

## 1. Indiana's Forest Resources

### 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.

Currently, Indiana houses nearly 4.9 million acres of forest land. Forested area has increased by about 1.2 percent (58,000 acres) since 2012. Timberland accounts for nearly 97 percent of forest land, while the remaining 3 percent of forest is reserved or unproductive.

Eighty-four (84) percent, or over 4.1 million acres of forest land, is privately owned. The state and local government own 8.0 percent or 394,000 acres while the federal government owns roughly 7.5 percent or 388,493 acres. A little over 3 percent or 165,781 acres of forest land is considered reserved.

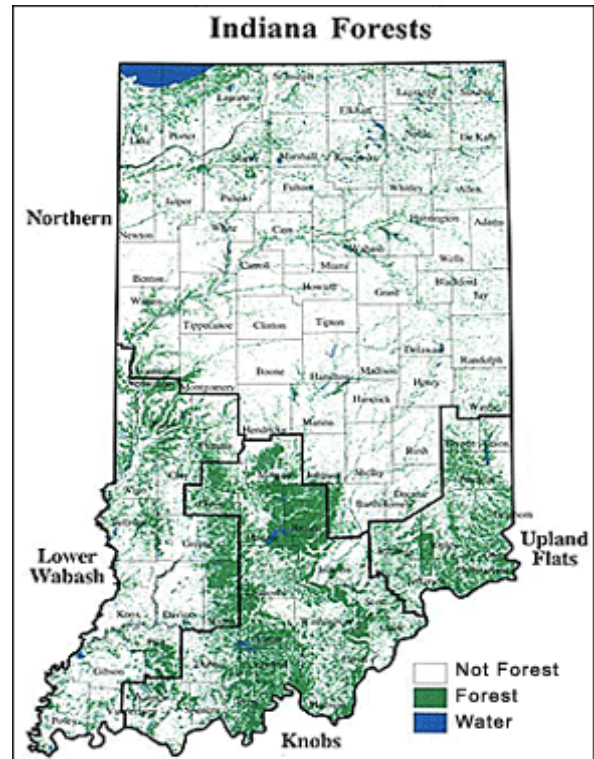


Figure 1. Distribution of Indiana's Forests

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 2017 FIA survey period identified 93 different tree species growing in Indiana forests. Hardwoods are the dominant species in Indiana. The oak/hickory group alone occupies 71 percent of forest land, the bulk of which resides in the white oak/red oak/hickory forest type.

Forest land consists mainly of sawtimber stands (nearly 80 percent); poletimber stands (13 percent), seedling-sapling stands (6 percent),

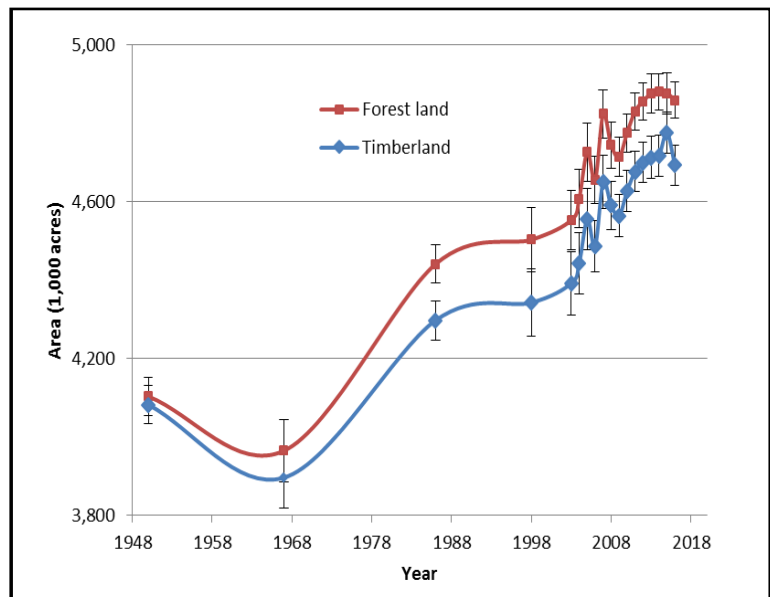


Figure 2. Area of forest land and timberland in Indiana by inventory year, 1950, 1965, 1986, 1998, 2003 to 2016. Error bars represent 1 standard error or a 68-percent confidence interval.

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and nonstocked (less than 1 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 351 million individuals; followed by American elm, sassafras, American beech, and red maple for number of trees >1 inch at root collar on forest land. Interestingly, the 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 1.29 billion cubic feet. These yellow poplars also store approximately 24.5 million tons of woody biomass in their tissues.

White ash, followed by yellow-poplar, sugar maple, black oak and red oak show the highest mortality in Indiana for the 2017 forest inventory. Annual mortality increased by 37.2 percent between 2012 and 2017 and in 2017 was 1.4 percent of net volume, up from 1.1 percent in 2012.

Source: Forests of Indiana, 2017 located at [https://www.fs.fed.us/nrs/pubs/ru/ru\\_fs165.pdf](https://www.fs.fed.us/nrs/pubs/ru/ru_fs165.pdf)

### Volume – Growth & Mortality

Net volume (10.9 billion ft<sup>3</sup>) experienced an increase of about 5.3 percent since 2012. Yellow poplar and sugar maple were the top two individual tree species by volume estimates, each with over 1 billion cubic feet. White oak, black oak, and red maple rounded out the top five, all with over 500+ million cubic feet each. White ash fell out of the top five for volume because it is number one in annual mortality - 23.1 million ft<sup>3</sup>. Yellow poplar, sugar maple, black oak and red oak, respectively, round out the top five in annual mortality (12.5, 10.0, 7.3, 6.3 million ft<sup>3</sup>).

Source: Forests of Indiana, 2017 located at [https://www.fs.fed.us/nrs/pubs/ru/ru\\_fs165.pdf](https://www.fs.fed.us/nrs/pubs/ru/ru_fs165.pdf)

### 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 \$13.5 billion annually (2016) to Indiana's economy. In 2013, Indiana's primary wood-using industry included 130 sawmills, five veneer mills and one mill producing other products. Direct employment within the industry accounted for over 30,800 people and indirectly, the industry supports around 96,000 jobs. Forest-based manufacturing provided \$3.5 billion in value-added, \$7.9 billion in value of shipments, and a payroll of \$1.2 billion to Indiana's economy in 2014. 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. 2013, Resource Update FS-116: [https://www.fs.fed.us/nrs/pubs/ru/ru\\_fs116.pdf](https://www.fs.fed.us/nrs/pubs/ru/ru_fs116.pdf)
2. Indiana's Hardwood Industry: Its Economic Impact (Update of the 2010 Hoover/Settle report): [http://www.in.gov/dnr/forestry/files/fo-Hrdwd\\_Imp\\_2016.pdf](http://www.in.gov/dnr/forestry/files/fo-Hrdwd_Imp_2016.pdf)
3. Economic Impact 2015: [http://www.in.gov/dnr/forestry/files/fo-2015\\_FIA\\_Annual\\_Report.pdf](http://www.in.gov/dnr/forestry/files/fo-2015_FIA_Annual_Report.pdf)

Maple syrup is a product of Indiana's forests. In 2018, there were 213 maple syrup producers with 59 counties having at least one producer. Most are found in northern half of the state. Of those, 78 responded to a survey with 68 indicating a total production of 15,398 gallons of maple syrup. This was up from 9,160 and 12,054 gallons in 2016 and 2017, respectively. A total of 54,893 taps

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produced 757,581 gallons of sugar water with an average 49.2 gallons to get one gallon of maple syrup. The 2017 retail prices for gallon, quart and pint are \$42.85, \$13.88 and \$8.22, respectively, up for gallons and down for quart and pint from 2017 average prices. Average dollar return per tap is \$15.03 compared to \$8.51 in 2017. The estimated statewide income is \$659,804 and can approach \$825,000 accounting for producer consumption, product given away and product not reported.

Source: [https://www.IN.gov/dnr/forestry/files/fo-maple\\_syrup\\_report\\_2018.pdf](https://www.IN.gov/dnr/forestry/files/fo-maple_syrup_report_2018.pdf)

## 2. State Forest Health Issues – An Overview

The **2018 growing season's forest health problems and concerns** include continued western spread of ash mortality from Emerald Ash Borer; localized gypsy moth defoliation in Allen, Elkhart, and St. Joseph Counties; additional areas and expansion of chestnut oak mortality in Brown County State Park, Morgan-Monroe, and Yellowwood State Forests and Brownstown Ranger District of the Hoosier National Forest; and localized occurrence of herbicide damage to oaks and species.

**The recurring forest health issues** include gypsy moth management, oak wilt, emerald ash borer, Thousand Cankers Disease, and mortality/decline in aging hardwood forests.

**Future forest pests of concern** but not present in Indiana in 2018 include the exotic pests, Sudden Oak Death, Asian Longhorned Beetle, Hemlock Woolly Adelgid, Beech Bark Disease, Beech Leaf Disease, Gold Spotted Oak Borer, and other *Agilus* spp., Spotted Lantern Fly, and Red Bay Wilt.

Thousand Cankers Disease of black walnut is a disease of concern. The good point to date is that the various surveys have not detected the disease in an Indiana black walnut. The components of the disease – Walnut Twig Beetle and *Geosmithia morbida* – have been detected in Indiana through a research project and from logs and traps at two sawmills.

Some **Invasive plants** are affecting Indiana forest regeneration and biodiversity. Plants of concern 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 196 sites in 43 counties totaling 186.94 acres are confirmed. This is an increase of 10 sites and 21.6 acres with one new site totaling 13 acres. The goal is to move kudzu to the Ohio River and eventually out of Indiana.

Joining the Division of Entomology and Plant Pathology's Aquatic Plant Rule (312-IAC-18-3-23) is preliminary adoption of the Terrestrial Plant Rule that is expected to become law in spring 2019. Between the two rules, 28 aquatic and 44 terrestrial invasive plants are prohibited or restricted from sale or position.

## 3. Exotic Insect Pests of Indiana Forests

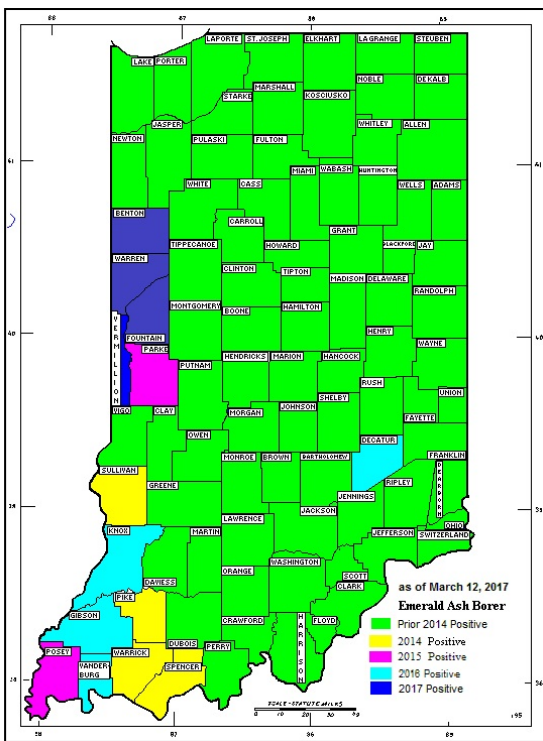
Gypsy moth, Thousand Cankers Disease and Emerald Ash Borer continue to dominate the monitoring and management activities. Hemlock Woolly Adelgid, Sudden Oak Death, Spotted Lantern Fly, Tree of Heaven, other exotic beetles are adding to the monitoring work. There is also

awareness for sassafras mortality as it may be caused by Laurel Wilt (Red Bay Wilt), as well as for beech mortality possibly from Beech Bark Disease. New to monitoring is Beech Leaf Disease.

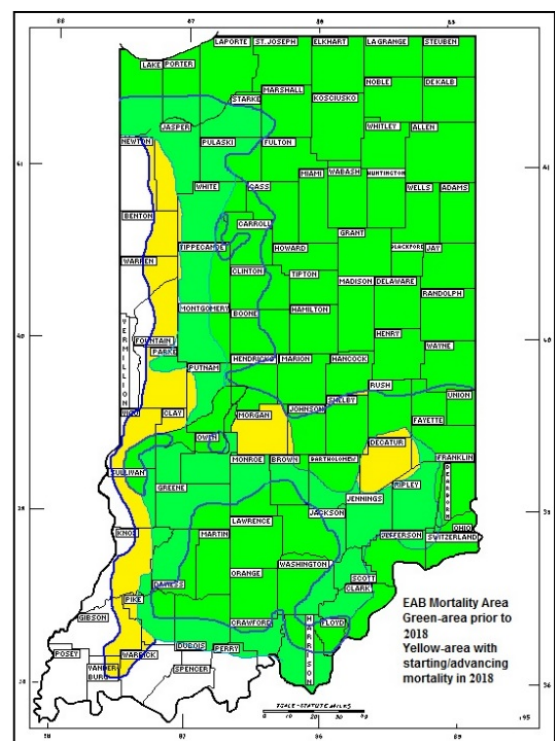
### 1. Emerald Ash Borer - *Agilus planipennis* Fairmaire

Emerald Ash Borer (EAB) is present in all 92 counties. Ash tree mortality has not made its way across Indiana to the Illinois border, except for the northwest corner and west central area of Indiana. The southwest corner of Indiana is just beginning to see the first ash mortality in 2018 through 2022. The western side of the state in northern Indiana is old prairie area and tree habitat is the lowest in the state, thus ash mortality is expected to be slow in occurring.

Map 1 shows the counties confirmed positive since 2014. Map 2 shows occurrence and spread of ash mortality detected through 2018 aerial survey. The western edge of mortality is to the Illinois border in central western Indiana – Terre Haute (Vigo County). In northwestern Indiana, EAB



EAB Map 1. Positive EAB counties from 2004 through 2017 showing counties detected from 2014 to 2017.



EAB Map 2: EAB mortality prior to 2018 in green. Yellow area with starting/advancing mortality in 2018. Dark lines are prior year advances in mortality extent.

mortality is almost to Illinois with U.S. 41 as the western edge of mortality. A large area of mortality was detected west and north of Purdue University in 2018, which was not present in 2017. This area includes parts of Tippecanoe, White, and Warren Counties.

In southern Indiana below Interstate 64 from Perry County west to Vanderburgh County there is little EAB mortality. North of Interstate 64 and along U.S 41 mortality is starting and spreading to the Illinois border (Wabash River) and is to the border at Vincennes in Knox County.

EAB mortality is just starting to be noticeable in the ‘toe’ of the state and will likely be evident in 2019. In southwestern Indiana, EAB is in the early years of killing ash and it is expected that the killing wave will be through south western Indiana by 2022

EAB mortality was detected in 8,853 forested acres in 2018, bringing the total forested acres with mortality to 164,529 since 2009. This is only through aerial survey. The forested acres with ash mortality will eventually include total forested acres with ash. Adding the urban forest will increase that total.

Indiana's EAB quarantine was repealed in October 2016.

## 2. Emerald Ash Borer Parasitoid Release Program

The Division of Entomology & Plant Pathology released four EAB parasitoids in 2016 and 2017. The egg parasitoid *Oobius agrili* and three larval parasitoids, *Tetrastichus planipennisi*, *Spathius galinae* and *S. agrili* (Photos 1, 2, 3) were received from the USDA Lab in Brighton, Mich.

Release occurred at the same locations each year for a total of 13 sites in five locations in southeast Indiana – Brookville Lake (5), Austin Bottoms (4), Hardy Lake Recreation Area (2) Crosley Fish & Wildlife Area (1), and Atterbury Fish & Wildlife Area (1). Counties with release sites are Franklin, Union, Jennings, Scott, Jackson, Washington, and Johnson Counties, respectively (Map 3).

For the two years, 86,900 *Oobius agrili*, 215,985 *Tetrastichus planipennisi*, and 11,950 *Spathius spp.*, a total of 314,835 parasitoids, have been released.

In 2019, surveys will be conducted to re-capture any of the parasitoids to determine if they have established.

Source: 2016 and 2017 Division of Entomology & Plant Pathology Annual Reports, Emerald Ash Borer Parasitoid Release Program report by Jared Spokowsky



Photo 1: *Oobius agrili* (Houping Lui Michigan State University).



Photo 2: *Spathius* spp. (David Cappaert)

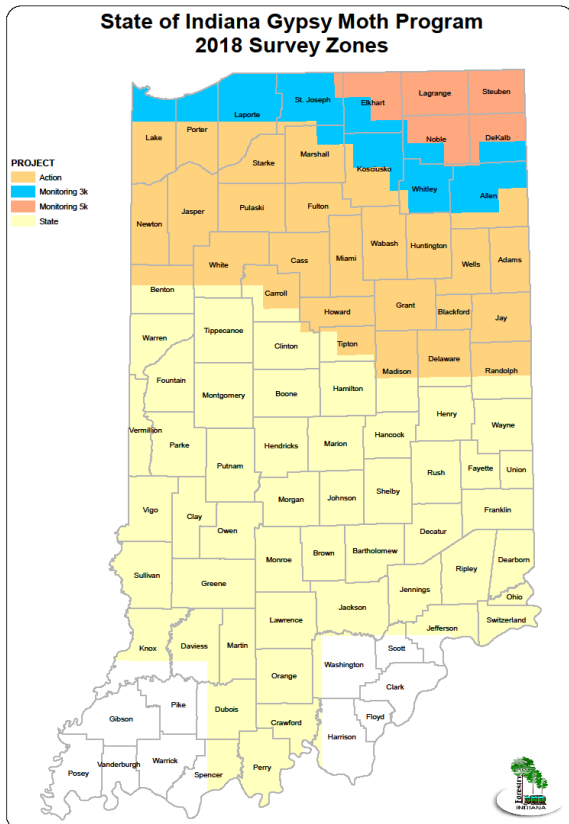


Photo 3: *Tetrastichus planipennisi* (David Cappaert)

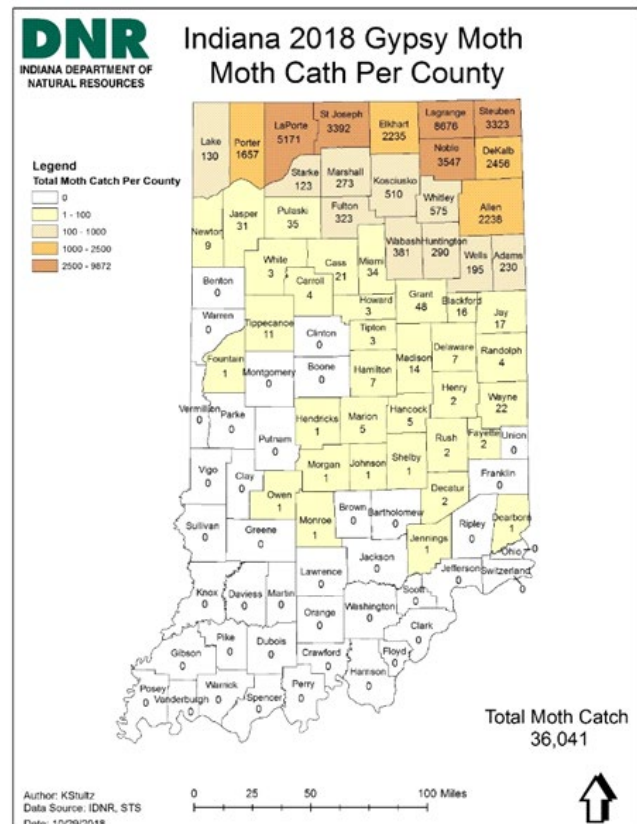
## 3. Gypsy Moth – *Lymantria dispar*

The 2018 Cooperative Gypsy Moth Survey completed its 31<sup>st</sup> 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: the STS Evaluation Zone, the STS Action Zone, and the State Area (GM Map 1). The survey design used fixed 8K & 5K, fixed 3K & 2K, and fixed 3K survey grid points for the three zones, respectively. Across all zones, the survey deployed 10,843 traps. Part of 13 and all of three counties in the state area were not trapped in 2018 compared to seven and five counties, respectively, not trapped in 2017. Areas are not trapped for economic reasons, but also because of negative trap catches in previous years. The areas of the state that are not trapped changes each year so that no areas are left without traps in subsequent years.

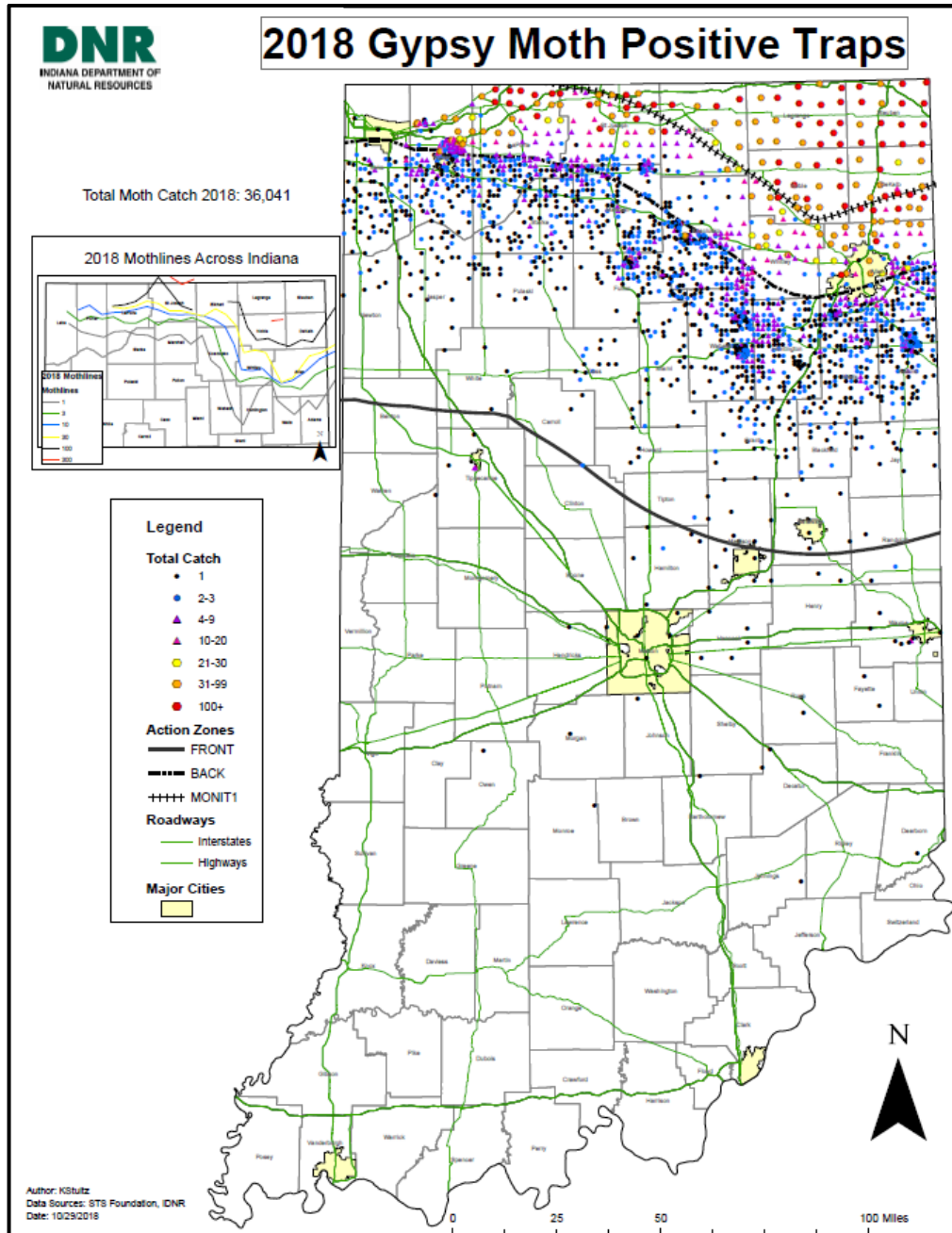
The survey detected 36,041 moths from 52 counties ranging from one to 8,876 moths per county (GM Map 2). The total number of moths caught in 2018 increased compared to 2017 (Graph 1) due mostly to three random traps placed in the evaluation zone to monitor start and end of moth flight. Moth counts in those areas are expected to be high, so adding additional traps in those areas can increase expected results. Without those three traps (4,424), the 2018 moth catch totaled 31,616 and is an increase of 6,909 from 2017, without 2017's two random traps. For total moths, including the random traps of each year, 2018 was 3,514 moths higher than 2017 (36,041 vs 32,527) and higher than 2016 (36,041 vs 32,431). Thus, 2018 saw an increase in all moth catch compared two prior years. The cost for the 2018 gypsy moth survey was \$86,448.87 in salary and mileage for intermittent trap tenders. This works out to \$7.97 per trap.



GM Map 2: 2018 Gypsy Moth Survey Zones. Red-monitoring 8K, Blue-monitoring 5K. Tan-Action 2K & 3K. Yellow-State 3K. White-No traps.



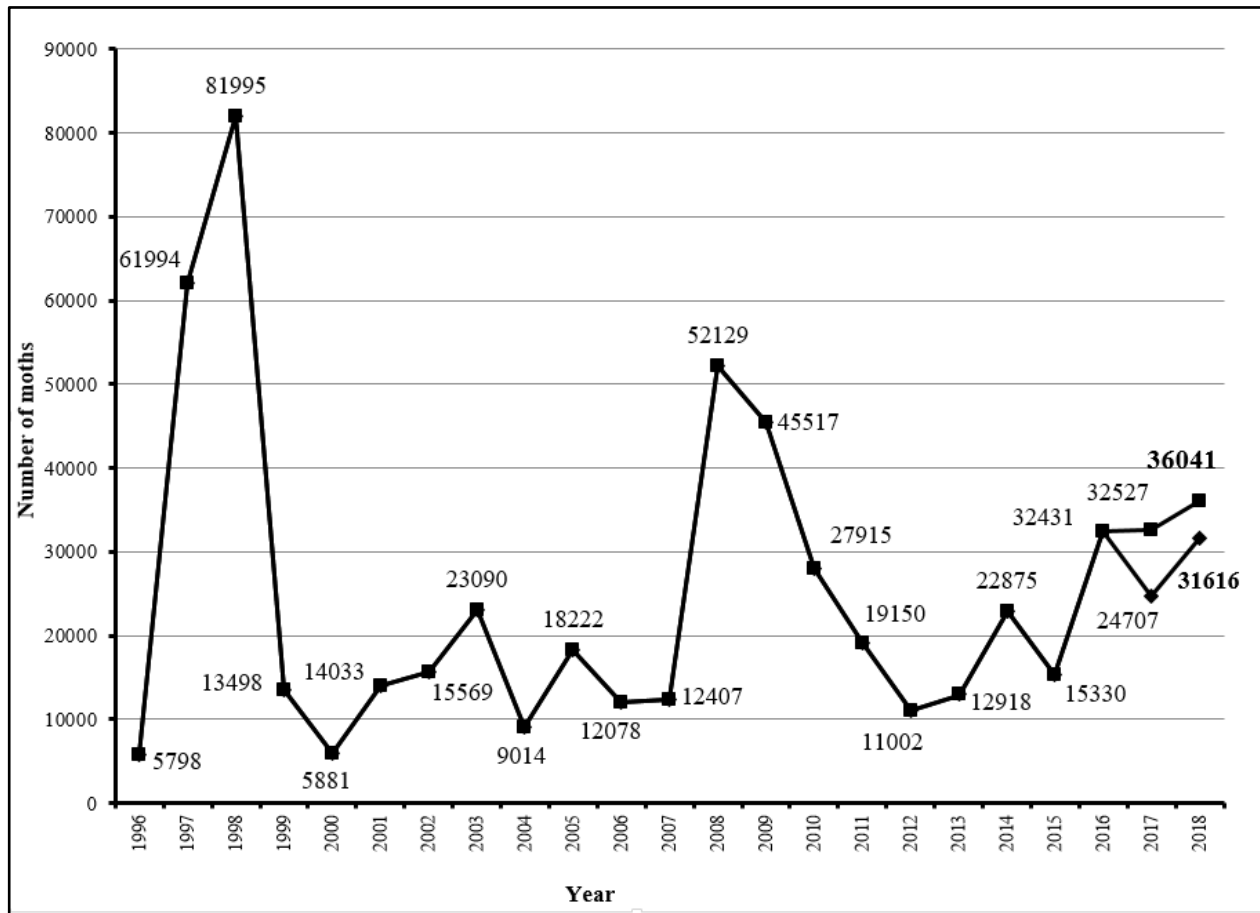
GM Map 1: 2018 Gypsy Moth catch in each county. Total moth catch for state - 36,041



GM Map 3: 2018 Gypsy Moth positive trap locations by range of moth catch in each trap.

The majority of the moth catch was in the Evaluation Zone (GM Map 3). The Evaluation Zone, which includes the quarantined counties of Steuben, LaGrange, Elkhart, Noble, St. Joseph, Porter, Allen, LaPorte and DeKalb (GM Map 5), detected 89.7% of the moths (32,339 of 36,041). The Action Zone detected 8.1% of the moths (2,901 of 36,041). The majority of the Action Zone moth catch occurred in the northern and eastern parts which are adjacent to the Evaluation Zone. The State Area detected 2.2% of the moths (801 of 36,041). Since the survey began in 1972, a total of 581,414 moths have been caught in 90 of the 92 counties. Gypsy moth has not been detected in Dubois or Sullivan County since surveys began in 1972.

Graph 1: Number of male gypsy moths caught by year from 1996 to 2018, for 2017 and 2018 higher number includes random traps in evaluation zone used to daily/weekly monitor start and end of moth flight.



Defoliation was reported in four counties – Allen, Elkhart, Porter, and St. Joseph. Defoliation occurred to small residential areas dominated by white oak and other oaks. Two residential areas in St. Joseph counties experienced 100% defoliation of white oak and in one location caterpillars were forced to white pine and completely defoliated them. In each location, *Entomphaga maimaiga* and NPV virus were killing caterpillars. For all reports, defoliation totaled less than 150 acres.

**Treatments 2018:**

Btk (*Bacillus thuringiensis kurstaki*): Treatments to slow the spread and development of gypsy moth were conducted on a single site in 2018 totaling 1,569 treatment acres. There were three sites treated with mating disruption totaling 3,158 treated acres (Table 1 & 2 and GM Map 4). Btk cost per acre per application was \$34.69/A. Mating disruption cost per acre was \$7.32/A for 6 grams and \$13.14/A for 15 grams.

In 2014, an eradication treatment began on the campus of Purdue University. Treatment occurred in 2014 and 2017. In 2015, there were only five moths caught in the 2014 treatment area, but in 2016 that number jumped to 46 prompting treatment again in the spring of 2017. In 2017, 24 moths were caught in 11 separate traps in the 2014 treatment area. In 2018, 9 moths were caught in 2 traps at the core of the treatment area. Negative moth catch is expected for 2019.

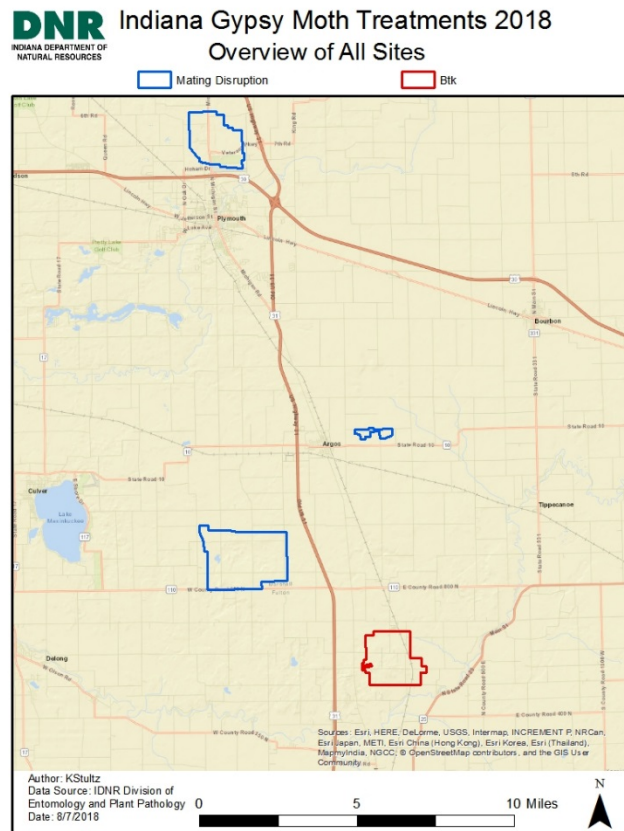


Table 1: 2018 STS Btk Treatment Sites.

	COUNTY	SITE NAME	MATERIAL	Appl #	METHOD	EA ACRES	Treat Acres	Total Acres treated all applications
1	Fulton	Tiosa Btk 2018	Btk 25 BIU	2	Aerial	2,023	785	1,569
Total						2,023	785	1,569

Table 2: 2018 STS Mating Disruption Treatment Sites.

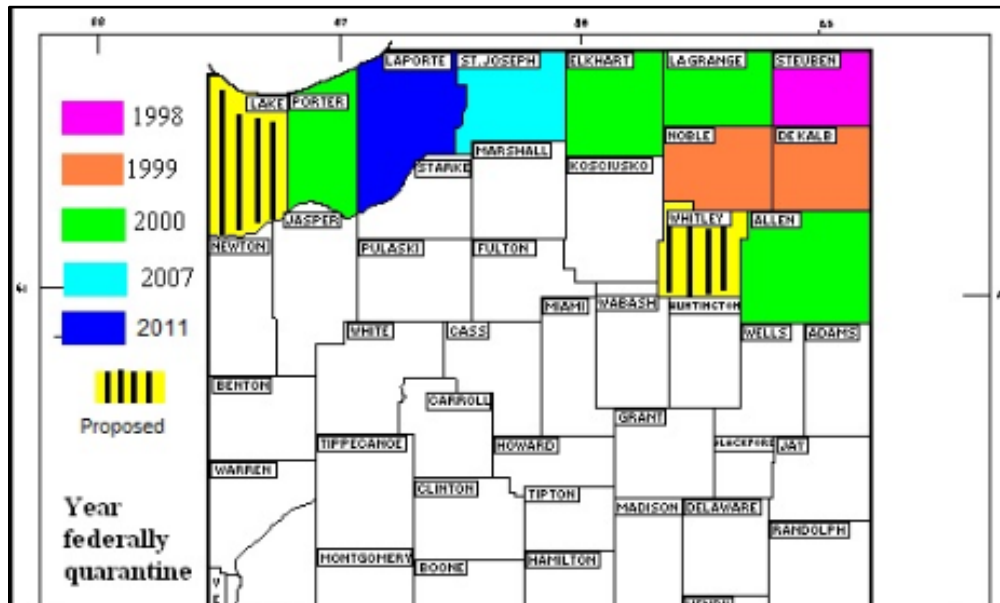
	COUNTY	SITE NAME	MATERIAL	Appl #	METHOD	EA ACRES	Treat Acres	Total Acres treated all applications
1	Marshall	Argos MD 18	SPLAT GM-O @ 15 grams	1	Aerial	128	122	122
2	Marshall	Green TWP MD 2018	SPLAT GM-O @ 15 grams	1	Aerial	3,539	1,715	1,715
3	Marshall	Plymouth MD 2018	SPLAT GM-O @ 6 grams	1	Aerial	1,815	1,321	1,321
Total						5,512	3,158	3,158



GM Map 4: 2018 Gypsy Moth Treatment Sites. Blue outline-Mating Disruption. Red outline-Btk.

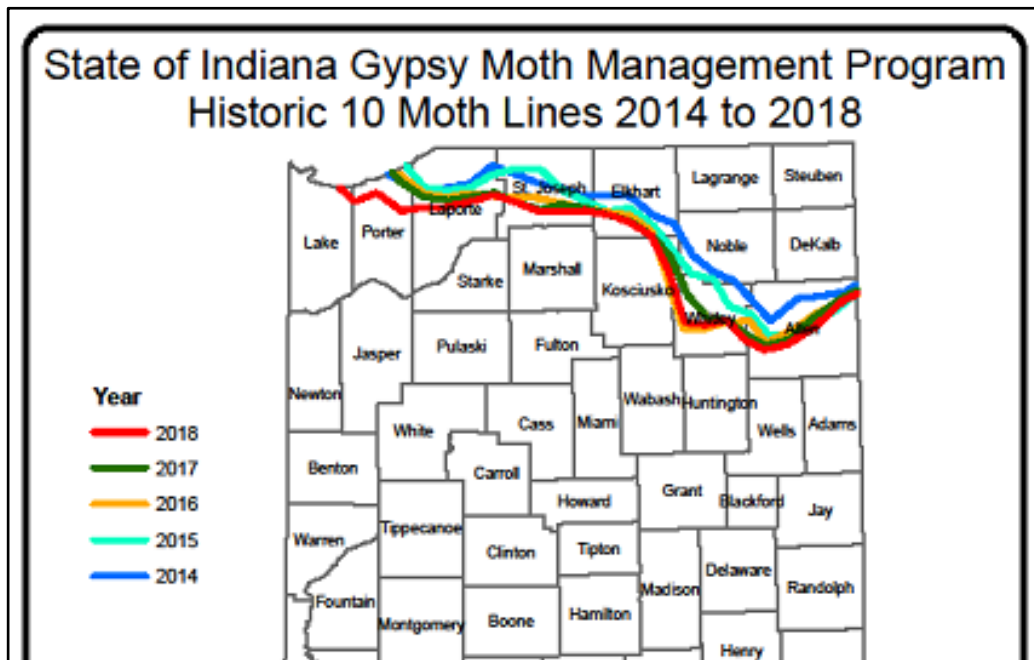
### Quarantine:

No new counties were added to the state quarantine list in 2018, but evaluations are underway to determine if Lake and Whitley counties need to be added (GM Map 5). 2010 was the last year a county was added to the quarantine.



GM Map 5: Gypsy Moth quarantined counties through 2018 showing year initially quarantined.

The 10-moth line is used to consider a county for quarantine. GM Map 6 shows the historic 10-moth line for the last five years. It has remained fairly stationary.



GM Map 3: 10 moth line from 2014 to 2018.

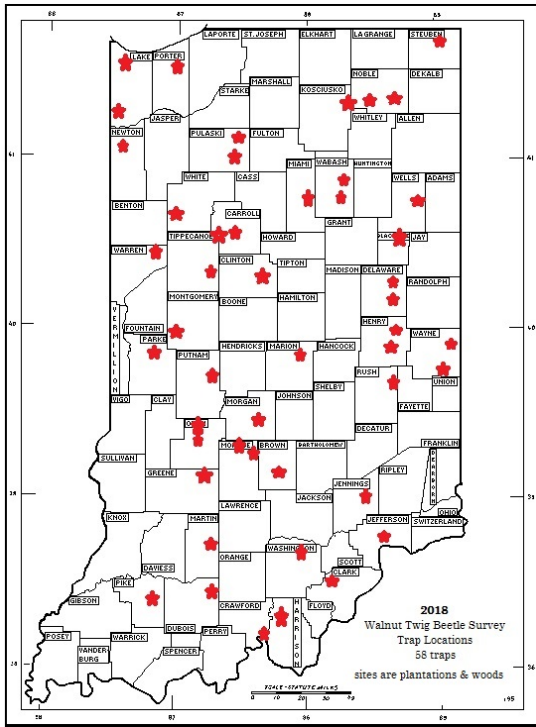
#### 4. Thousand Canker Disease - *Pityophthorus juglandis* and *Geosmithia morbida*



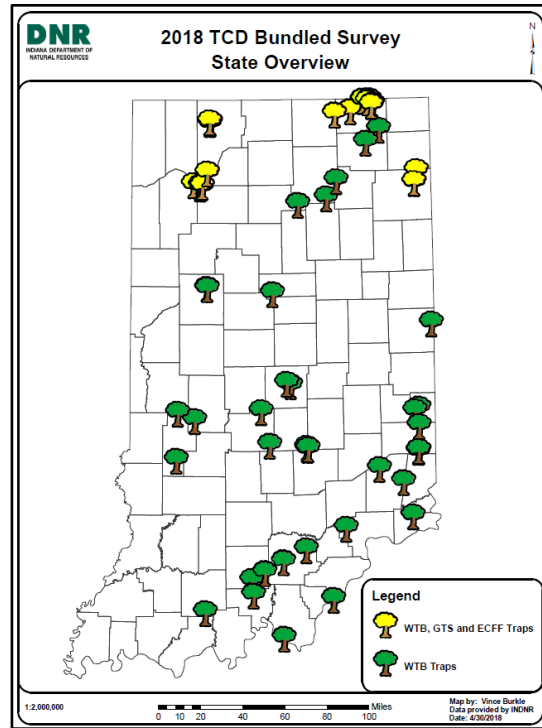
WTB Photo 1: Walnut Twig Beetle collected during 2014 survey. Photos by Bobby Brown USDA.

The 2018 walnut twig beetle (WTB) (WTB Photo 1) survey consisted of 122 Lindgren funnel traps throughout the state with 64 placed at high risk sites and 58 traps placed in plantations and woods (WTB Map 1&2). Traps were deployed mid to late April and were removed late September through early October.

There were 1263 samples collected and no WTB was detected.



WTB Map 1: 2018 Location of walnut twig beetle traps in plantations & woods (red stars).

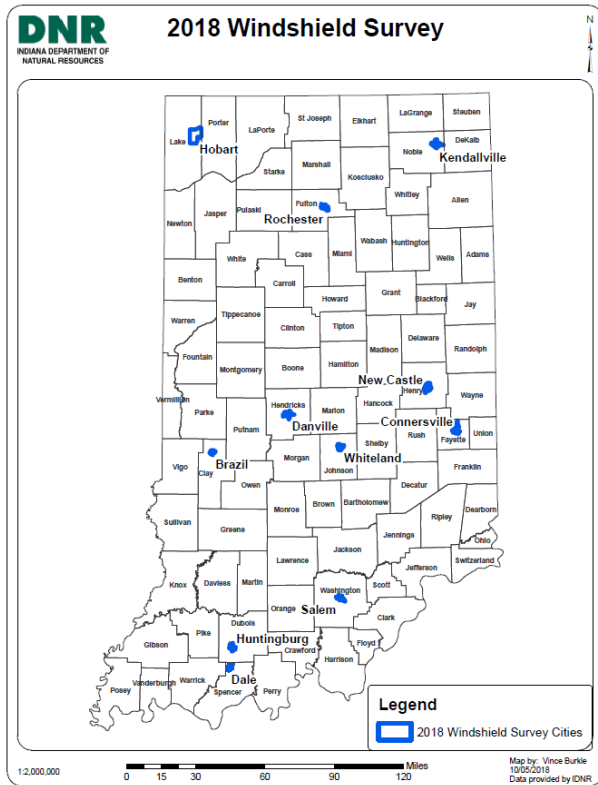


WTB Map 2: Location of walnut twig beetle traps in high risk sites. Yellow tree sites also trapped Golden Twig Spot Moth and European Cherry Fruit Fly as part of USDA CAPS survey.

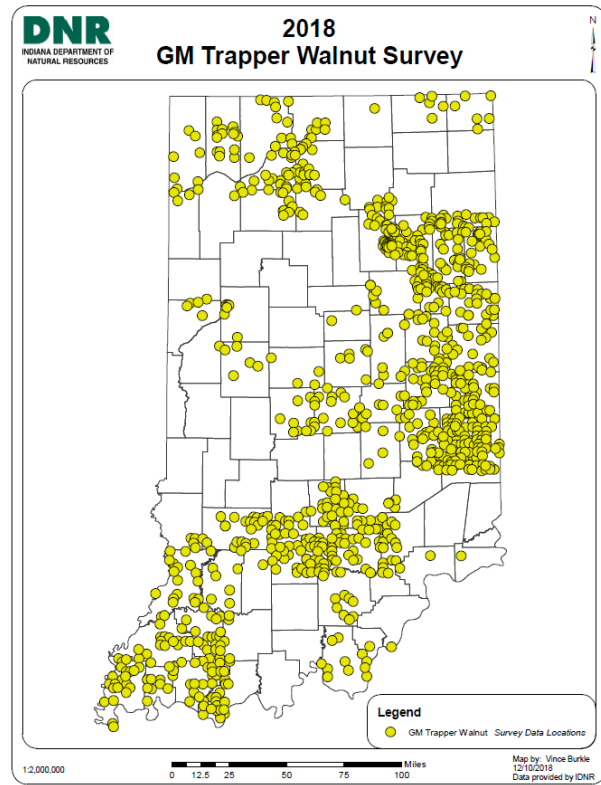
The Windshield Survey added 10 new locations in 2018 (WTB Map 3). The purpose of this survey is to locate walnut trees in urban areas and evaluate them for symptoms consistent with TCD. The 2018 survey was conducted in Brazil, Connersville, Dale, Danville, Hobart, Huntingburg, Kendallville, New Castle, Rochester, Salem, and Whiteland. A total of 568 trees were surveyed, with 12 listed as suspect for future evaluation. Since this survey began in 2012, 7,511 trees have been evaluated in 87 municipalities.

Gypsy moth trap tenders also collected data on the location and condition of walnut trees near gypsy moth traps. They identified 980 trees and indicated 7 trees with dieback or decline. Since 2011, trap tenders have collected data on 8,223 walnut trees.

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

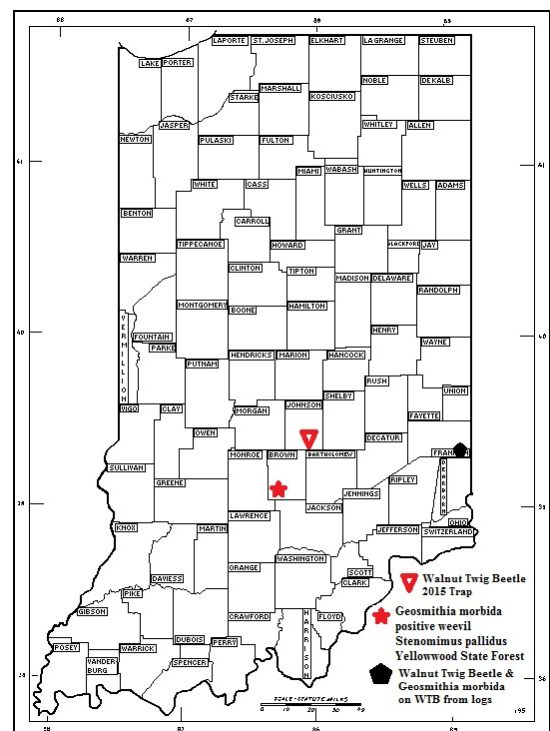


WTB Map 3: 2018 TCD survey cities.



WTB Map 4: 2018 Walnut tree locations surveyed by gypsy moth trap tenders.

WTB was confirmed at a sawmill in Franklin County March 2015 from two beetles collected in the 2014 trapping survey. The 2015 delimit survey of the sawmill location detected four WTB from two traps. One trap on the sawmill detected one WTB on 8/13/2015 and two WTB on 9/1/2015. The second trap was across the road from the sawmill and detected one WTB on 5/13/2015. All were confirmed by the USDA 12/9/2015 and all tested negative for *G. morbida*. The trap across the road was located next to a black walnut tree, which was cut down in 2016 and taken to Purdue for rearing and isolation. WTB and *G. morbida* were not collected and isolated from the tree. The 2016, 2017 and 2018 delimit survey set 55, 13 and 9 traps at the saw mill and adjoining woods. WTB was not detected in those traps during those years.



WTB Map 5: WTB & weevil with *G. morbida* sites.

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## 5. Other Exotic Insect Pests of Concern

**Hemlock Woolly Adelgid** - *Adelges tsugae* - Hemlock Woolly Adelgid (HWA) was detected in one site in LaPorte County in 2012. Survey of that site and surrounding area since 2012 has not detect HWA. Survey of native eastern hemlock forest locations scattered across Indiana continued in 2018. HWA has not been detected in those locations and has not been detected in any landscape, nursery and retail locations.

**Asian Long-horned Beetle (ALB)** - *Anoplophora glabripennis* – No trapping survey conducted in 2018. Through the Forest Pest Outreach and Survey Project, resource personnel and the public continue to be trained to recognize and report ALB and suspect trees. No reports from trained volunteers or the public were received. ALB does not occur in Indiana.

## **4. Plant Pathogens of Concern**

### 1. Chestnut Oak Mortality

*Armillaria mellea*, *Agrius bilineatus*, Hypoxylon Canker (*Biscogniauxia atropunctata*), *Phytophthora cinnamomi* and possibly 2012 drought.

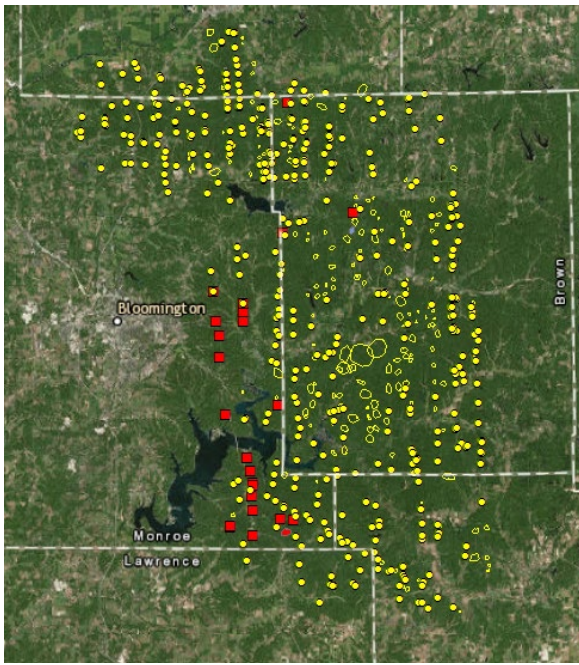
Patoka Reservoir (Dubois County) reported chestnut oak mortality reported for the first time in 2016 in a 29-acre area. Patoka is implementing a forest management plan to salvage mortality, suppress further mortality, regenerate the forest, and implement wildlife management in the area.

2018 aerial survey of the forests of and around Morgan-Monroe, Yellowwood, Jackson-Washington, Clark State Forests, Brown County State Park, and Hoosier National Forests identified over 800 locations with declining and dead trees, from a small spot of one to two trees to areas of one to 30 acres. The spots and locations totaled almost 12,000 acres. This disease is still killing trees and spreading as yellowing and red top trees were observed during aerial survey.

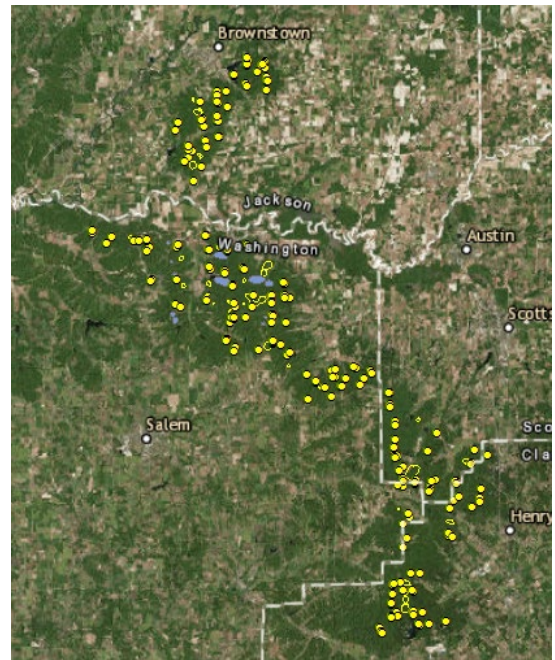


Photo: Chestnut Oak Mortality

This disease only involves chestnut oak, making it similar to the Rapid White Oak Mortality reported in Missouri, which only involved white oak. Both diseases involve *Armillaria*, *Hypoxylon*, *Agrius bilineatus* and *Phytophthora cinnamomi*. The understanding of *Phytophthora cinnamomi* role is needed to understand the role of the other agents as well as weather and site factors



Locations of Chestnut Oak Mortality in Morgan-Monroe SF, Yellowwood SF, Brown County SP and Hoosier NF in Brown, Jackson, Lawrence, Monroe & Morgan Counties.



Location of Chestnut Oak Mortality in Jackson-Washington SF and Clark SF in Clark, Jackson, Scott & Washington Counties.

## 2. Oak Wilt - *Bretziella fagacearum* (formerly - *Ceratocystis fagacearum*)

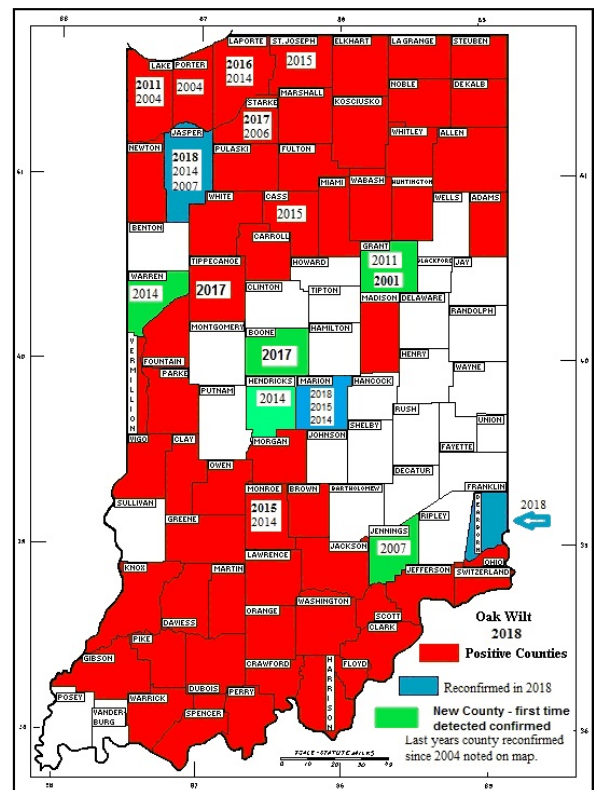
Oak wilt was reconfirmed in Dearborn and Jasper Counties in 2018 by Purdue Plant Diagnostic Lab (culture confirmation) from a red oak and pin oak, respectively.

There were no first time county detections in 2018. Boone County in 2017 was the last county to record a first-time confirmed occurrence. Prior to 2017, it was Hendricks and Warren counties in 2014/

Oak wilt has been detected in 65 counties.

Oak wilt is common in the woodlots of northwestern Indiana in the Kankakee River basin. In all situations, 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.

Usually in southern Indiana, oak mortality is not oak wilt but Oak Decline – Two-Lined Chestnut Borer, Hypoxylon Canker and Armillaria Root Rot. Oak wilt has not been detected in white oak.



Oak Wilt Positive Counties and year confirmed/reconfirmed.

### 3. Ailanthus Wilt – *Verticillium nonalfalfae*

No report of Tree of Heaven, *Ailanthus altissima*, wilting were received in 2018. Prior sites in Noble and Fayette Counties tested for the wilt fungus did not have any wilting trees in 2018. A wilting tree with this fungus will have a golden color to the sapwood surface. Wilting is likely to be seen in mid-to-late July and trees need to be sampled quickly when the tree is wilting to culture the fungus. The fungus has the possibility of being a bio-control.

Looking for Spotted Lantern Fly, *Lycorma delicatula*, which uses Tree of Heaven and is a threat to trees and horticultural crops, may assist in potentially detecting this disease as more survey work focuses on locating tree of heaven. The Thousand Cankers Disease Windshield survey located tree of heaven in addition to locating black walnut trees and will revisit those trees to look for Spotted Lantern Fly.

### 4. Sudden Oak Death - *Phytophthora ramorum*

The Division of Entomology & Plant Pathology continued the annual Sudden Oak Death (SOD) survey. In 2018, 39 separate locations were surveyed in 23 counties (SOD Map 1). A total of 400 samples were collected with 39 of those testing positive for *Phytophthora spp.* None of those tested positive for *P. ramorum*. No trace forward survey occurred. No forest survey or water source survey was conducted.

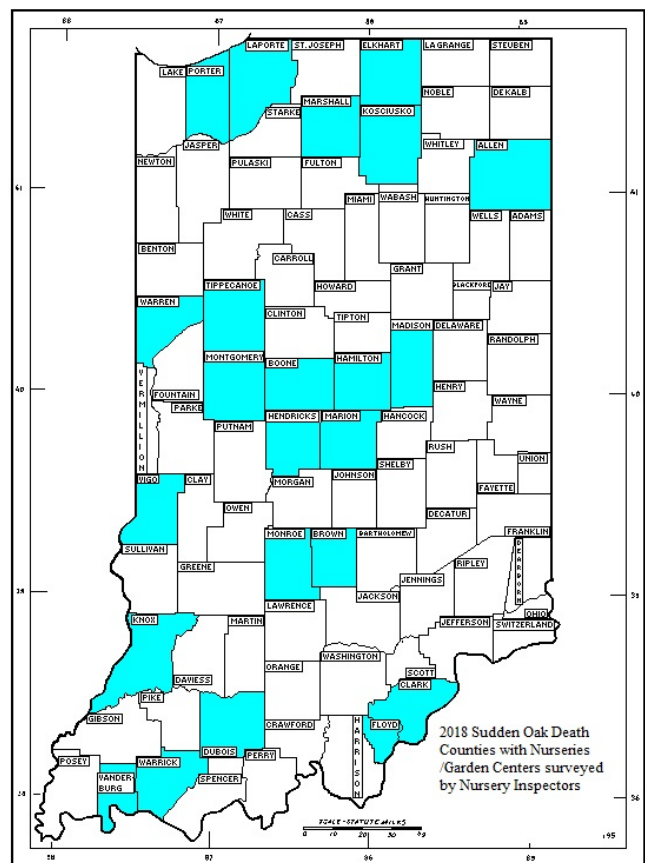
Through 14 years of survey, SOD has only been confirmed twice – a nursery in Lake County in 2006 and a garden center in St. Joseph County in 2012. SOD has not been detected since.

### 5. Beech Bark Disease

Disease complex of *Cryptococcus fagisuga* Lind and *Nectria coccinea* var. *faginata* Lohman

No survey for this disease was conducted in 2018. The 2017 report of this disease by one landowner in Marshall County was examined and the trees did not have this disease.

To date 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.



SOD Map 1: 2018 Counties surveyed for Sudden Oak Death

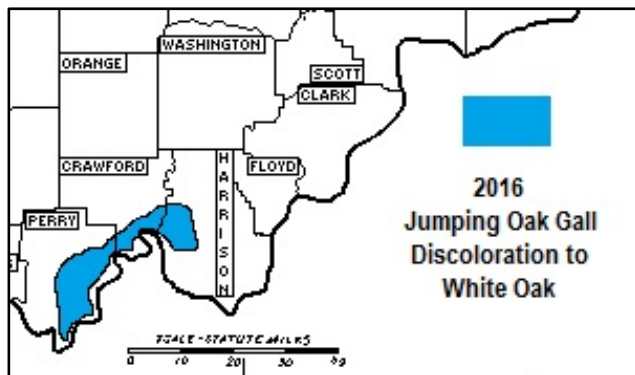
## 6. Red Bay (Laurel) Wilt – *Raffaelea lauricola* and Redbay Ambrosia Beetle, *Xyleborus glabratus*

This forest pest complex is not known to be present in Indiana. No surveys were conducted in 2018. The 2017 report of sassafras mortality in Crane Naval Weapon Support Center in Martin County was not examined. A report of sassafras mortality at Morgan-Monroe State Forest found extensive Armillaria Root Rot in the dead trees. No evidence of ambrosia beetle was detected in the dead trees. Also, a report was received in late in 2017 of sassafras mortality in Brown County State Park which was not examined. It will be examined in 2019.

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

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

Jumping Oak Gall is a small wasp that creates tiny round galls on the underside of white oak trees and turns leaves brown. There was no reports and no discoloration/damage to white oak in 2018. The last year of damage was 2016.



### 2. Forest Tent Caterpillar – *Malacosoma disstria*

There was no report of forest tent caterpillar in 2018. The last epidemic occurred in southeastern Indiana between 2002 and 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).

### 3. Looper Complex – Linden Looper *Erannis tiliaria* and Half Winged Geometer *Phigalia titea*

Defoliation by this looper complex did not occur in 2018. 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.

### 4. White Pine Root Decline - *Verticicladiella procera*

Procera Root Rot (White Pine Root Decline) is an annual killer of white pine windbreak, ornamental, and Christmas trees. No survey was conducted in 2018 but mortality occurs in all areas of the state as landowners continue to call each year about their dying white pines.



