

# 2022 Indiana Forest Health Highlights

## 1. Indiana's Forest Resources

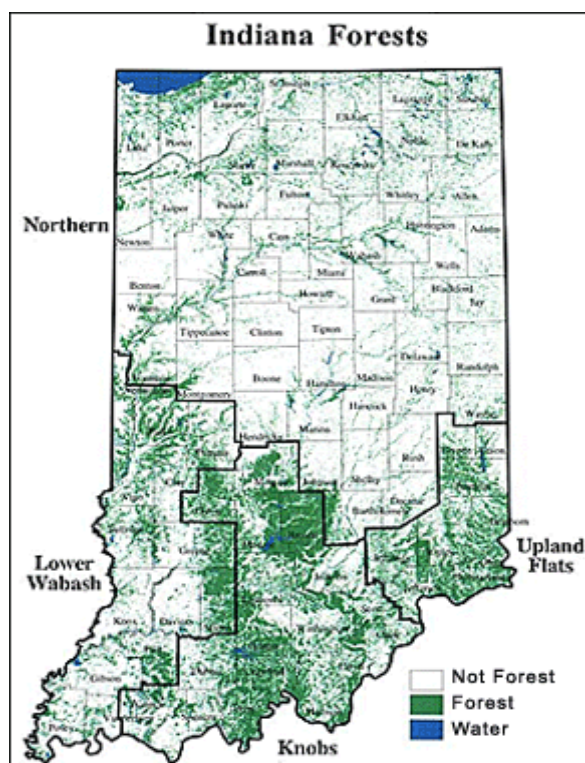



Figure 1. Distribution of Indiana's Forests

### 1.1 Forest Area, Types, Species

Reflecting the effect of past glaciations, forests exist in large consolidated blocks chiefly in the hilly southern part of the state. In the northern two-thirds of the state, forests generally occupy scattered woodlots, wetlands, and riparian corridors (figure 1)

Currently, Indiana houses 4,792,842 acres of forest land. Forested area has decreased by about 190,000 acres (1.8 percent) since 2015. (Forests of Indiana, 2020, USFS, Forest Inventory and Analysis, State Fact Sheets, data updated 11/01/2022, [https://public.tableau.com/views/FIA\\_OneClick\\_V1\\_2/Factsheet?%3AshowVizHome=no](https://public.tableau.com/views/FIA_OneClick_V1_2/Factsheet?%3AshowVizHome=no))

Timberland accounts for 4,623,000 acres (96.4 percent) of forest land, while 169,900 acres (3.5 percent) of forest land is reserved or unproductive.



Eighty-three (83.2) percent, or 3,987,600 acres of forest land, is privately owned. The state and local government own 6.0 percent or 288,000 acres while the federal government owns roughly 7.2 percent or 347,400 acres. A little over 3.5 percent or 169,900 acres of forest land is considered reserved.

Indiana has surprisingly diverse forests, encompassing northern maple / beech / birch types to southern bald cypress swamps. The land is dominated by the oak-hickory type in south-central Indiana. The 2020 FIA survey period identified 90 different tree species growing in Indiana forests. Hardwoods are the dominant species in Indiana. The oak/hickory group alone occupies 60 percent or 2,890,100 acres of forest land, the bulk of which resides in the white oak/red oak/hickory forest type.

Forest land consists mainly of sawtimber stands at 3,934,700 acres or 82.1 percent, pole timber stands at 574,900 acres or 12.0 percent, seedling-sapling stands at 255,600 acres or 5.3 percent, and nonstocked at 27,600 or less than 10.01 percent. Indicative of a maturing (aging) forest, white and red oak/hickory is found primarily in the sawtimber stand-size class.

The sugar maple (*Acer saccharum*) is the most numerous tree in Indiana with an estimated 342 million individuals; followed by American beech, sassafras, American elm, and red maple for number of trees >1 inch at root collar on forest land. Interestingly, sugar maple is not the most voluminous species in the state that distinction belongs to the state tree, yellow poplar, a.k.a. the tulip tree (*Liriodendron tulipifera*) with a net volume of nearly 1.41 billion cubic feet. These yellow poplars also store approximately 26.34 million tons of woody biomass in their tissues.

Ash species group followed by yellow-poplar show the highest mortality (by number of trees) in Indiana for the 2020 forest inventory, and by volume white ash, green ash, yellow-poplar are the top three followed by black oak, sugar maple, white oak, black cherry, slippery elm, American elm, and red maple. Annual mortality is 14,030,861 trees and 173.9 million cubic feet.

Source [https://public.tableau.com/views/FIA\\_OneClick\\_V1\\_2/Factsheet?%3AshowVizHome=no](https://public.tableau.com/views/FIA_OneClick_V1_2/Factsheet?%3AshowVizHome=no)

## **1.2 Volume – Growth & Mortality**

Net volume (10.5 billion cubic feet) experienced an increase of about 3.0 percent since 2015. Yellow poplar and sugar maple were the top two individual tree species by volume estimates, with over 1.3 and 0.98 billion cubic feet, respectively. White oak, black oak, and American sycamore rounded out the top five each with over 0.44 billion cubic feet. Annual net volume growth (173.3 million ft<sup>3</sup>) was led by yellow-poplar and sugar maple (33.7, 23.7 million cubic feet). White ash continues to be number one in annual mortality – 43.9 million cubic feet. Green ash, yellow poplar, black oak, and sugar maple, respectively, round out the top five in annual mortality (18.3, 13.2, 8.3, 7.0 million cubic feet). Total annual mortality of sound bole volume is 173.9 million cubic feet.

Source: Forest Inventory EVALIDator web-application Version 2.0.4. <https://apps.fs.usda.gov/fiadb-api/evaluator>

## **1.3 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 mill 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>
2. Forests of Indiana 2015 [https://www.in.gov/dnr/forestry/files/fo-2015\\_FIA\\_Annual\\_Report.pdf](https://www.in.gov/dnr/forestry/files/fo-2015_FIA_Annual_Report.pdf)

#### **1.4 Maple Syrup** – maple syrup report 2021 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 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 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 dollar 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](#)

## **2. State Forest Health Issues – An Overview**

The **2022 growing season's forest health problems and concerns** did not begin like 2021 with landowner's concern for Brood X Periodical Cicada. The problem that increased via reports from forest landowners and foresters is **herbicide** symptoms on foliage of white oak, and other oaks.

2022 was the year that DNR's management work eradicated **gypsy moth** from Indiana. After 35+ years, there is no more reports of gypsy moth defoliation and trap catch from annual survey.

But it was the first year to report a new pest – perhaps in name. **Spongy moth's** first defoliation occurred in 7 northern counties – Allen, DeKalb, LaGrange, LaPorte, Noble, Porter, Whitley. Defoliated acres totaled 2,337 which is the most for one year. LaPorte and Porter county had the most at 1,417 and 614 respectively.

Even though noticeable defoliation occurred in more counties and acres, the number of male moths captured decreased by 44% and the spread moved backward by rate of 8 miles/year. The advancing front of spongy moth returned northward to the location it was in 2019.

The other new pest, **spotted lantern fly**, arrived last year in Switzerland county. It's second appearance was July this year in city of Huntington, Huntington county. As last year, a landowner

reported the presence of the colorful nymph stage. Surveys found it west side of the city near railroad line and industrial location.

Another new pest – **beech leaf disease** – came closer to Indiana when Ohio reported it was detected in a nature preserve in northwest Ohio 30 miles east of Steuben county. Late summer after Ohio’s report, Michigan reported it in 3 southeastern counties adjacent to and north of Detroit. Late summer visual surveys in northeast counties did not detect the disease.

The **walnut twig beetle** surveys, vector of *Geosmithia morbida* that combine to create thousand cankers disease, did not detect the beetle or an infected tree in 2021 and in 2022. Walnut twig beetle was trapped at two sawmills and two plantations prior to 2019 was not trapped through 2022. The beetle was trapped in one log yard in 2020 but not in 2021 or 2022. This disease is not present in Indiana.

**Emerald ash borer** (EAB) is not a pest of concern since it has infested the entire state. Ash trees are a concern as the requests go out to report a healthy ash – lingering ash – that may have resistance or tolerance and are surrounded by ash killed by EAB.

**Chestnut oak mortality** is still a concern in Morgan Monroe, Yellowwood State Forests, Brown County State Park, and Hoosier National Forest. In addition, white oak mortality may become a concern as forest inventory and analysis data may indicate an increase in mortality.

**Oak wilt** is still a problem in northwest Indiana. No new county confirmation or reconfirmation of existing counties in 2022. Although it was reported in Delaware county on a Ball State University property.

No other defoliation, mortality, or new pest occurred or reported in 2022. Overall, the main concerns are herbicide damage, spongy moth defoliation, and oak mortality.

**Future forest pests of concern** are the exotic pests, Asian longhorned beetle, hemlock woolly adelgid, beech bark disease, sudden oak death, gold spotted oak borer, other *Agrilus* spp., ZigZag Sawfly of Elm, and laurel (red bay) wilt.

Asian longhorned beetle (ALB) adult was captured inside a factory in Porter county in 2020. Surveys through 2022 have not detected infested trees. Still a concern for southeast Indiana due to the infestation east of Cincinnati Ohio.

Laurel wilt is believed to be present based on reports of wilting sassafras trees. However, samples have not confirmed presence of the wilt fungus nor red bay ambrosia beetle.

**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*, and others.

The kudzu eradication program continues its efforts and to date 216 sites in 43 counties totaling 241.20 acres are confirmed. 3 new sites of 1.81 acres confirmed in 2022. The goal is to move kudzu to the Ohio River and eventually out of Indiana.

The Division of Entomology and Plant Pathology implemented the Terrestrial Plant Rule (312-IAC-18-3-25) in 2020 prohibiting and restricting 44 terrestrial invasive plants. With the Aquatic Plant Rule (312-IAC-18-3-23), 74 invasive plants are prohibited or restricted from sale or position.

### 3. First time occurrence impacting Indiana Forests

#### 3.1 Oak Shot Hole Leaf Miner – *Japanagromyza viridula* syn *Agromyza viridula*



Figure 1: Shot hole leaf miner damage on black oak leaves.

Shot Hole Leafminer damage (figure 2) that occurred in 2020 to 79,992 acres through south central Indiana (Figure 3) to black oak and other oaks did not repeat in 2022 although some shot hole damage at a low level to oaks was reported in extreme south central Indiana (figure 2). It also did not occur in 2021 except for a few reports of shot hole at a very low level in south central Indiana.

Spring frost/freeze events in late April through mid-May did not occur in 2022 as in 2020 with the leafminer.



Figure 2: Areas of shot hole leaf miner defoliation mapped during 2020 aerial survey in south central Indiana.



## 4. Exotic Insect Pests of Indiana Forests

Spongy moth, thousand cankers disease of black walnut, chestnut oak mortality and oak wilt dominated the monitoring and management activities. Monitoring activities are adding laurel wilt (sassafras mortality), beech leaf disease, hemlock woolly adelgid and spotted lantern fly to forest health survey activity.

### 4.1 Spongy Moth – *Lymantria dispar dispar*

Entomological Society of America changed common name Gypsy Moth to Spongy Moth in 2022.

The Cooperative Gypsy Moth Survey ended with its 34th year of the statewide survey in 2021. The Cooperative Spongy Moth Survey began its 1<sup>st</sup> year in 2022. 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 4): 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, respectively. In the state area, 27 counties were surveyed partially or not at all for economic reasons and no trap catches in prior years. Across all zones, the survey deployed 9,090 traps all referenced by GPS.

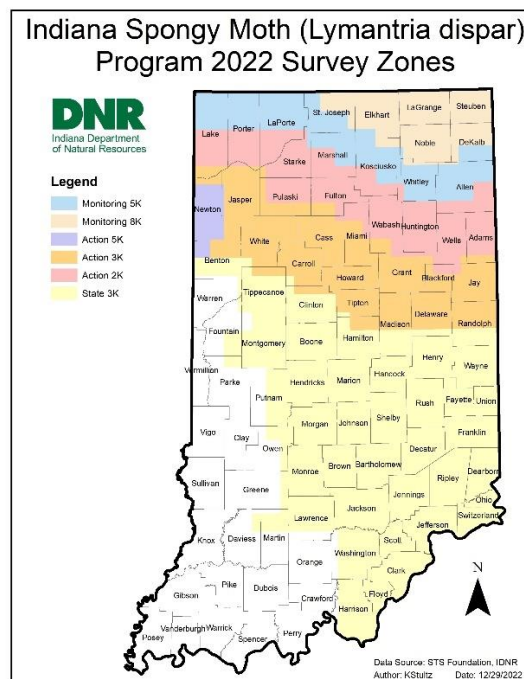


Figure 3: Gypsy moth survey zones - yellow state zone, pink slow the spread action zone, blue slow the spread monitoring zone 5k, tan slow the spread monitoring zone 8k

The survey detected 23,457 moths from 42 of counties (33 in STS and 9 in state zone) ranging from 1 to 6,751 moths per county. LaPorte county had the highest moth catch – 6,751, followed by LaGrange, DeKalb, Steuben, and Allen counties.

Total moths is 44% lower than 2021 catch (41,770) and 33% lower than 2020 catch but is 24% higher than 2019 (figure 5). There was low catch positive traps through the STS action zone from a larval blow-in event from the epidemic in Michigan. A larval and moth blow event has occurred 2 or 3 times in the past with trap catch decreased the following year.

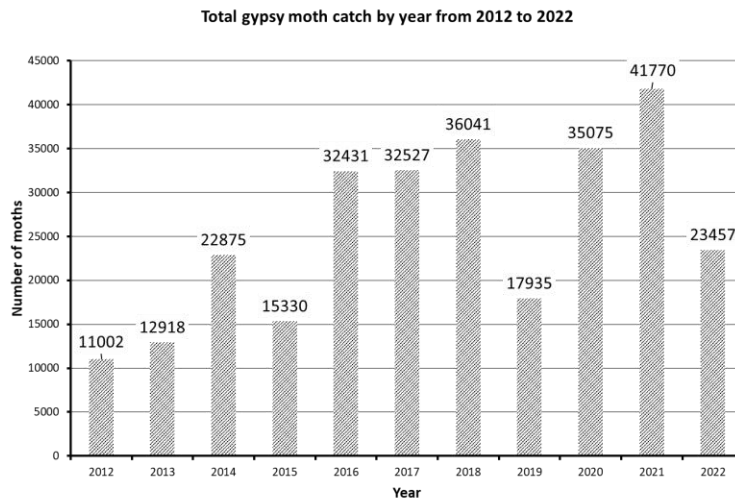


Figure 4: Graph showing number of male gypsy moths caught by year from 2011 to 2021

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 91.77% of the moths (21,527 of 23,457). The Action Zone detected 7.82% of the moths (1,834 of 23,457). The State Area detected 0.41% of the moths (96 of 23,427).

Most of the moth catch in the Action Zone occurred in the top 2K grid area. Majority of traps were 1 and 2 moth catch and occurred across the width of the 2K grid. Below the 2K grid is the 3K grid and on eastern side of this grid, most of the positive traps were single moth catch. These positive traps extended farther down the state as occurred in 2020 and 2021.

Since the survey began in 1972, a total of 699,651 moths have been caught in 90 of the 92 counties. Spongy moth has not been detected in Dubois or Sullivan County since surveys began in 1972.

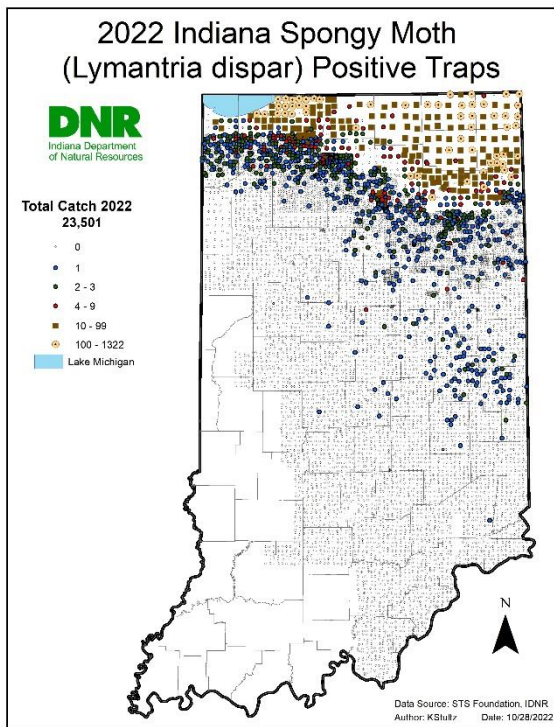


Figure 5: Map showing 2022 Gypsy Moth trap locations range of catch from 0 to 100+ in each trap.

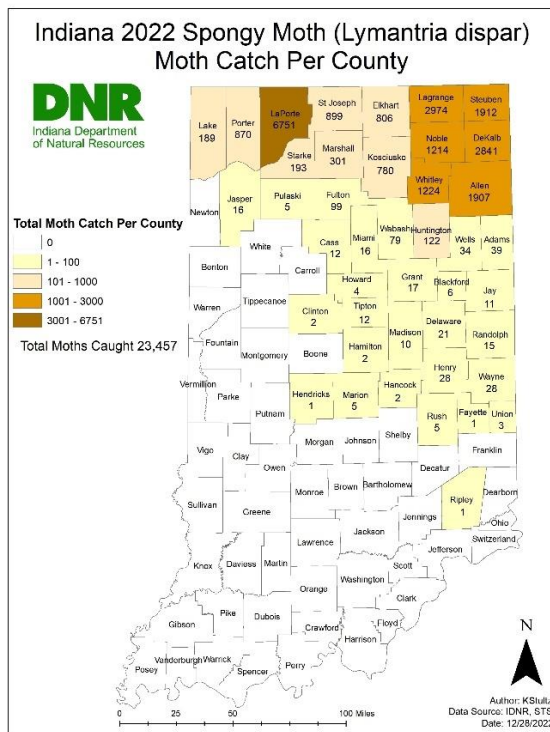


Figure 6: 2022 total moth catch in each county. Total state catch is 23,457.

## Defoliation 2022

Aerial survey recorded 2,337 acres of noticeable defoliation in Allen, DeKalb, LaGrange, LaPorte, Noble, Porter and Whitley counties. LaPorte and Porter county had the most defoliation at 1,417 and 614 acres, respectively. This was the second year of noticeable defoliation in LaPorte county and acres defoliated increased over 2021. This was the first year of noticeable defoliation in Porter county and occurred in the Dunes National Lake Shore area Noble county defoliation occurred in 3 locations. One was light defoliation in Chain O Lake State Park White Oak Nature Preserve which was treated with Btk and suppressed defoliation compared to 2021. Defoliation in Allen, DeKalb, and LaGrange county was small, localized woods. This total exceeded the 1,383 defoliated acres reported from 2008 to 2021.

Table 1; 2022 Spongy moth defoliation acres by county.

Acres by county and defoliation level					
County / Defoliation level	Very Severe	Severe	Moderate	Light	Total
Allen	47	36	43		127
DeKalb		17			17
LaGrange		17			17
LaPorte	992	296	98	31	1,417
Noble		63		34	97
Porter	586	28			614
Whitley			50		50
Total	1,625	457	191	65	2,337



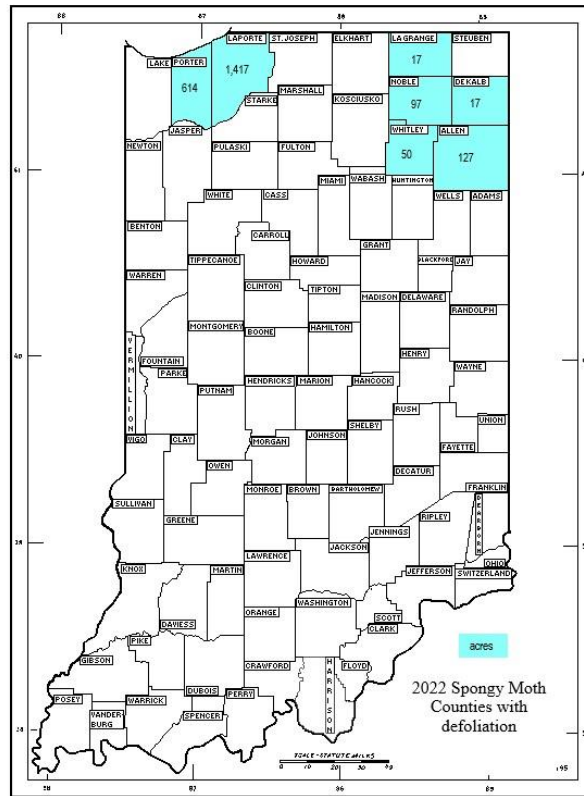


Figure 7: 2021 counties and acres of Gypsy Moth Defoliation.

**Treatments 2022 to Slow The Spread:**

Btk (*Bacillus thuringensis kurstaki*):

Treatment to slow-the-spread and development of spongy moth were conducted on 2 sites in 2022 totaling 696 acres treated (table 2 and figure 9). Each site was treated once at 38CLU/A. Application cost was \$50.80 per acre and total cost was \$49,580.80.

Table 2; 2022 sites by county, acres treated by Btk

	County	Site Name	Treatment Material	Treatment			Acres Treated
				Rate	Appication #	Method	
1	Marshall	Richland Center Btk 22	Btk	38 CLU	1	Aerial	71
2	LaPorte	Kingsbury Btk 22	Btk	38 CLU	1	Aerial	625
<b>Total Treated Acres</b>							696

Mating Disruption:

Eleven sites totaling 23,548 acres were treated once with Splat GM Organic. Nine sites totaling 19,708 acres were treated at 6 gram/acre and two sites of 3,840 acres at 15 gram/acre (table 3 and figure 9). Mating disruption application cost was \$8.35 per acre for 6 grams and \$13.99 per acre for 15 grams. Total cost was \$218,579.02.

Table 3: 2022 sites by county, rate, acres treated with mating disruption

	County	Site Name	Treatment Material	Treatment			Acres Treated
				Rate	Application #	Method	
1	Allen	Flatrock Creek MD 22	MD	6g	1	Aerial	200
2	Allen	Hoagland MD 22	MD	6g	1	Aerial	7790
3	Huntington	Warren MD 22	MD	6g	1	Aerial	976
4	Marshall	Argos MD 22	MD	6g	1	Aerial	650
5	Marshall & Fulton	Old Tip MD 22	MD	6g	1	Aerial	3212
6	Porter	Valparaiso MD 22	MD	6g	1	Aerial	3324
7	Pulaski & Starke	Beardstown MD 22	MD	6g	1	Aerial	1510
8	Wabash	North Manchester MD 22	MD	6g	1	Aerial	466
9	Wells	Bluffton MD 22	MD	6g	1	Aerial	1580
10	Kosciusko	Warsaw MD 22	MD	15g	1	Aerial	705
11	Miami & Fulton	Macy MD 22	MD	15g	1	Aerial	3135
				<b>Total 6 g</b>			19,708
				<b>Total 15 g</b>			3,840
				<b>Total Acres STS</b>			23,548

**Treatments 2022 to Suppress Defoliation:**

Btk (*Bacillus thuringensis kurstaki*):

2022 was the first year to conduct a suppression treatment. Two sites in Chain O' Lake State Park totaling 280 acres were treated once with Btk at 38 CLU/A. Total cost was \$14,224.00.

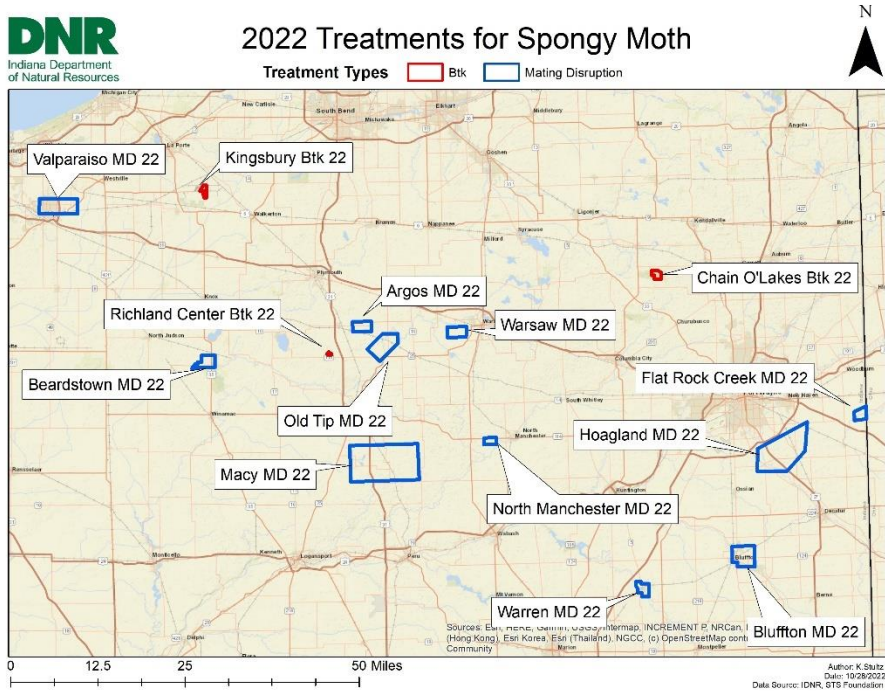


Figure 8: Map: 2022 Spongy Moth Treatment Sites. Site label has name and treatment material.

## Treatment Analysis

Slow-the-Spread treatment analysis found Richland Center Btk treatment successful and Kingsbury Btk treatment partially successful. Suppression sites are not evaluated for success in STS but achieved the goal of suppressing defoliation.

Slow the Spread treatment analysis found all mating disruption sites successful.

### **Eradication: Purdue – 3 years no moths detected – Eradication achieved**

In 2014, an eradication treatment began on the campus of Purdue University. Treatment occurred in 2014 and 2017. The treatment area was delimited in 2020 to 2022. No moths were trapped in the area during this time. The treatment area is considered eradicated.

### **Eradication: Richmond**

The 2021 delimit detected 2 single moth traps on western side of the delimit of the eradication area. The 2022 delimit detected 2 single moth traps again on western side of the eradication area. The treated area did not have any moths detected in delimit traps. Delimit trapping is planned for 2023 to hopefully find no moths in traps in and around the original treatment site.

### **Quarantine and 10 moth line:**

Lake and Whitley counties were quarantined initially in November 2022 with implementation March/April 2023. The 10 moth line has remained relatively unchanged for the last 3 years. It is one guide used in the decision to quarantine a county.

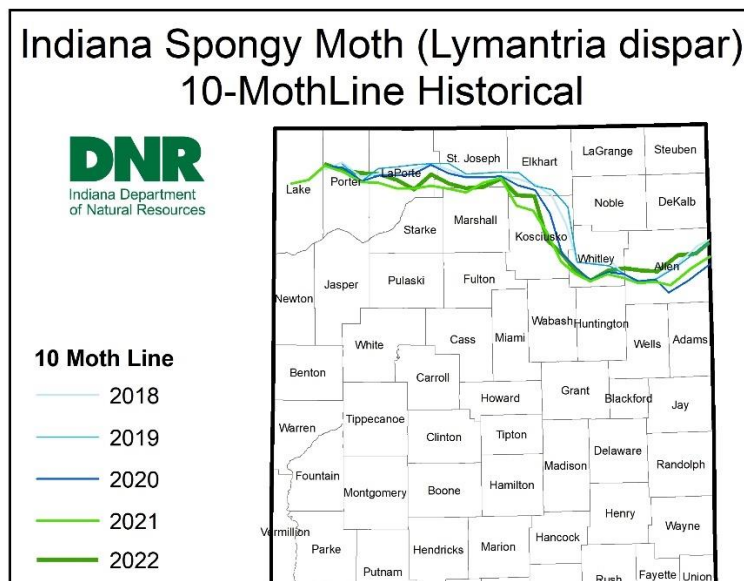


Figure 9: Map: Ten moth line from 2018 to 2022. Line means an average of ten moths caught per trap around the line for the specific year.

## Indiana Spongy Moth (*Lymantria dispar*) Quarantine

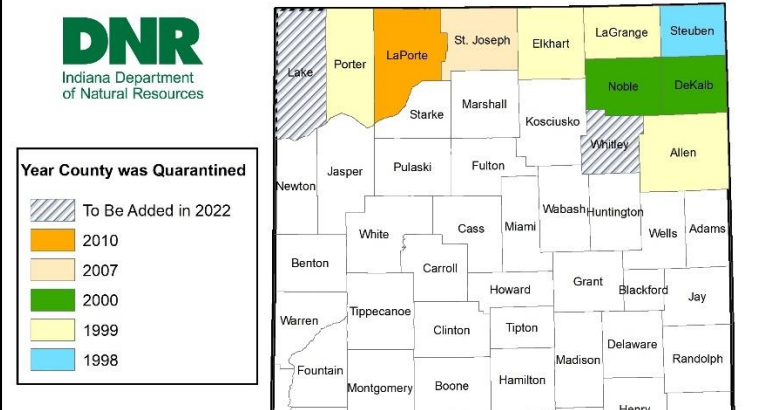


Figure 10: Counties quarantined 1996 to 2022.

### **Spread Rate:**

For 2022, the annual spread rate is negative 8.00 miles per year, and the three-year average spread rate is 1.29 miles per year. Both the annual and three year spread rate are well below Indiana’s goal of 6.00 mile per year. The decrease is due to population decrease in northern Indiana and epidemic population in Michigan collapsing.

Table 4: Gypsy moth annual and 3 year average spread rate in kilometers and miles

Unit	2022	3 year average
Kilometer	-12.87	2.07
Mile	-8.00	1.29

### **4.2 Emerald Ash Borer - *Agrilus planipennis* Fairmaire**

By 2017 Emerald Ash Borer (EAB) was throughout the state and the state quarantine had been repealed. It is no longer a pest of concern. But ash trees are a concern and efforts are ongoing to locate ash trees surviving and surrounded by dead trees. These ash trees may have tolerance and resistance to EAB and could be added to tree improvement efforts to breed trees that can withstand EAB.

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

The 2022 walnut twig beetle (WTB) (photo) survey consisted of Lindgren funnel traps at 30 high risk sites (sawmills and veneer mills) and 38 plantations or woods (figure 13 & 14). Traps were deployed mid-April and were removed in early October. Samples screened did not detect WTB.



Photo: Walnut Twig Beetle collected during 2014 survey. Photo by Bobby Brown USDA

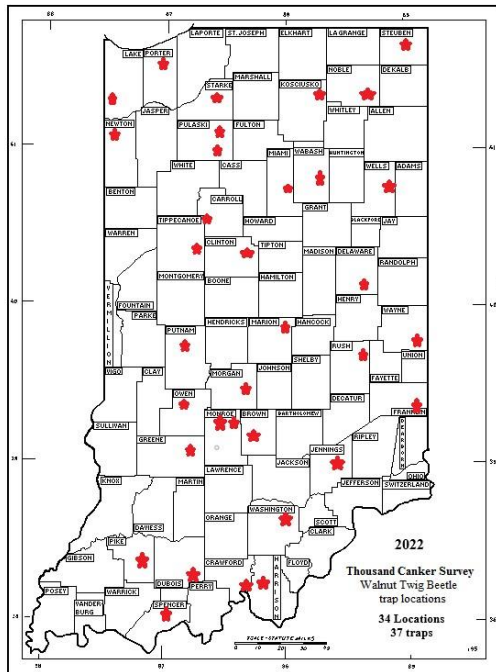


Figure 11: Map of 2022 location of walnut twig beetle traps in woods or plantations.

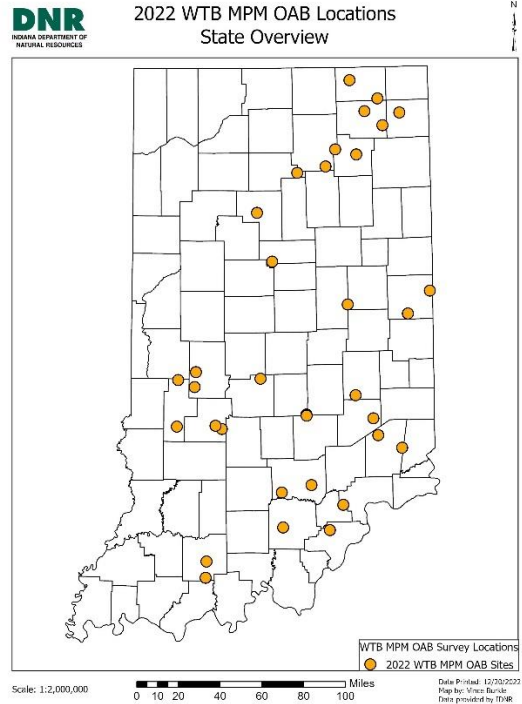


Figure 12: Map of 2022 location of walnut twig beetle traps at high risk sites

The Windshield Survey of black walnut trees occurred in 14 cities. Surveyed were Avilla, Bremen, Georgetown, Westville/Wanatah, Albion, Clay City, Veedersburg, Oakland City, Hope, Gaston, Columbia City/Dublin/Mount Auburn. The survey of 292 points and 572 trees detected one suspect tree. Suspect trees from prior year survey are not showing progressive symptoms. Since this survey began in 2012, 12,614 trees have been evaluated with 153 suspect trees and no positive trees in 135 municipalities

Spongy moth trap tenders also collected data on the location and condition of walnut trees near gypsy moth traps. They identified 250 trees and identified 5 trees that had symptoms which were given to nursery inspectors to check and monitor in the future. Since 2011, trap tenders have monitored over 10,000 walnut trees

From two beetles in 2014, four beetles in 2015 and one beetle in 2016 at the sawmill in Franklin County, the sawmill has been free of walnut twig beetle from 2017-2021 and no beetles detected in samples screened through November 2022.



The veneer mill in Johnson county was free of Walnut Twig Beetle from 2016 to 2021 and not detected in samples screened through November 2022 .

The veneer mill has a south log yard just across county line in Bartholomew County. One beetle was collected 7/31/2019 and again 6/29/2020 from a funnel trap. WTB was not detected at the south log yard in 2021 and samples screened through November 2022.

The Black Walnut Plantation on Yellowwood State Forest where *Geosmithia morbida* was detected on the weevil *Stenomimus pallida* and served as a research site continues to show NO symptomatic trees and no walnut twig beetle detected by traps in 2022.

The 2018 trap tree survey locations in Crawford and Jennings detected WTB at each location and *Geosmithia morbida* was found on the WTB. Delimit survey of each location 2019-2021 did not detect WTB. Both locations were not delimited in 2020 but had one trap at the location of 2018 girdled tree. Samples screen through November have not detected WTB. Trees in these plantations do not show symptoms of TCD.

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*



Figure 13(Left) Spotted Lanternfly 4th instar nymphs. Photo by Stephen Ausmus

Figure 14 (Right) Spotted lanternfly adult. Photo by Lawrence Barringer, Pennsylvania Department of Agriculture

Spotted lanternfly (SLF) (figure 15 & 16) 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. The raining of

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.

Spotted lantern fly was confirmed July 2021 in Switzerland County. July 2022, it was confirmed in city of Huntington in Huntington county. Both locations were reported by landowners.

In Huntington, surveys found it west side of the city near railroad line and industrial location. Railroads have moved SLF across Pennsylvania and into Ohio. It is likely that is how it arrived in Huntington. The Switzerland county site is from a household move from Pennsylvania.

The Division of Entomology and Plant Pathology conducted surveys at both locations and applied insecticides to populations and limit spread. They also use herbicide to kill small tree of heaven. This effort will continue in 2023.

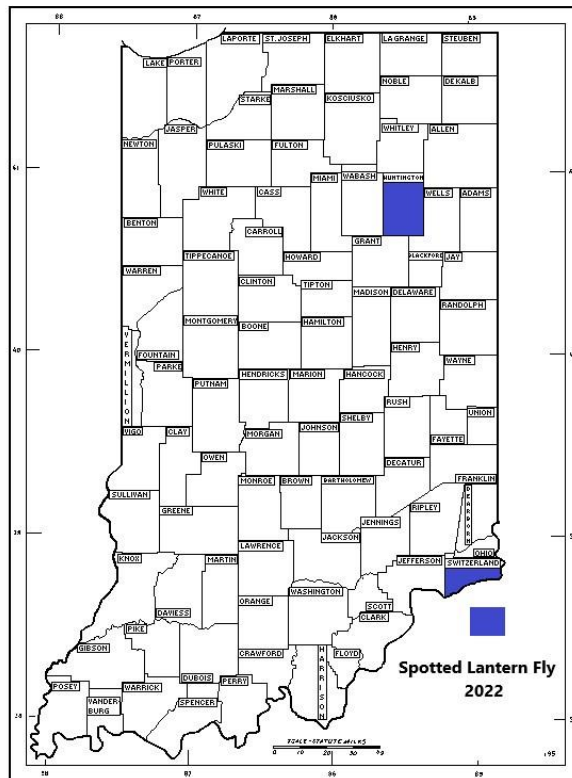


Figure 15: 2022 spotted lantern fly infested counties.,

## 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 in 2021 and 2022. Surveys continue in 2023.

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

There was no reports of possible ALB infested trees or the beetle in 2022.

### 5.2 Hemlock Woolley Adelgid - *Adelges tsugae*

Ten years ago, Hemlock Woolly Adelgid (HWA) was detected in 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 that site and surrounding area since 2012 has not detect HWA. Survey of native eastern hemlock forest locations scattered across Indiana continues and through 2022 HWA has not been detected. It has not been introduced through nursery stock and detected in any landscape, nursery, and retail locations.

## 6. Plant Pathogens of Concern

### 6.1 Chestnut Oak Mortality – disease complex cause under study

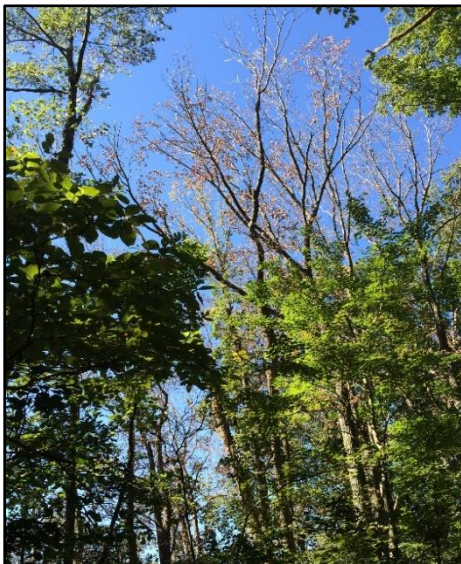


Figure 17: Chestnut oak mortality Patoka Reservoir September 2016

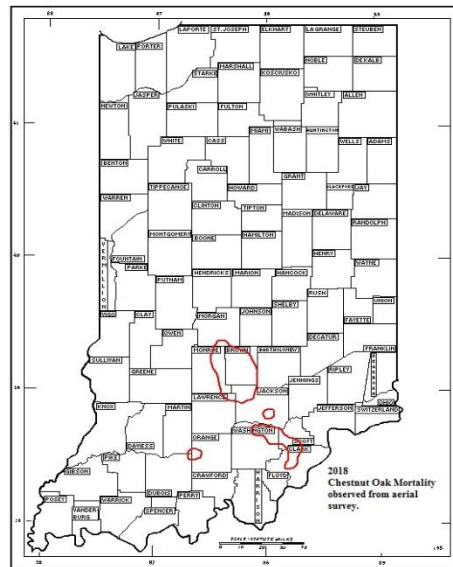


Figure 17: Areas in southern Indiana with chestnut oak mortality in 2018

The forest health management plan to address chestnut oak mortality (figure 19) at Patoka Reservoir (Dubois county) received the decision notice from the Army Corps of Engineers to proceed and a harvest was advertised and awarded in late 2021. The harvest did not occur in winter 2021-2022 and is expected to occur winter of 2022-2023.

The purpose of the harvest is to salvage mortality, suppress further mortality, regenerate the forest, and implement wildlife management in the area.

Chestnut oak mortality continues to occur in south central Indiana in the areas reported in prior years. No aerial survey was conducted to record new or prior mortality.

The chestnut oak mortality project conducted by Purdue grad student continued with preliminary analysis of increment cores and review of FIA data of oak mortality to determine a trend of mortality over time.

Purdue grad student has collected data on 130 plots over Morgan Monroe State Forest, Yellowwood State Forest, and Hoosier National Forest. Data for plots in Yellowwood State Forest south of highway 46 and northern portion of Hoosier National Forest had the highest mortality and unhealthy trees. Data also indicates north, and northeast aspects had a higher proportion of dead trees and higher slope position had the higher proportion of mortality followed by mid slope position. Data indicates high stand density had higher mortality.

The student reviewed Forest Inventory Analysis data and found limited number of Indiana plots with mortality but found more plots in eastern U.S. with elevated mortality particularly high in Pennsylvania and Virginia forests.

The student sampled roots in 5 sites in 2021 and found one occurrence each of *Phytophthora cinnamomi* and *Phytophthora vexans*.

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

No new counties confirmed or reconfirmed for oak wilt in 2022. Oak wilt was reported on Ball State University land, but the trees were not sampled and confirmed by lab analysis. The reported location will be sampled in 2023 as confirmed culture and DNA samples of oak wilt are needed to list the county having oak wilt.

The number of oak wilt counties remains at 66 (figure 21).

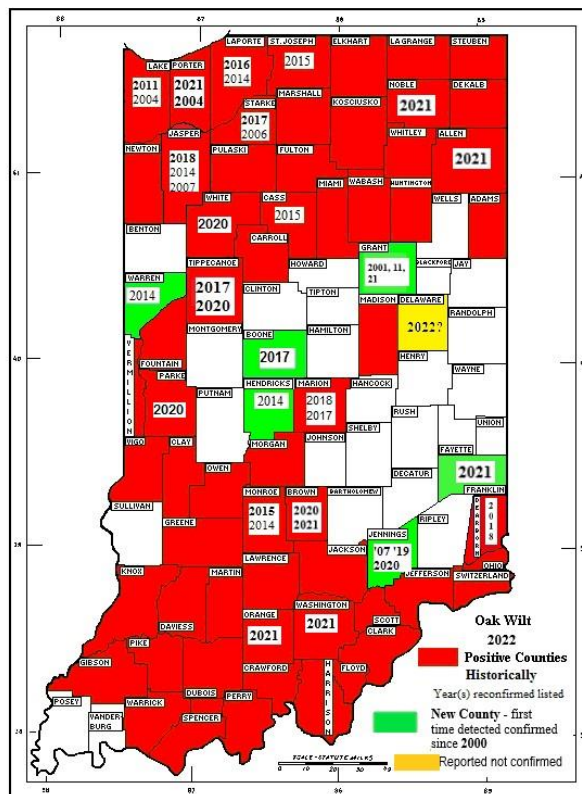


Figure 18: Counties confirmed with oak wilt. Counties in red were confirmed with oak wilt from original surveys through 1979. Green shaded counties were first time confirmation after 2000, Years in county indicate year of confirmation or reconfirmation.

Besides Delaware, Blackford, Bartholomew, Johnson, Posey, and Vanderburgh counties are possible first time detection of oak wilt. 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.

It 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.

In southern Indiana forests, oak mortality may be Oak Decline and not Oak wilt. 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 white oak group trees 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 2022 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 the nursery trade in 2006, 2012 and 2019. And 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 host 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, 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 2021.

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

A few wilting/dying sassafras trees were reported but not examined in 2022. No trapping survey for red bay ambrosia beetle in 2022.

This disease is suspected to be in Indiana, but through 2022 it has not been detected and confirmed.



## **6.5 Beech Leaf Disease** - *Litylenchus crenatae mccannii*

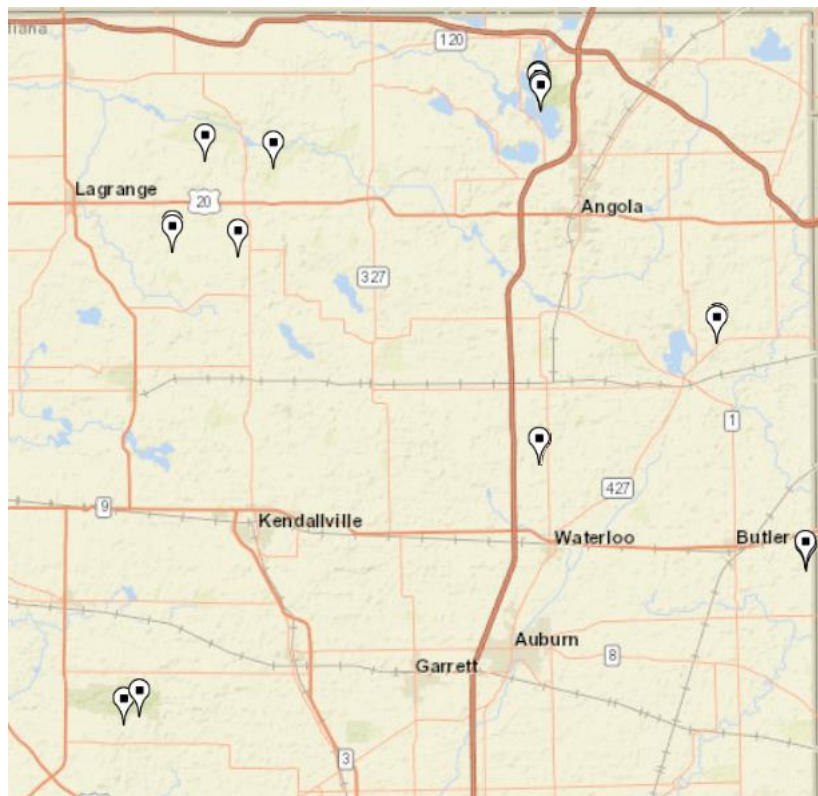
A nematode *Litylenchus crenatae mccannii* was found to be the cause of this disease. This is a subspecies of *Litylenchus crenatae* which is native to Japan found on *Fagus crenata*. In the U.S. there is morphological and host range differences that resulted in the subspecies designation.

Survey by district foresters in 2020 did not detect the disease. 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 visual surveys in 14 locations total in DeKalb (2), LaGrange (3), Noble (3), and Steuben (6) Counties with a total of 19 sample points and did not detect the disease.



This disease is getting closer to Indiana and is likely to be present or the nematode could be present and has not developed to a level to produce leaf symptoms.

Through 2022, this disease is not present in Indiana.

## **6.6 Beech Bark Disease** - *Cryptococcus fagisuga*, *Nectria coccinea* var. *faginata*

No survey was conducted in 2022 for this disease. Foresters and arborists did not report a beech that may have this disease. Thus, this disease is not present in Indiana and is expected to first

occur in northern Indiana because of its presence along Lake Michigan in the Lower Peninsula of Michigan. The concern is the possibility that infected/infested material (firewood) is brought into Indiana.

### **6.7 Bur Oak Blight** - *Tubakia iowensis*

Bur oak blight was first detected in 2017 in Lake county. In 2018, the fungus was confirmed on swamp white oak in Allen county. No reports of the disease were received in 2019 and 2020. However, in 2020, I observed one symptomatic tree in Lake county in September and other trees in Lake county observed with symptoms in 2017 did not show symptoms in 2020. No reports of this disease in 2021 and 2022.

### **6.8 White Pine Needle Cast** – *Dothistroma pini*

Yellow and tan color needles were observed on large white pine in September 2018 in Monroe county along highway 446 on the Hoosier National Forest. Purdue Plant Diagnostic lab confirmed *Dothistroma pini* present in symptomatic needles. Through 2022, those trees still have the disease and thin tree crowns. They have not died or shown symptoms of dying.

Symptoms have been observed in Brown, Monroe, and Orange counties since 2018 and were observed in 2021. Symptoms were observed in Pike County on Pike State Forest in 2022. The trees have had the disease for several years.

## **7. Native Insect and Disease Concerns**

### **7.1 Jumping Oak Gall** - *Neuroterus spp.*



Figure 19: Jumping oak galls on underside of white oak leaf.

No reports were received in 2020-2022. It was reported in 2019 on white oak in Martin, Lawrence and Orange counties in 2019 (figure 23). Prior to that, noticeable damage occurred in 2016. Other years of damage are 2012 and 1999.

### **7.2 Forest Tent Caterpillar** – *Malacosoma disstria*

There was no report of forest tent caterpillar in 2022. 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).



Treatment of kudzu by IDNR-DEPP began in 2006 and has continued annually to remove kudzu from Indiana. In 2022, herbicide applications were conducted at 38 kudzu sites in 20 counties. A total of 63.21 acres were treated by contract in 2022. No staff treatments in 2022.

For all DNR DEPP treated sites, 96.0 percent have at least 90 percent suppression or greater in 2022. This is up from 88.0, 91.2, 94.0 percent in 2019 to 2021, respectively.

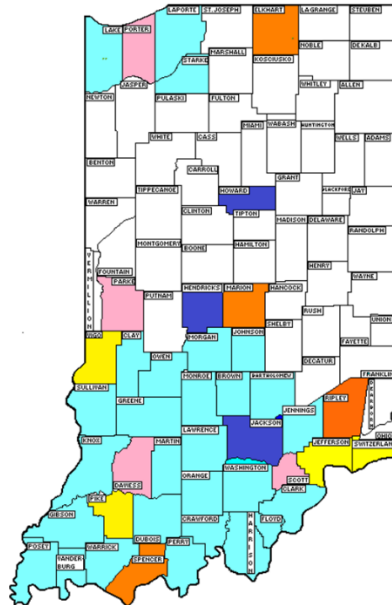


Figure 21: Kudzu treatment status by county - no treatment Orange, likely eradicated dark blue, approaching eradication yellow, under DNR treatment light blue, landowner treatment pink.

A total of 39 sites appear to be eradicated including those treated by private landowners, commercial owners and DNR. Specific sites are in Brown, Clark, Harrison, Howard, Jackson, Johnson, Jennings, Knox, Lawrence, Monroe, Morgan, Owen, Pike, Starke, and Warrick counties. Figure 25 map indicates status of treatment in each county with kudzu.

(Ken Cote, Division of Entomology & Plant Pathology Personnel Communication)

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