutive year of defoliation in LaPorte county.

No counties were added the spongy moth quarantine.

Past Oak Defoliation was reported in late May in the Post Oak Nature Preserve on Harrison Crawford State Forest. An aerial survey identified several areas of noticeable defoliation totaling estimated 1,000 acres and this could be the return of a looper epidemic.

Spotted lantern fly was detected in eight counties in 2024 – Bartholomew, Boone, DeKalb, Grant, Miami, Noble, Ohio, Wabash. Like prior year's detections a rail line was involved in 2024.

Beech leaf disease is in northwest Ohio and Southeast Michigan, but 2024 surveys did not detect the nematode or symptoms in Indiana.

Walnut twig beetle traps have not detected it in 2024 in forests, plantations, or high-risk sites – sawmills. The disease is not in Indiana black walnut.

Emerald ash borer (EAB) is killing of ash trees in the southwest toe of the state. In other areas, foresters have reported surviving ash to evaluate for inclusion in tree improvement.

Chestnut oak mortality continues to occur, and an aerial survey identified a 3,700-acre area of dead and declining trees on Brown County State Park. Purdue research found it is the result drought induced decline that started with small droughts prior to the 2012 drought.

Oak wilt was reconfirmed in Elkhart county and for the third time since 2021 in Franklin county. No county had oak wilt confirmed for the first time.

Sassafras wilt is proposed by Purdue research as a new disease complex found checking sassafras for laurel wilt and red bay ambrosia. The components of sassafras wilt complex were identified in 9 counties. Wilting sassafras was reported in 12 other counties.

No other defoliation, mortality, or new pest occurred in 2024. Overall, the main concerns are herbicide damage, oak wilt, oak decline and spongy moth

Future forest pests of concern are Asian longhorned beetle, hemlock woolly adelgid, beech bark disease, sudden oak death, gold spotted oak borer, other *Agilus* spp., and Zig Zag Sawfly of Elm. They were not detected in 2024.

Invasive plants affecting Indiana forest regeneration and biodiversity are kudzu, *Pueraria montana*, tree of heaven, *Ailanthus altissima*, bush honeysuckle, *Lonicera* spp., Japanese stilt grass, *Microstegium vimineum*, garlic mustard, *Alliaria petiolate*, *multiflora rose* and others.

3. First time occurrence impacting Indiana Forests

3.1 Sassafras Wilt – *Novel Ophiostoma* sp. *Xylosandrus crassiusculus*, *X. germanus*, *Anisandrus maiche*, *Aphelenchoides* sp.

Olivia Bigham, PhD Researcher. Anna Conrad, USFS Pathologist Purdue University, and Matt Ginzel, Professor of Forest Entomology Purdue University received additional reports and locations (counties) of wilting sassafras 2022 through 2024.

They investigated the reports and isolated several fungal species from wilted sassafras including a Novel *Ophiostoma* sp.. They did not capture red bay ambrosia beetle from wilted sassafras. They did capture ambrosia beetles *Xylosandrus crassiusculus*, *Xylosandrus germanus* and *Anisandrus maiche* from material collected 2022 to 2024. They also found a plant parasitic nematode, *Aphelenchoides* sp. in wilted trees.

But they did not isolate the Laurel wilt fungus, *Harringtonia lauricol* formerly *Raffaelea lauricola* from the wilted sassafras.

They will continue to investigate the detection of the novel *Ophiostoma* sp., ambrosia beetle species, and plant parasitic nematode, they found in wilting sassafras. With no detection of laurel wilt disease and detection of an assemblage of insects and microbes associated with wilting sassafras they are calling it Sassafras Wilt.

Sassafras wilt with the assemblage of insects and microbes is present in 5 counties (figure 8). An additional 4 counties have wilt symptom, xylem stain, beetle damage and no detection of

Ophiostoma sp. An additional 12 counties have only sassafras wilt symptoms reported or observed.

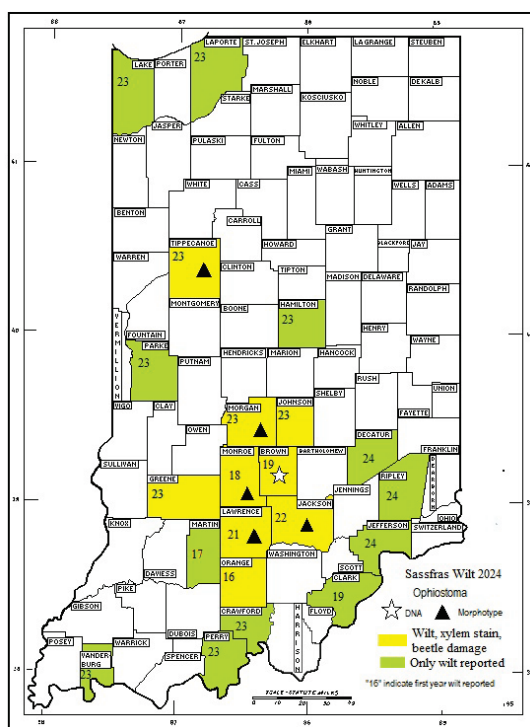


Figure 8: Sassafras wilt counties noting counties with *Ophiostoma* sp., wilt, xylem stain, beetle, wilt only, and year wilt reported.

4. Exotic Pests of Indiana Forests

Spongy moth, thousand cankers disease of black walnut, oak wilt, and beech leaf disease dominated forest health program monitoring and management activities. Other exotic pest monitoring activities included, sassafras wilt, hemlock woolly adelgid and spotted lantern fly.

4.1 Spongy Moth – *Lymantria dispar dispar*

The 2024 Cooperative Spongy Moth Survey completed its 37th year of the statewide survey. The survey is part of the Slow-the-Spread (STS) Program and uses the STS protocol for its design and operation dividing the state into three zones (figure 9): the STS Evaluation Zone, the STS Action Zone, and the State Area. The survey design used fixed 8K & 5K, fixed 3K & 2K and fixed 3k survey grid points for the three zones, plus regulatory trap sites in state area. Four random traps were placed for moth flight monitoring in the STS evaluation zone. In the state area, several counties in southwest Indiana were not surveyed. The area around the 2023 Dubois county positive trap catch was surveyed since that catch was the first ever detection of spongy moth in Dubois county.

Across all zones, the survey deployed 9,767 traps all referenced by GPS.

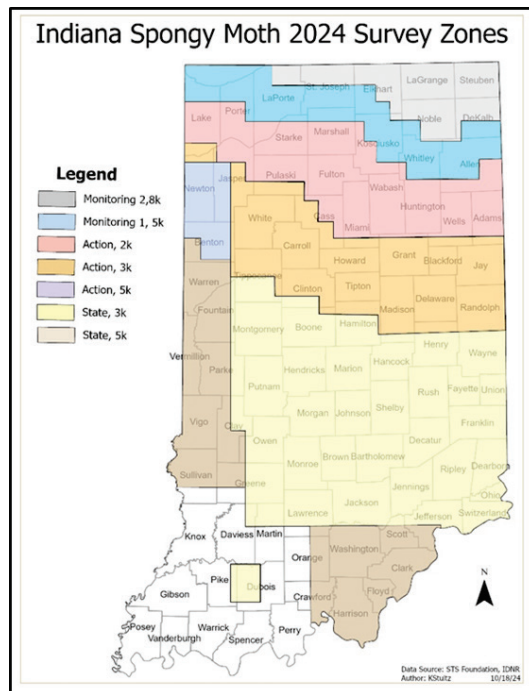


Figure 9: Spongy moth survey zones – yellow and gray state zone, pink, tan, light blue slow the spread action zone, dark blue and violet slow the spread monitoring zone.

The survey detected 25,293 moths from 44 counties (37 in the STS zones and 7 in the State zone) ranging from 1 to 5,000 moths per county. LaGrange county had the highest moth catch followed by LaPorte (3,951 moths), St. Joseph (3,943 moths), and Noble (2,364 moths) (Figure 12 & 13).

Total moth catch is 36% lower than 2023 (39,535) and like 2022 (23,457) (figure 10).

As in prior years, most of the moth catch was in the Evaluation Zone. The Evaluation Zone is Monitor 1 & 2 zones, is the quarantined counties of Allen, DeKalb, Elkhart, LaGrange, Lake, LaPorte, Noble, Porter, St. Joseph, Steuben, and Whitley, and detected 90.3% of the moths (22,841 of 25,293). The Action Zone detected 9.64% of the moths (2,437 of 25,293). The State Area detected 0.06% of the moths (15 of 25,293).

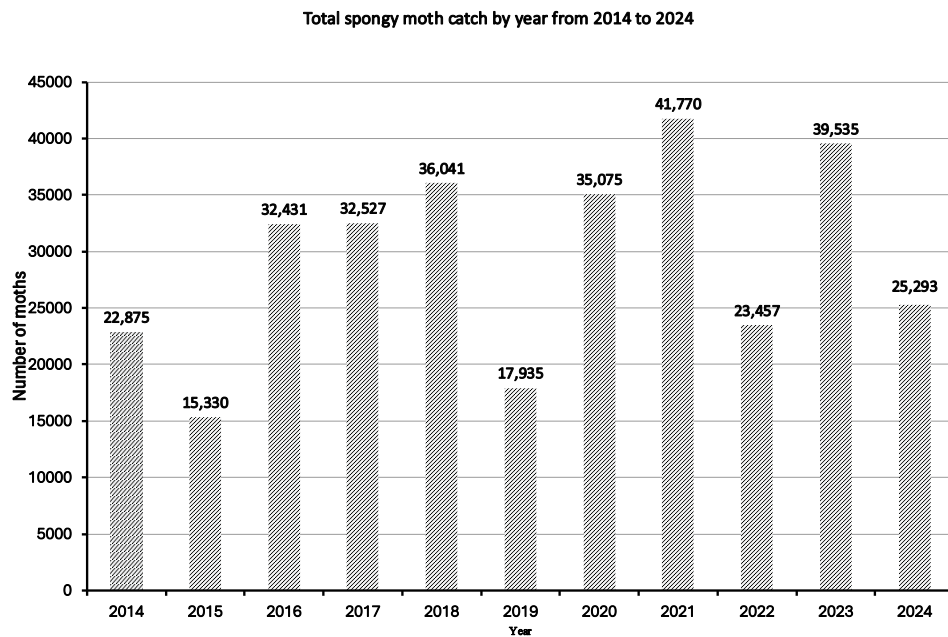


Figure 10: Number of male spongy moths caught by year from 2014 to 2024.

Since the survey began in 1972, a total of 764,479 moths have been caught in 91 of the 92 counties. After catching a single spongy moth for the first time in Dubois County in southern Indiana in 2023, the area was trapped in 2024 with no moths caught. Spongy moth has not been detected in Sullivan County since surveys began in 1972 (figure 11).

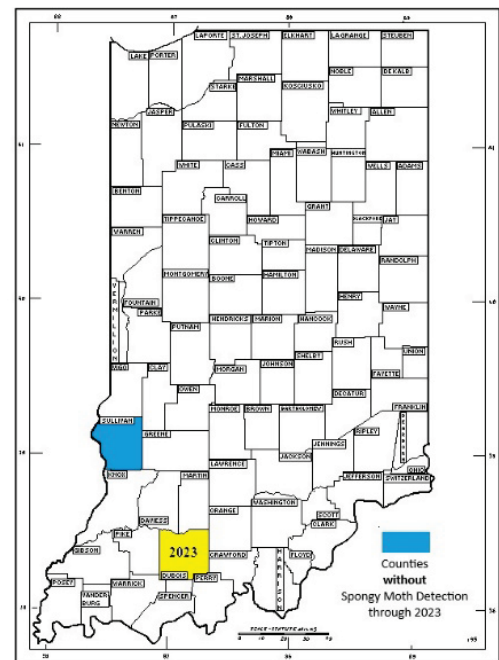


Figure 11: Counties with recent and no detection of spongy moth life stage.

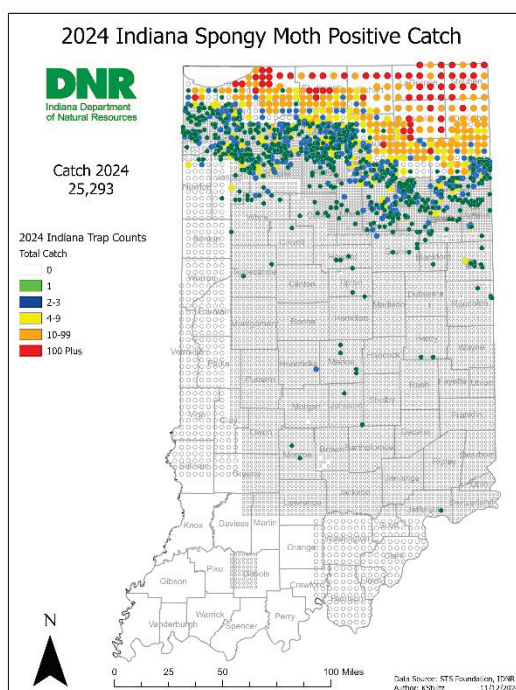


Figure 12: Map showing 2024 Spongy Moth trap locations. Total range of catch from 0 to 100+ in each trap.

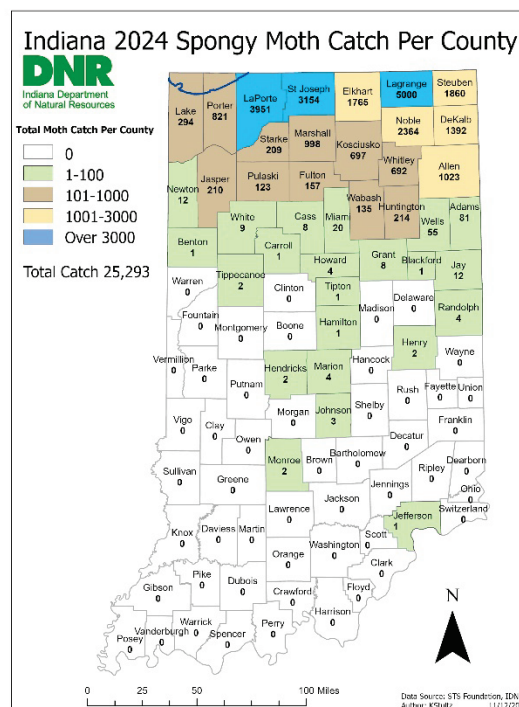


Figure 13: 2024 total moth catch in each county. state catch is 39,535.

Defoliation 2024

An aerial survey across northern tier quarantined counties detected defoliation in Allen, LaPorte, Noble, Porter and Whitley counties. (Figure 14).

This was the fourth year of noticeable defoliation in LaPorte county. The number of defoliated areas and their size decreased significantly. The severity of defoliation was less than prior years. The population collapsed from *Entomophaga maimaiga* and NPV virus killing caterpillars.

2023 was the second year of noticeable defoliation in Porter County and occurred in same area as 2022 with similar intensity. The 2024 aerial survey recorded oak mortality in one of two 2023 defoliated areas. This area occurred in the Dunes National Lake Shore area south of Indiana Dunes State Park between U.S. Hwy 20 and 12 east of IN 49.

There was no defoliation between 2023 and 2024 in Chain O Lakes State Park (Noble county) in the campground or nature preserve that were treated in 2022. The 2022 Btk treatment prevented defoliation in the campground, but there was defoliation in the Nature Preserve in 2022, but less than 2021. Mortality occurred in 2023 in the nature preserve but did not increase in 2024.

Total defoliated acres in 2024 are estimated at approximately 4.000 acres.

2024 completed the first recorded occurrence of defoliation for four consecutive years in the same area, LaPorte County, in Indiana.

Table 2: 2023 sites by county, rate, acres treated with mating disruption.

County	Site Name	Program	Treatment Type	Treatment Material			EA Acres	NLCD Acres	Estimated Treatment Acres	Actual Treatment Acres
				Rate	Application #	Method				
Starke	Winona MD24	STS	MD	6 g	1	Aerial	10,272	4,467	4,725	4,357
Huntington/Allen/Whitley	Roanoke MD24	STS	MD	6 g	1	Aerial	13,137	2,468	4,090	5,002
Total 6 g							23,409	6,935	8,815	9,359
Total Acres STS							23,409	6,935	8,815	9,359
County	Site Name	Program	Treatment Type	Treatment Material			EA Acres	NLCD Acres	Estimated Treatment Acres	Actual Treatment Acres
				Rate	Application #	Method				
Wayne	Richmond MD24	Eradication	MD	6 g	1	Aerial	6,124	3,276	4,775	5,149
Total 6 g							6,124	3,276	4,775	5,149
Total Acres Eradication							6,124	3,276	4,775	5,149
Total Acres				MD	6 g	1	Aerial	29,533	10,211	13,590
										14,508

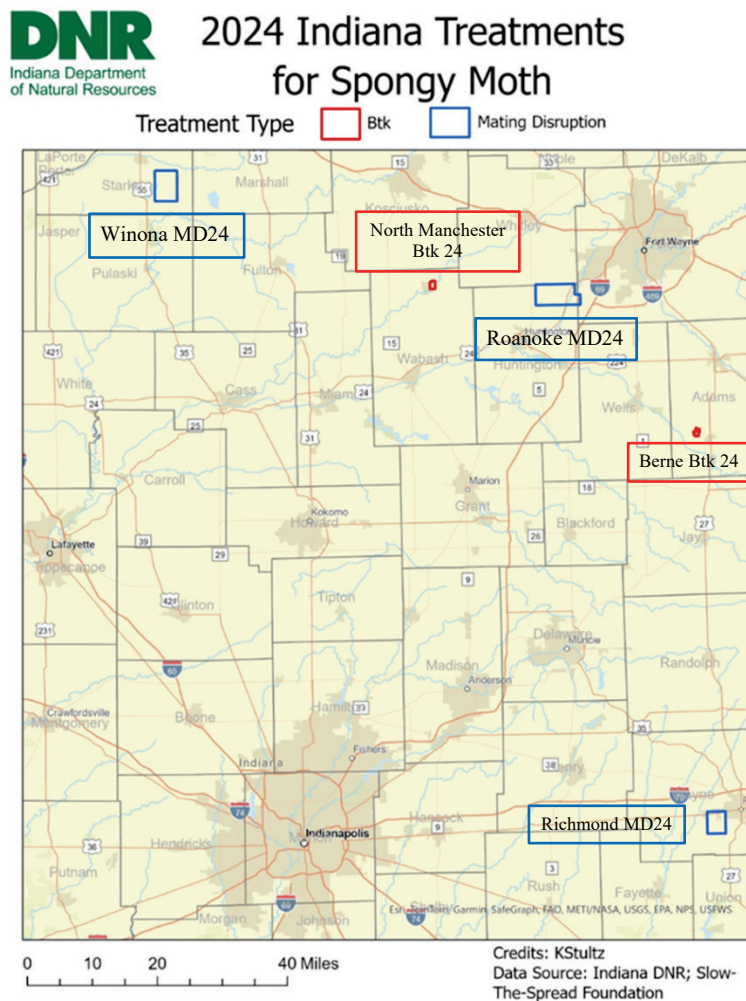


Figure 15: Map: 2024 Spongy Moth Treatment Sites.
Site label has name and treatment type.

Treatment Analysis of 2024 Btk and 2023 Mating Disruption sites (Figure 16)

Slow-the-Spread analysis found the 2024 North Manchester treatment successful but the 2024 Berne Btk site not successful and field examination of the treatment site found 3 apple trees near the high catch milk carton trap had old and new eggmasses at the tree base. Review of application tracking found the apple trees did not receive direct application of Btk. Eggmasses

were treated with golden sun oil and site will be delimited in 2025. The 2024 mating disruption sites will be evaluated in 2025.

Analysis of the 2023 mating disruption sites found 2 sites successful (Beaver Dam and Plymouth) and 1 site partially successful (Etna Green).

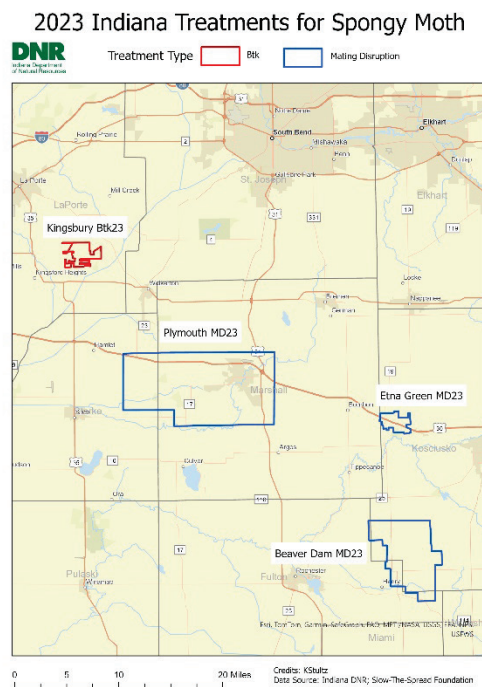


Figure 16: Map 2023 Spongy Moth Treatment Sites. Site label has name and treatment type.

Eradication: Richmond

The 2021 delimit detected 2 single moth traps on the western side of the delimit of the eradication area. The 2022 delimit detected 2 single moth traps again on the western side of the eradication area. In 2023, a 17 trap delimit was placed and 10 of those traps captured 14 spongy moths. Since there is still a lingering moth catch in the eradication area, mating disruption treatment occurred in 2024. Initial evaluation indicates treatment was successful. Evaluation trapping in 2025 will confirm the initial success and move site toward eradication.

Spread Rate:

The 2024 annual spread rate is -8.43 miles which is the same as the 2022 annual spread rate. The 3-year average spread rate is -1.85 miles which is less than the 2022 rate of 1.29 miles (Table 3).

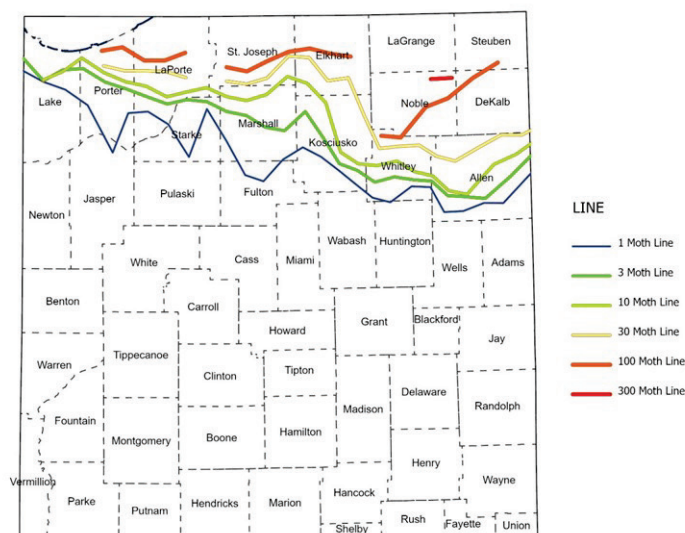
Table 3: Spongy moth annual and 3-year average spread rate in kilometers and miles.

Unit	2024	3-year average
Kilometer	-13.57	-2.98
Mile	-8.43	-1.85

Moth Lines:



Indiana Spongy Moth 2024 Moth Lines



Data Source: STS Foundation, IDNR
Author: KSultz
10/18/24

Figure 17: 2024 moth lines, from south to north the 1, 3, 10, 30, 100 moth line and 200 moth line if it is present.

The decreased moth catch total throughout the state moved the 1, 3 and 10 moth lines northward from their location in 2023. This change is believed to result from impact of *Entomophaga maimaiga* and NPV killing caterpillars, reduced populations in Michigan and change in weather events that could move spongy moth south but did not.

The 10-moth line begins to follow U.S. Hwy 30 across the state (Allen to Lake County) compared to prior years when it followed U.S. Hwy 30 in just the eastern half of the state (Allen and Whitley county).

The 10-moth line remains stable for the prior five years (figure 18).

The 10-moth is used in the decision to quarantine a county. When it is half-way through a county, the process to quarantine the county begins. From the 2024 survey, no counties meet this guide, and none are planned for quarantine.

Indiana Spongy Moth Historic 10-Moth Line

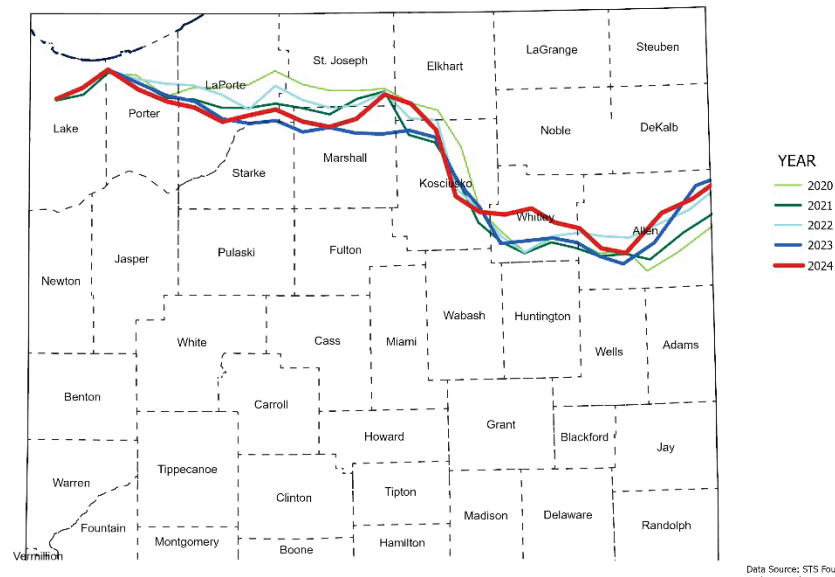


Figure 18: Ten moth line from 2020 to 2024. Line means an average of ten moths caught per trap around the line for the specific year.

Quarantine:

Lake and Whitley counties were quarantined in 2023. No counties in 2024 are proposed for quarantine.

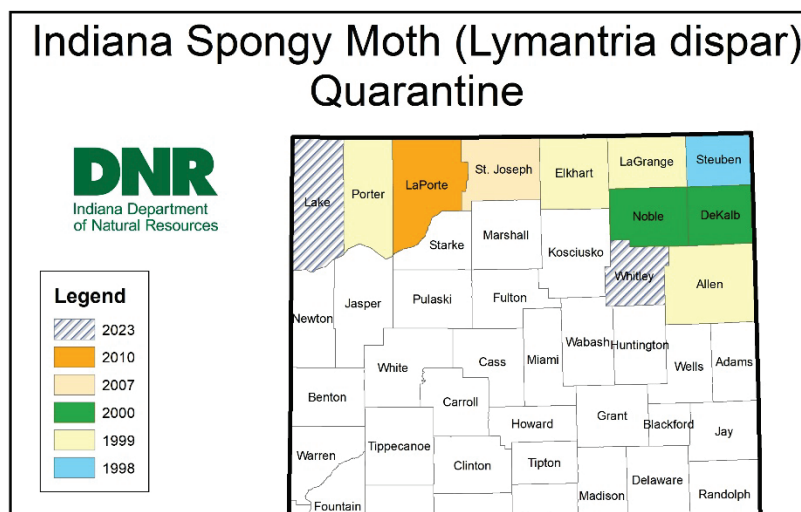


Figure 19: Counties quarantined 1998 to 2024.

4.2 Emerald Ash Borer - *Agilus planipennis* Fairmaire

EAB was confirmed in all 92 counties in March 2017. EAB took from 2004 to 2017 to travel from northeast to southwest Indiana. From 2009 to 2020, 169,745 acres of EAB mortality were recorded by an aerial survey mapping the advancing front of mortality. EAB mortality has completed its move through the state. All Indiana forest acres containing ash will have, have, or have had EAB mortality. This also includes all urban forests and street trees.

No survey was conducted in 2024. Southwest counties Gibson, Pike Posey, Vanderburg and Warrick are still experiencing ash mortality. Across the state efforts continue to locate live ash trees amongst dead ash that may have resistance or tolerance.

4.3 Thousand Canker Disease – *Pityophthorus juglandis* & *Geosmithia morbida*

The Walnut Twig Beetle (figure 20) trapping survey consisted of 32 locations (figure 21) – plantations or forest – placing 33 lindgren funnel traps baited with the walnut twig beetle lure. One trap was placed in the black walnut plantation in Yellowwood State Forest where *Stenomimus pallidus* with *Geosmithia morbida* was originally collected by USFS survey.



Figure 20: Walnut twig beetle collected during 2014 survey, Photo by Bobby Brown USDA.

Traps were placed at 33 high-risk sites (figure 22) - sawmills and veneer mills - throughout the state in 2024. For the 2 locations with previous trapping of WTB, traps were not placed at the Franklin County sawmill, but 4 traps were placed at the veneer mill in Edinburgh.

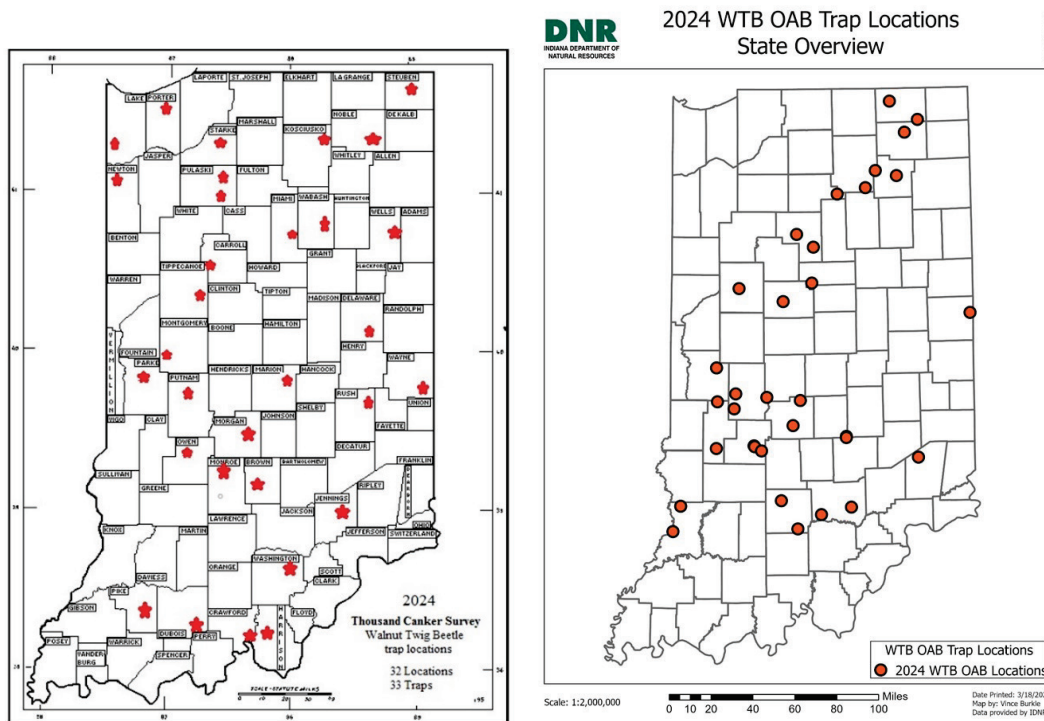


Figure 21: Left - Map of 2024 location of walnut twig beetle traps in woods or plantations.

Figure 22: Right - Map of 2024 location of walnut twig beetle traps at high-risk sites.

From two beetles in 2014, four beetles in 2015 and one beetle in 2016, the sawmill in Franklin County has not detected the beetle through 2022. With no detection for six years, no traps were placed at the mill in 2023 and 2024.

The veneer mill in Johnson County was free of walnut twig beetle from 2016 to 2022. Its south log yard just across the county line in Bartholomew County had one beetle trapped 7/31/2019 and again 6/29/2020 from a funnel trap. WTB was not detected at the south log yard from 2021 to 2024.

The 2018 trap tree survey in Crawford and Jennings detected walnut twig beetle at each location from the trap tree but not traps. *Geosmithia morbida* was found on walnut twig beetles – one each from sample above girdle and branch – by culture and DNA test.

The delimit survey using 9 traps at each location in 2019 to 2021 did not detect WTB. The 2022 to 2024 survey used one trap at the girdled tree location and WTB was not detected. Trees in these plantations do not show symptoms of TCD.

The Black Walnut Plantation on Yellowwood State Forest where *Geosmithia morbida* was first detected on the weevil *Stenomimus pallida* and served as a research site continues to show no symptomatic trees and no walnut twig beetle detected through 2024.

The windshield survey was conducted in 16 cities - Bloomington (southern 1/3), Butler/Waterloo, Cambridge City/Dublin/Mt Auburn, Chesterton, Evansville (northwest ¼), Greensburg, Indianapolis Perry Township (southern 1/3), Jeffersonville (southern ½), Lafayette (northern 1/3), Mishawaka/Oceola (eastern 1/3), Princeton, and Sheridan.

1,617 trees at 775 locations were surveyed with 18 trees listed as suspect. Suspect trees will continue to be evaluated for progressing symptoms. Since this survey began in 2012, 15,123 trees have been evaluated with 185 suspect trees and no positive trees in 161 municipalities.

To date, Thousand Cankers Disease of Black Walnut (TCD) has NOT BEEN DETECTED AND CONFIRMED from a walnut tree in Indiana. There is NO mortality of black walnut trees from TCD occurring in Indiana.

4.4 Spotted Lanternfly – *Lycorma delicatula*

Spotted lanternfly (SLF) (figure 23) is an invasive species detected in Berks County Pennsylvania in 2014. This colorful planthopper sucks sap from plants excreting a honey dew that is sticky and turns black with the growth of sooty mold after raining down in the forest.

It feeds on more than 70 plant species and has a strong preference for Tree of Heaven also an invasive species, grapevines, red maples, black walnut, birch, and willow.



Figure 23: Left, Spotted lanternfly 4th instar nymphs. Photo by Stephen Ausmus. Right, Spotted lanternfly adult. Photo by Lawrence Barringer, Pennsylvania Department of Agriculture.

Spotted lantern fly was detected in eight counties in 2024 – Bartholomew, Boone, DeKalb, Grant, Miami, Noble, Ohio, Wabash (figure 24). Several of the detections are associated with railyards and rail lines.

Switzerland county has the largest infested area, followed by the city of Huntington. Next is Elkhart/Goshen and Fort Wayne. Acres of land area infested is not determined but is estimated to exceed 150,000 acres.

The Division of Entomology and Plant Pathology conducted treatments in Switzerland and Huntington counties targeting tree of heaven with dinotefuran or spaying understory with bifenthrin.

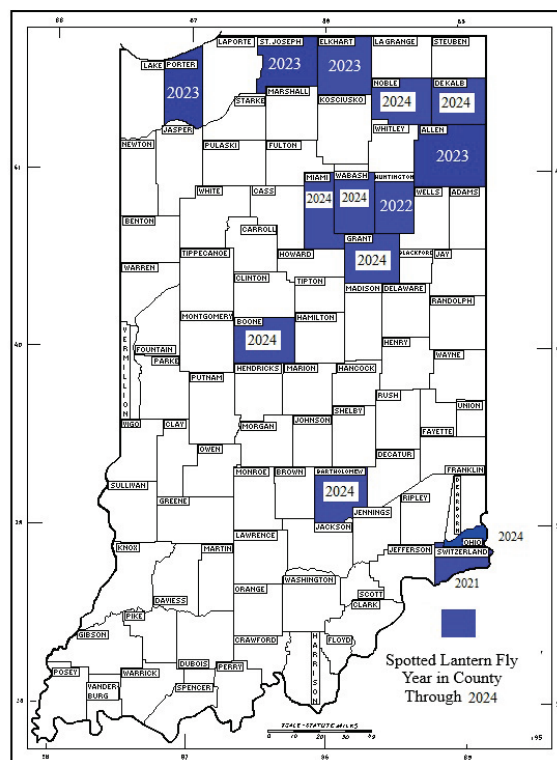


Figure 24: Spotted lantern fly infested counties through 2024.

5. Other Exotic Insect Pests of Concern

5.1 Asian Long-horned Beetle (ALB) - *Anoplophora glabripennis*

Survey around the industrial building where ALB was collected in 2020 has not detected the beetle or infested trees from 2021 to 2024 and is considered in interception not the start of infestation.

ALB does not occur in Indiana and concern continues for introduction into southeastern Indiana from the Bethel, Ohio infestation.

There were no reports of possible ALB infested trees or the beetle in 2024.

5.2 Hemlock Woolley Adelgid - *Adelges tsugae* Hemlock Elongate Scale, *Fiorinia externa*

In 2012, Hemlock Woolly Adelgid (HWA) was detected on one site in Michiana Shores in LaPorte County. The site is ½ mile south of Michigan line and 8 miles south of an infestation in New Buffalo, Michigan. Survey of the site and surrounding area since 2012 has not detected HWA.

Survey of native eastern hemlock forest locations scattered across Indiana through 2024 has not detected HWA. It has not been introduced through nursery stock and detected in any landscape, nursery, and retail locations.

The Division of Entomology and Plant Pathology monitors nurseries and retail locations for the hemlock elongate scale that could be introduced on Christmas wreaths and hemlock plants. It was not detected in 2024.

6. Plant Pathogens of Concern

6.1 Chestnut Oak Mortality – not Pathogenic, Drought induced decline. And Black Oak Decline.

First reported in Patoka Reservoir in 2016, chestnut oak mortality (figure 25) is still present in south central Indiana in the areas reported in prior years. Other oaks and tree species are also experiencing decline and mortality. Received reports of black oak decline from landowners indicating it is occurring to smaller diameter trees. This is unusual as it is known that large and very large diameter will die more readily than smaller diameter black oak. Will investigate this in 2025.

The 2024 aerial survey identified several areas of mortality, and one large area estimated at 3,700 acres with a large amount of dead trees (figure 26). The large area occurred in Brown county



Figure 25: Chestnut oak mortality
Patoka Reservoir September 2016.

State Park east of Yellowwood State Forest. The other areas of mortality occurred in Morgan-Monroe and Yellowwood State Forests, and the Hoosier National Forest around Monroe Reservoir.

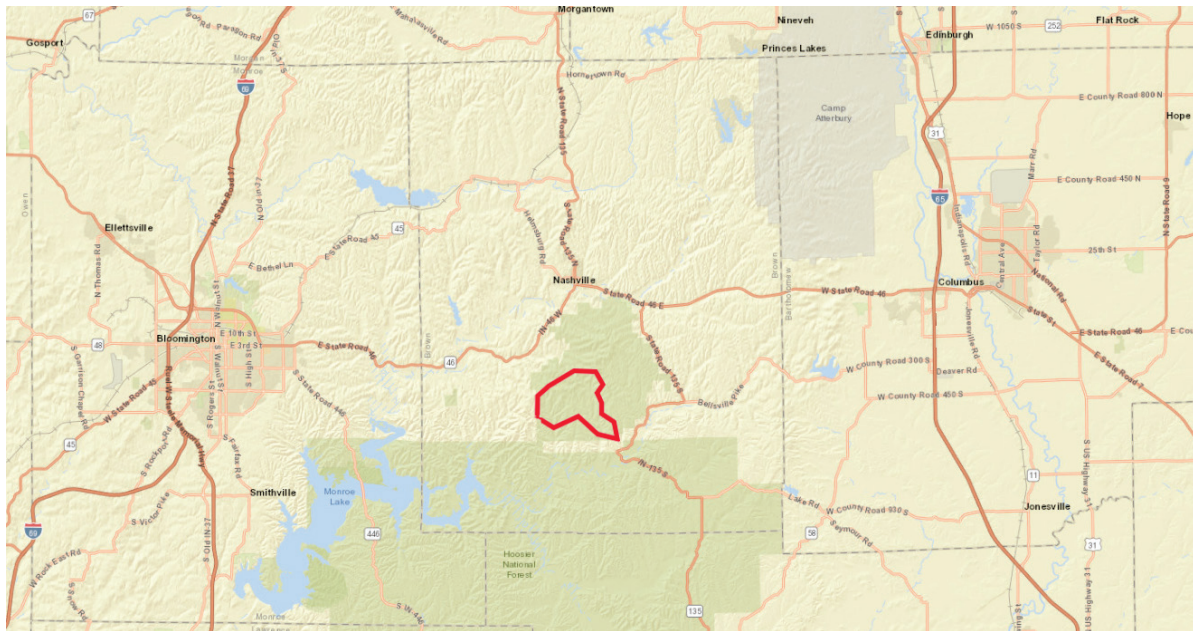


Figure 26: Area with extensive tree mortality in Brown County State Park.

The large area coincides with the research report of Chestnut Oak mortality conducted by Purdue grad student that found the highest mortality and unhealthy trees in Yellowwood State Forest south of highway 46 and northern portion of Hoosier National Forest. Higher mortality occurred in north and northeast aspects, higher slope position followed by mid slope position, and high density stands. Brown county State Park was not included in the study, but the research results apply to the large area of mortality in the Park.

Dendrochronology analysis of annual rings found that smaller drought events before 2012 placed the trees in a position leading to decline and death when the strong 2012 drought occurred. The analysis found that trees growing fast in their early years were more likely to decline and die. The slower growing trees in the early years tolerated the drought as they put more resources into roots than above ground tree parts. Fast growing trees put resources in the above ground part of the tree. The study did not associate mortality with any pathogen, as *Phytophthora cinnamoni* was considered a possible cause as its occurrence was very limited. The mortality followed typical drought induced oak decline series.

The paper of the study “A dendrochronological examination of a recent decline of chestnut oak across southern Indiana” is published in the journal of Forest Ecology and Management and can be found at this weblink

<https://www.sciencedirect.com/science/article/abs/pii/S0378112724001580>.

6.2 Oak Wilt - *Bretziella fagacearum* (formerly - *Ceratocystis fagacearum*)

Oak wilt was not confirmed from a new county in 2024.

It was reconfirmed in Elkhart county for the first time since before 1979 and again for the third time since 2021 in Franklin county.

The Elkhart location is a yard of large northern pin oak trees. Infection occurred in May via a broken branch or the pruning wound to remove the broken branch. Wilting began in June and oak wilt confirmed at Purdue Plant Diagnostic Lab in early July. Management using injections of propiconazole and trenching began in August. The origin of fungal mat that sap beetles used is unknown.

Franklin County original (first ever) confirmation was 2021, second confirmation in 2023, and third in 2024. All locations occur across the county. The 2021 and 2023 confirmations are in classified forests. The 2024 location is a yard location north of Batesville.

The 2022 report from Ball State University that oak wilt was detected on one of their properties in Delaware county was not visited in 2024 and aerial survey over part of Delaware county did not detect oak wilt.

An aerial survey detected wilting oak on Purdue farm in eastern Grant county. The Purdue forester is aware of these trees. No oak wilt was detected east of the farm in Blackford county.

The number of oak wilt counties remains at 66 (figure 22).

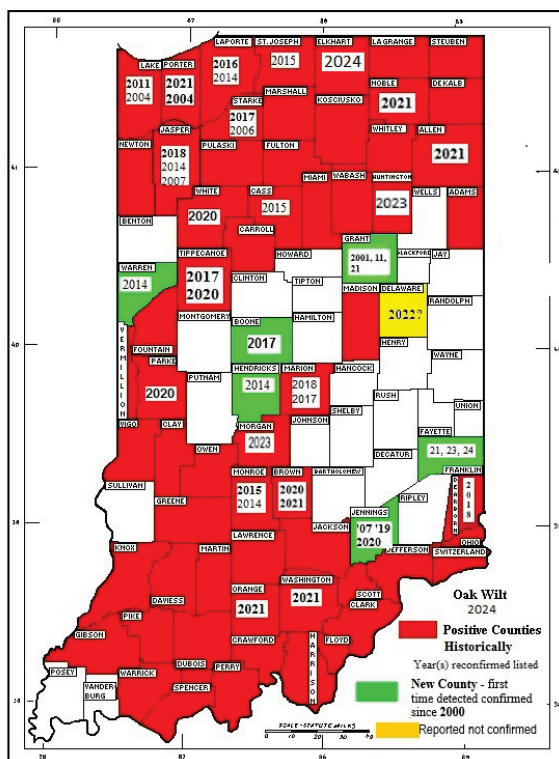


Figure 27: Counties confirmed with oak wilt. Counties in red were confirmed with oak wilt from original surveys through 1979. Green shaded counties were first time confirmation after 2000, Years in county indicate year of confirmation or re-confirmation.

Delaware, Blackford, Bartholomew, Decatur, Johnson, Posey, Rush, Vanderburgh and Wells counties are possible for first-time detection of oak wilt due to it occurring close to the county border of adjacent oak wilt county. The Grant County 2021 reconfirmation is less than one mile

west of Blackford County. The 2020 and 2021 reconfirmations in Brown County are less than 1 and 2 miles, respectively of Bartholomew and Johnson County. Based on symptom reports oak wilt is possible in Posey and Vanderburgh County. The oak wilt in Franklin is a few miles east of Decatur and Rush Counties.

Oak wilt is common in the woodlots of northwestern Indiana in the Kankakee River basin. Mortality occurs to red and black oak in small spots, less than one acre, consisting of sapling to saw timber size trees totaling less than 10 trees per spot, usually one to five trees. The Dunes National Lakeshore is actively managing oak wilt locations and identifying new locations.

In southern Indiana forests, oak mortality may be Oak Decline and not Oak wilt. The symptoms of the two diseases are similar, and testing is needed for oak wilt confirmation versus oak decline. Oak wilt has not been detected in white oak or other trees in white oak group in Indiana.

6.3 Sudden Oak Death - *Phytophthora ramorum*

The Division of Entomology & Plant Pathology continued the annual Sudden Oak Death (SOD) survey in nurseries and garden centers. Nursery inspectors submit 200 or more samples each year from any of 5 vector species they encounter in nursery inspections.

The 2023 samples have not detected *Phytophthora ramorum*. There were no reports of suspect oak trees with SOD symptoms because of the 2019 SOD interceptions on Rhododendrons in garden centers.

The only time SOD has been detected in Indiana is through vector species in nursery trade in 2006, 2012 and 2019. The disease has not been detected in the rural or urban forest.

6.4 Red Bay (Laurel) Wilt – *Raffaelea lauricola*, red bay ambrosia beetle, *Xyleborus glabratus*

Sassafras and spicebush are hosts of this disease and are present in Indiana forests. In 2020 the disease was detected in sassafras in two Kentucky counties that border Clark, Floyd, and Harrison County. Kentucky forest health has not reported additional location of sassafras with laurel wilt in their border counties to those Indiana counties.

Wilted sassafras in Brown County State Park in 2019 had sapwood stain and ambrosia beetle attack typical of Laurel Wilt. However, the samples were not tested and testing in 2021 of adjacent wilted trees did not confirm the fungus. 2020 ambrosia beetle traps did not detect red bay ambrosia beetle, and no traps were placed in since 2020.

Besides the 2021 Brown County samples, samples from trees in Lawrence, and Monroe counties were tested in 2021. Lab tests did not confirm laurel wilt fungus.

No report of wilting sassafras received in 2022.

A few reports of wilting sassafras in 2023. One from Lawrence County. And one from Monroe County. The report in Monroe County tested at Purdue Plant Diagnostic Lab was negative. I received a report of wilting spice bush from Gibson County, and it was examined and tested. No trapping survey for red bay ambrosia beetle in 2023 and 2024.

Refer to the Sassafras Wilt report in **3.1 above**

6.5 Beech Leaf Disease - *Litylenchus crenatae mccannii*

A nematode *Litylenchus crenatae mccannii* was found to be the cause of this disease. This is a subspecies of *Litylenchus crenatae* which is native to Japan found on *Fagus crenata*. In the U.S. there is morphological and host range differences that resulted in the subspecies designation.

Survey by district foresters in 2020 did not detect the disease. The survey was not repeated in 2021.

Ohio reported beech leaf disease in a nature preserve in northwest Ohio 30 miles east of Steuben County in mid-summer 2022.

Late summer after Ohio's report, Michigan reported it in 3 southeastern counties adjacent to and north of Detroit.

Late summer after those reports visual surveys in 14 locations total in DeKalb (2), LaGrange (3), Noble (3), and Steuben (6) Counties with a total of 19 sample points did not detect the disease.

Foresters did not specifically survey this disease in 2023 and did not report American Beech with symptoms of this disease in 2023.

The 2023 survey for buds is a Bipartisan Infrastructure Law invasive species survey grant between Indiana, Michigan, and Wisconsin Departments of Natural Resources. Each state collects buds and submits them to Purdue Plant Diagnostic Lab to test for DNA of the nematode.

In November and December 2023, 31 locations in 13 counties were surveyed - Allen, DeKalb, Greene, Huntington, LaGrange, Monroe, Noble, Owen, Pike, Spencer, Steuben, Wabash, and Wells.

Survey in these counties collected buds and submitted them to Purdue Plant Diagnostic Lab tested for the DNA of the nematode. The tests did not detect the nematode or nematode DNA

Through 2023, this disease is not present in Indiana.

Foresters did not report American Beech with symptoms in 2024.

Surveyed 14 locations in spring 2024 submitting 75 samples for testing at Purdue Plant Diagnostic Lab. Surveyed 26 locations in fall 2024 submitting 77 samples for testing at Purdue Plant Diagnostic Lab. All samples were negative except one fall survey plot in LaGrange county that was inconclusive by DNA but negative by water extraction.

That is not the case in 2024 for other white pine along U.S. Hwy 50 in Jackson County, St Hwy 364 in Pike County, a plantation in Orange County and elsewhere. Trees are dying from years of infection.

The following counties have observed symptoms – Brown, Clark, Jackson, Monroe, Morgan, Orange, Pike, and Washington, and are likely in other counties.

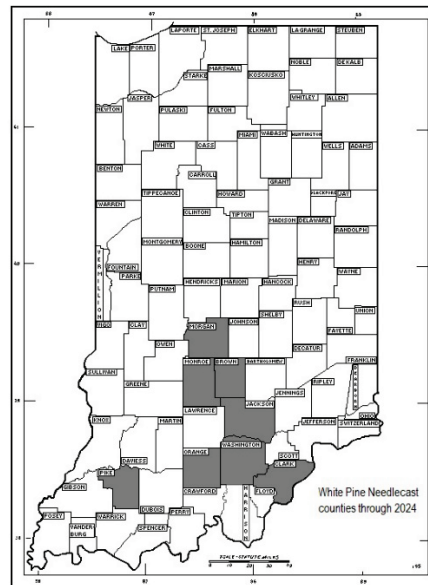


Figure 29: Counties with white pine needlecast through 2024.

7. Native Insect and Disease Concerns

7.1 Jumping Oak Gall - *Neuroterus* spp.

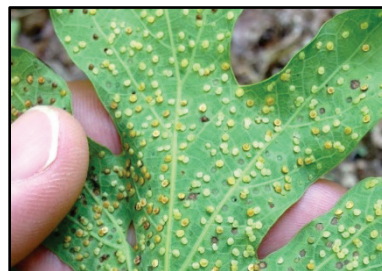


Figure 30: Jumping oak gall on underside of white oak leaf.

No reports in 2024. One report in 2023 which was first report in northern Indiana – Lake County.

The last report was 2019 on white oak in Martin, Lawrence, and Orange counties. Prior to that, noticeable damage occurred in 2016, 2012 and 1999.

7.2 Forest Tent Caterpillar – *Malacosoma disstria*

There was no report of forest tent caterpillar or its defoliation in 2024. The last epidemic occurred in southeastern Indiana 2002 -2006 (Dearborn, Jefferson, Ohio, and Switzerland

counties). Prior to that, the only other recorded epidemic was in the mid-late 1970s in south-central Indiana (Greene, Lawrence, Martin, and Monroe counties).

7.3 Looper Complex – Linden looper, *Erannis tiliaria*, half winged geometer, *Phigalia titea*

Defoliation by this looper complex did not occur in 2024. The last occurrence was 2013 with very light defoliation in Washington County in Jackson-Washington State Forest.

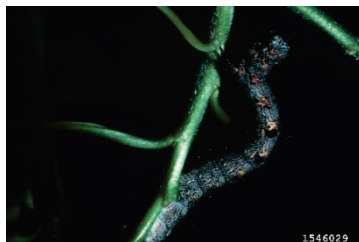
The first looper defoliation occurred 1978-1982 across south-central Indiana. The second defoliation occurred from 2003-2004, defoliating 89,252 acres in 2003 and 131,943 in 2004 over seven south-central counties each year.

Using the timeline of the two epidemics occurring about every 20 years, loopers and their defoliation could occur in 2024. And maybe they have started in 2024.

Loopers Return in Harrison Crawford State Forest??



Defoliation of the post oak trees in Post Oak Nature Preserve in Harrison Crawford State Forest was reported Friday May 24. The report stated it was only post oak defoliated, and caterpillars and their frass were not found. Some individual trees were completely defoliated and others with light to moderate defoliation.



Aerial survey May 31 mapped defoliation in the Nature Preserve and several other areas on the forest totaling 1,000 estimated acres. Defoliation occurred on south facing slopes. Defoliation was not only post oak but other trees.

Half-wing geometer and linden looper, *Erannis tiliaria*, *Phigalia titea*, are suspected as they feed from budbreak to late May and are not seen by Memorial Day or after. After feeding they pupate in the soil and emerge in fall and spring to mate and lay eggs.

Trapping survey this fall, and spring will determine if they have returned. The female moths are flightless and crawl from the soil to treetop to lay eggs. Tree bands with tanglefoot placed at DBH will capture the female as she climbs to treetop. The band also captures male moths attracted to the female which are used to identify the species.

Treatment in May 2025 may be necessary to protect the nature preserve because repeated heavy defoliation could kill post oak, other oaks, and hickory. The number of female moths trapped will be used to determine if treat is needed.

Checked the traps in December and did not find female or male moths or other insects on the traps. Traps will be replaced when checked and visited again in February March 2025 to look for looper adults that emerge late winter and early spring.

7.4 Anthracnose – *Apiognomonia* spp.

Sycamore anthracnose caused significant defoliation across Indiana in 2023. Most trees returned to full leaf in early July. No estimate of acres of defoliation.

2020 was the last year of significant anthracnose damage. In 2021, it occurred in selected areas across the state at a similar level of damage as 2020. On oak and other species, it was less than 2020 damage.

7.5 Tulip Tree Scale - *Toumeyella liriodendra*

There were no reports of the scale in 2024. The last report was 2020, with a few reports of black sooty mold and trees dripping sap from tulip trees in plantations, and one report of noticeable scale damage. The most damage occurred from 2011 to 2012 in south central Indiana combined with the 2012 drought, yellow poplar mortality was widespread in 2012 and 2013.

8. Invasive Plant Species

8.1 Kudzu - *Pueraria lobata*

Kudzu, an Asian native invasive vine, is located throughout Indiana but is predominately in southern Indiana. Currently there are 221 confirmed sites totaling 264 acres in 44 counties (figure 24). (Will Drew, Division of Entomology & Plant Pathology Personal Communication)

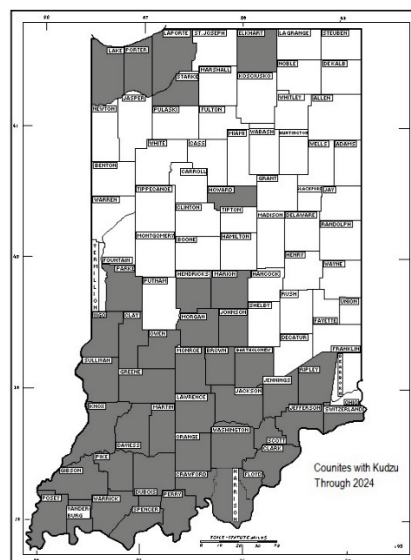


Figure 31: Counties with Kudzu

8.2 Invasive Plants – Top Ten on State Forests

Japanese honeysuckle and multiflora rose are one and two top invasive species on state forests occupying the most acres (figure 32)

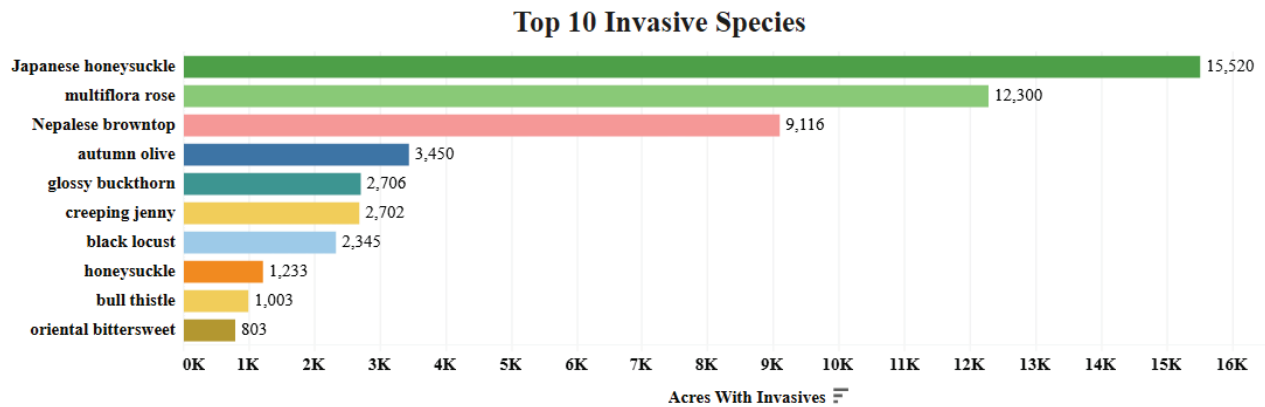


Figure 32: The top 10 invasive species on state forests by acres.

8.3 Invasive Plants – Top Ten on Classified Forests

On classified forests (private forestland), multiflora rose, and Japanese honeysuckle flip their one and two ranking by acres (figure 33).

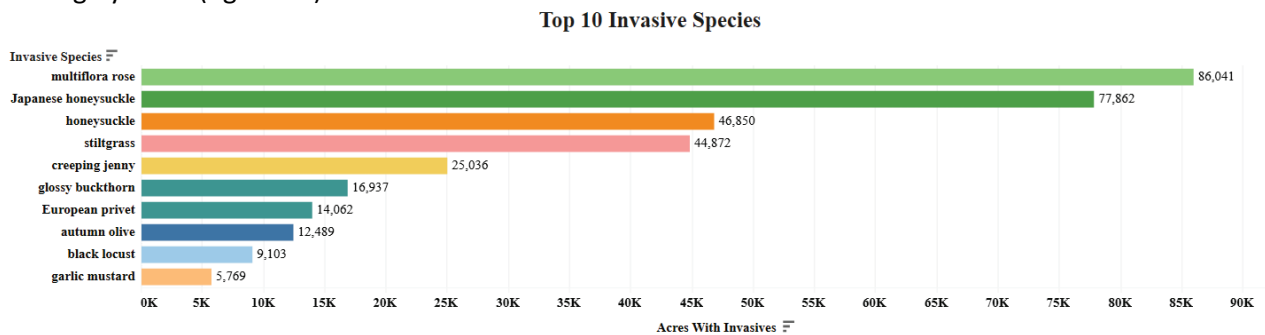


Figure 33: The top 10 invasive species on state forests by acres.

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