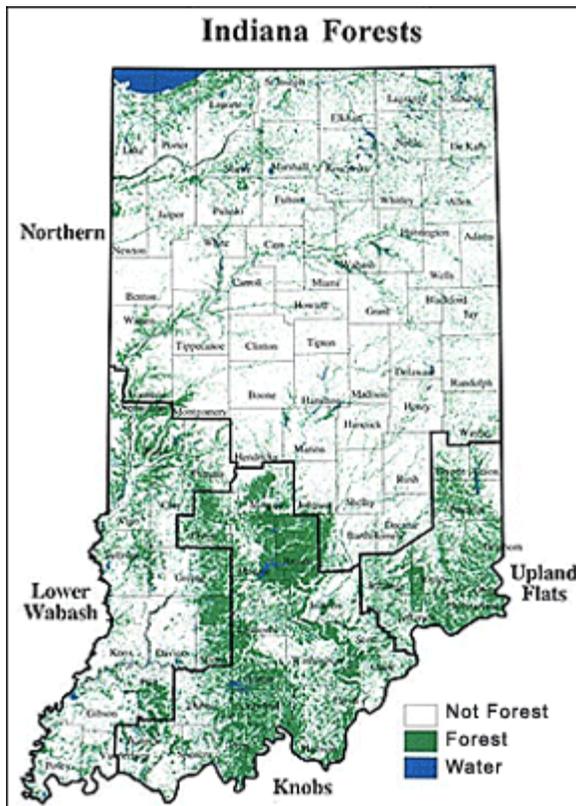




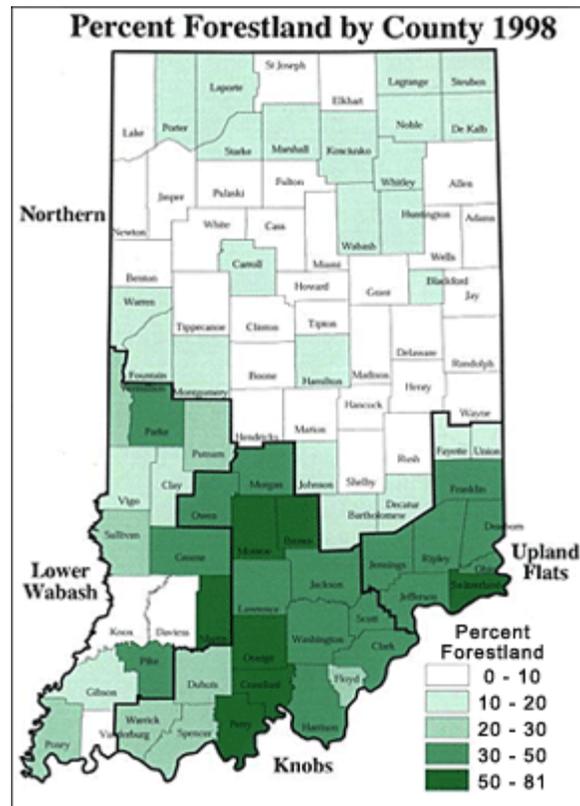
The Division of Forestry Completes 100 years

The Indiana Division of Forestry completed its' 100th year in 2001. The Division of Forestry of 2001 resulted from legislation passed in 1901 that established the Indiana Board of Forestry. One of the first natural resource agencies in the state, the Division has grown from the first state forest - Clark State Forest - established in 1903 to 13 state forests totaling 150,000 acres (~4% of Indiana's forestland). In addition to managing state forests, the Division provides management assistance to the 400,000+ acres of private forestland enrolled in the Classified Forest Program, a forest conservation program started in 1921. The Division's forest management assistance is not limited to these lands. Assistance is provided to all forest landowners, whether rural or urban, through 18 district foresters and a professional staff of over 50 foresters and forest specialists. In addition to managing forestland, the Division's reforestation and tree improvement program grows and sell 6 million tree seedlings from its' two nurseries each year. To obtain additional information on how the Division of Forestry developed and helped to increase forestland from less than 2 million acres 100 years ago to over 4 million acres today, visit the Division of Forestry's website at:

<http://www.in.gov/dnr/forestry/index.html>



Source:
Indiana Land Cover produced by a cooperative project between the U.S. Geological Survey and the U.S. Environmental Protection Agency based on Landsat TM5 Imagery acquired by the Multi-resolution Land Characterization (MRLC) Consortium. The images date from 1989 to 1993. Classes 41-43 and 91 were



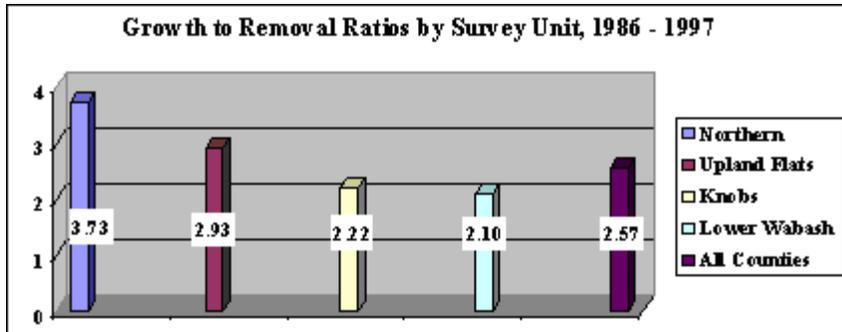
Source:
NC-FIA Indiana 1998

used to represent Indiana's forests.

THE FOREST RESOURCES

Indiana ranks third nationally in hardwood lumber production adding over \$4 billion to the state's economy. The forest products industry is the fifth largest manufacturing industry in the state. Of the over 1000 business and manufacturers in the forest products industry, 59,000 people are employed with a total payroll over \$1 billion annually. For the second quarter of 1997, lumber/wood product exports totaled \$57 million an increase of 22% from the first quarter.

To support the industry, Indiana forest resources continue to grow 2 ½ times the volume being removed. For the most recent year with available statistics, an estimated 500 million board feet were harvested to produce sawtimber, veneer, handles, pulp and cooperage.

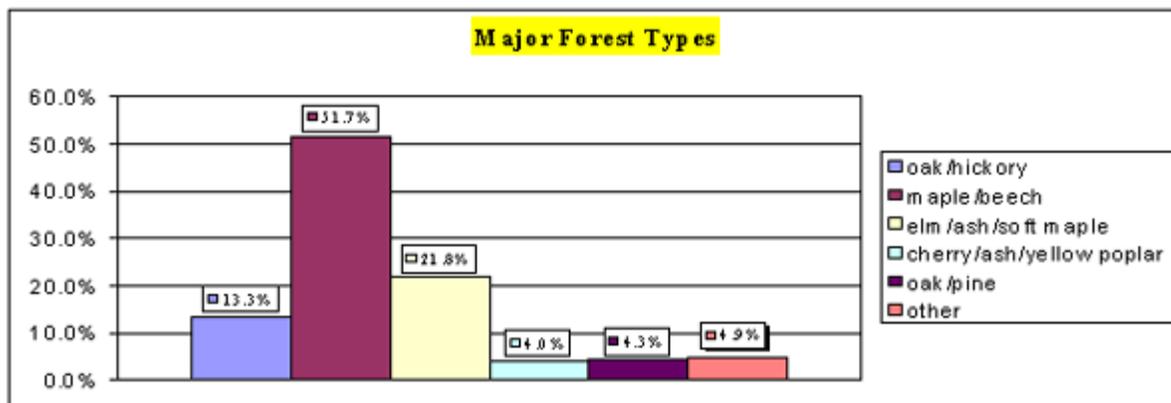


Since 1907, forestland increased approximately 430,000 acres, and from 1967 to 1998, the volume of timber increased from 3,800 to 6,900 million cubic feet. More than 85 different trees grow in Indiana forests.

Hardwoods account for 95% of the forest that is

identified into 13 forest types. Good sites (ability to produce >85 ft³/yr) represent 63% of the forest, which is privately owned (85%).

Indiana Forest Statistics	
Total acres	22,957,400
Forested acres	4,501,300
Percent forested - all land	20%
Percent timberland - all land	19%
Percent timberland - forest land	96%
Reserved acres 159,100 or 3.5% of forest land	



FOREST HEALTH ISSUES

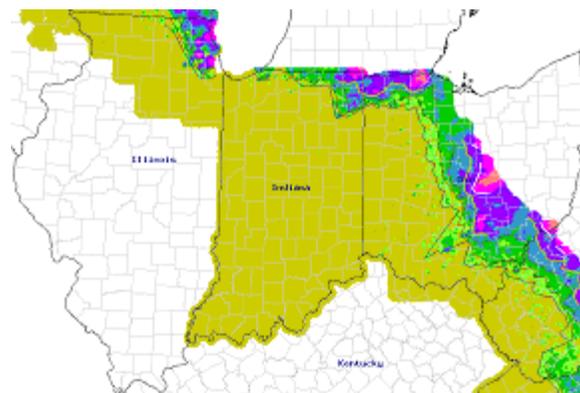
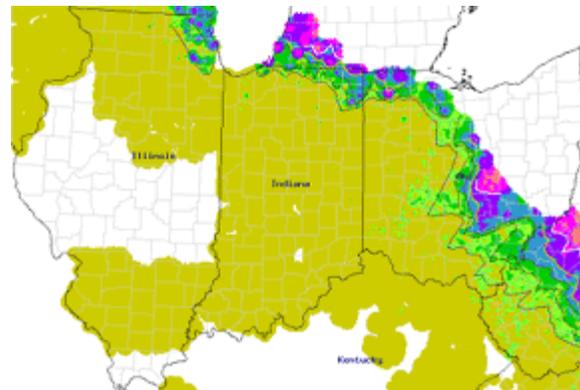
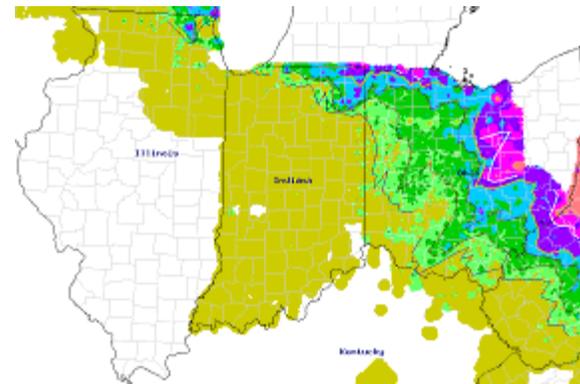
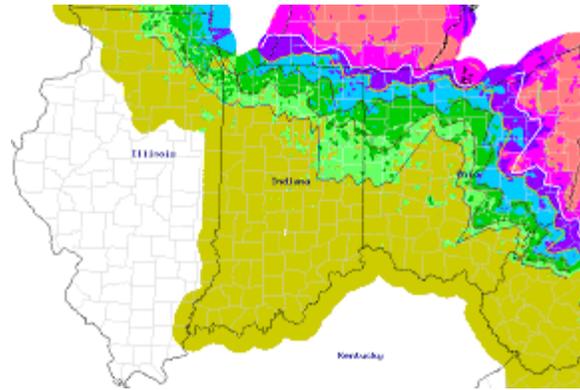
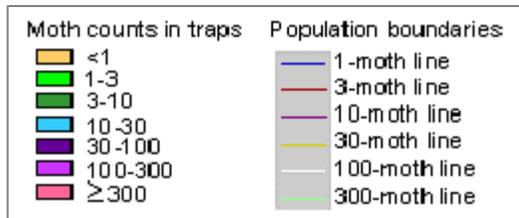
GYPSY MOTH HELD IN PLACE.

The number of male moths detected and the location of positive traps in 2001 indicate that

Indiana's gypsy moth management program is holding gypsy moth in place in northern Indiana. Comparing the maps of the gypsy moth advance (Maps 1-4) and the maps of moth lines (Maps 5-8) from 1998 to 2001, the movement of gypsy moth within Indiana has receded since 1998 and not advanced compared to 1999 and 2000 in the northern part of the state.

The detection survey found gypsy moth primarily confined to the 'Evaluation Area' and to the northern boundary of the 'Action Area'. This is the 10 and 30 moth line area as defined by Slow-The-Spread Program (STS) (Map 8). The 'Evaluation Area', which is the quarantined northeastern counties of Steuben, DeKalb, LaGrange, Noble and Allen, detected 10,475 of the 14,031 moths. The northern third of the state falls in the 'Action Area' which is below the 'Evaluation Area'. The 'Action Area' detected 3,523 of the 14,031 moths. The remainder of the state detected 33 moths, mostly from southeastern Indiana. This area of the state had a scattering of single moth trap catches similar to detection's found for the first time in 2000. Thus, the moths caught in this area of the state show that gypsy moth is beginning to move into this area of the state for the first time.

The 2001 Cooperative Statewide Gypsy Moth Survey completed its fifteenth year of the statewide survey and fourth year of using Slow-The-Spread (STS) protocol for the design and operation of the survey. The survey is designed on a kilometer based grid system and set 1,738 intensive and 14,166 detection traps all referenced by GPS. The 14,031 moths detected came from 40 counties, ranging from 1 to 6,244 moths per county (Figure 1). The moths detected was an increase from 2000



Maps1- 4. Gypsy moth Advance (Recession) from 1998 - 2001.

(5,881 moths) and equal to 1999 (13,498 moths), but less than the 81,995 moths detected in 1998 (Figure 2). Since the beginning of gypsy moth surveying in Indiana in 1972, 203,097 moths have been caught in 89 of the 92 counties. No new county records were detected in 2001.

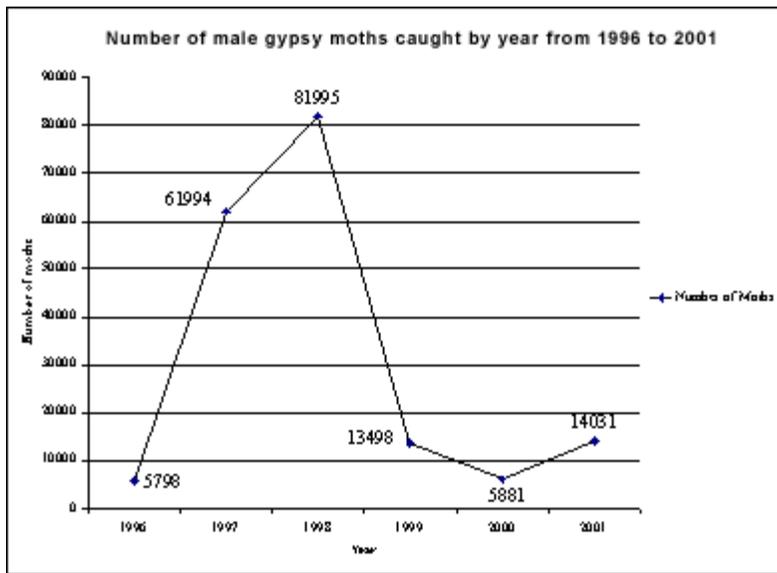
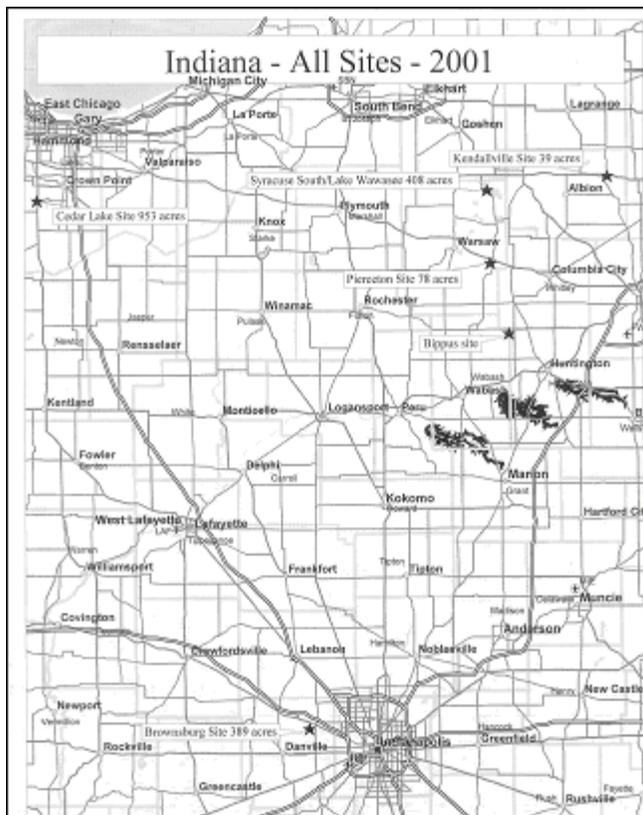


Figure 2. Male moths caught 1996 to 2001.

were treated with pheromone flakes to disrupt mating, and three sites were treated with Btk. In 2001, treatments to eradicate and slow-the-spread and development of gypsy moth were conducted on six sites. Two sites totaling 40 acres were treated with two applications of Btk at 30 BIU/acre/application. One Btk site was mass trapped following application. Four sites totaling 1,828 acres in three counties received one

application of pheromone flakes for mating disruption in June.



The sites treated in 2000 were surveyed in 2001 to determine effectiveness of the treatment. The table below lists the 2000 treatment sites and the treatment value (T) and colony value (C). If a treatment value is less than 0.33 the treatment is considered a success. If the colony value is greater than 1.0, than the colony is considered still present and the possibility of future treatment may be needed. All sites have a treatment value below 0.33 and the treatment was considered successful. Three sites (Altum Gardens, Summit, and Broad Ripple) had colony values near and above 1.0, which indicates gypsy moth may still be present and a future treatment may be needed. Of these sites, only Summit needs to have a future treatment.

Table 1. List of 2000 treatment sites

#	Block Name	State County	Agent	Area, ac	T	C	PPA
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15	Decatur	IN	Adams	PF	3225	0.02	0.10	97
16	Rochester	IN	Fulton	PF	425	0.00	0.00	57
17	Altum Gardens	IN	Hamilton	PF	550	0.15	0.96	54
18	Portland	IN	Jay	PF	875	0.00	0.00	91
19	Lake Wavasee	IN	Kosciusko	PF	600	0.00	0.00	74
20	Summit	IN	La Porte	BT	333	0.28	1.32	44
21	Trail Park	IN	LaPorte	BT	384	0.01	0.07	43
22	Broad Ripple	IN	Marion	PF	550	0.29	0.98	59
23	Coesse Corners	IN	Whitley	PF	825	0.29	0.52	87
24	Columbia City	IN	Whitley	PF	550	0.00	0.00	-1
25	Goose Lake North	IN	Whitley	PF	125	0.03	0.20	84
26	Goose Lake South	IN	Whitley	PF	250	0.03	0.22	84

Eastern Tent Caterpillar Strips Black Cherry for the second year.



USDA, Forest Service, S&PF

Black cherry trees in southern Indiana were stripped of their leaves again in May. For the second consecutive year, eastern tent caterpillar (ETC) was at epidemic levels causing moderate to severe (100%) defoliation to black cherry in southern and south central Indiana. Defoliation occurred to trees in every location from the fencerow to the forest. Every acre of forest in south central Indiana experienced ETC defoliation



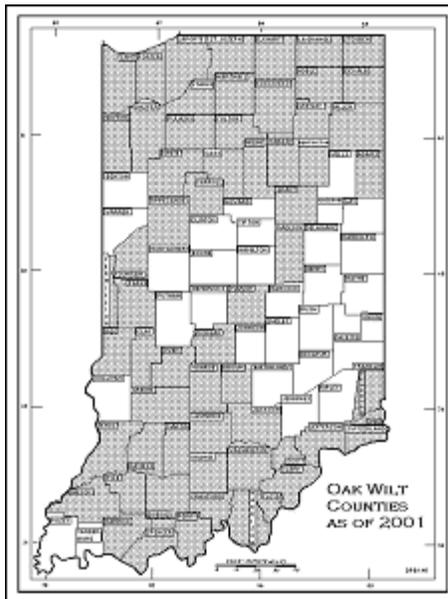
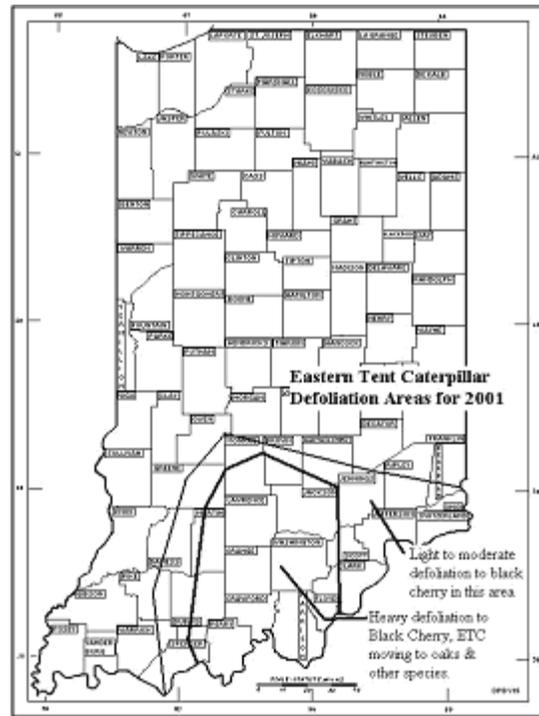
USDA, Forest Service, S&PF

if a black cherry was present. In 2001, ETC moved from the black cherry and feed on oaks when the black cherry source was not enough to satisfy its hunger. The question of many foresters and forest landowners is what will happen next year? Will ETC be back again? Following the pattern of its cousin, Forest Tent Caterpillar, when it defoliated 250,000 acres of forest in the mid 1970's, ETC will return to defoliate one last year in 2002. Then parasites will build high enough populations to control ETC and the level of defoliation will return to very low levels in future years. A large fly was the parasite that controlled Forest Tent Caterpillar in the 1970's and is expected to do the same for ETC.

Oak Wilt - New County Record

Oak wilt was confirmed from black and red oak in one location in Grant County in 2001. The oak wilt spot occurred in a one forest and apparently had been there for 2 years prior to discovery in 2001 as mortality had occurred earlier and was continuing. The location had both means of oak wilt spread - root graft transmission between

oaks and insect spread to an isolated red oak. This is the first confirmed identification of the fungus from this county. The number of counties with Oak Wilt increased to 62.



Jumping Oak Gall Still Present

The Jumping Oak Gall is still present in southern Indiana. Like 2000, the gall did not do any noticeable damage to white oak. Foresters and landowners would observe an occasional tree with galls on the foliage, but in each



IDNR, Forestry, Forest Health

observation, the gall did not cause discoloration to white oak. In discussions with other forest health specialists,

jumping oak galls caused discoloration for the first time in West Virginia, Maryland and other mid Atlantic states. 1999 was the first occurrence of this gall in Indiana's forests.

Jumping oak gall forms its gall in late May and early June on the underside of the foliage. One or more species of a Cynipid wasp (*Neuroterus spp.*) form the gall that causes the leaves to yellow than turn brown.

Locust Leaf Miner

The leaves of black locust did turn brown in color during 2001. From July through the remainder of the summer, the rust red to brown color of black locust leaves was common across southern Indiana. The leaf mining by the larvae of the locust leaf miner beetle caused the heaviest discoloration/defoliation in many years in Indiana. The locust leaf miner periodically goes into epidemic status, but can usually be observed every year in the

counties along the Ohio River. The defoliation weakens the tree and may lead to mortality from the locust borer. The locust borer can build its' population on trees weakened by locust leaf miner defoliation.

White Pine Weevil

White pine weevil was observed in northwestern Indiana in 2001. A pest of white pine and other pine species, the weevil attacks the terminal branch of the tree and causes dieback that results in a crook or sweep in the main stem of the tree. White pine weevil is a serious forest pest farther north in the lake states, but in Indiana it has not been a serious problem. The recent reports are some of the first reports of the weevil in Indiana. Its damage in Indiana will be a problem for Christmas tree growers, nurseries and windbreak trees.

Drought Mortality

The drought of 1999 appears to still have an effect on the forest in 2001. Reports of oaks and yellow poplar dying were received in 2001, mainly from southern Indiana. The decline and mortality may be greater on yellow poplar than on the oaks or other species. Yellow poplar developed cankers on the main branches of the tree crown. Gradually over time the top dies back and the tree eventually dies. When the tree dies, the bark quickly falls off, the top decays and the heartwood may or may not develop a dark stain. The future of yellow poplar is hard to predict because the drought of 1987/1988 did not produce the decline and mortality to yellow poplar that is being reported now. Thus, there is no information from prior droughts to help guide management for yellow poplar.

Oak Tatters

The tattered foliage of oak has been reported in Indiana since 1983. As in 2000, tattered foliage was light to the primary host - white oak, and to other oaks (burr, swamp white, red, black and shingle).

Tattered foliage loses the tissue between the leaf veins, which gives the leaf a "tattered appearance". Heavily tattered trees appear defoliated or with sparse foliage. Mortality from tatters has been minimal.



IDNR, Forestry, Forest Health

Tatters occur to the first flush of foliage in the spring. To date, the cause of tatters has not been verified, however temperature injury, insect feeding or oviposition, and herbicide have been suggested as causes. Tatters is not limited to Indiana, damage has occurred from Ohio west to Iowa.

White Pine Randomly Die

Procera Root Rot (White Pine Root Decline) has been noticeably killing white pine across the state for the past 10 years. It continues to kill wind break, yard and plantation trees. This disease is the most common forest pest that landowners request assistance, and as such has the status of the number one disease in Indiana.

Trees from 4 to 30 feet tall and 3 to 6 inches in diameter are commonly killed. Trees can turn brown in color at any time of the year, but do so more commonly in the spring and fall. Infected trees appear light green and sparse or thin at first. Then the trees turn brown in a short period of time. Most

landowners do not recognize the early symptoms of the disease. They usually see the dead brown tree and sawdust from woodborers that attack the dead tree. Management of the disease is done by using sanitation measures. There is no cure or preventative treatment for the disease.



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REGIONAL ISSUES



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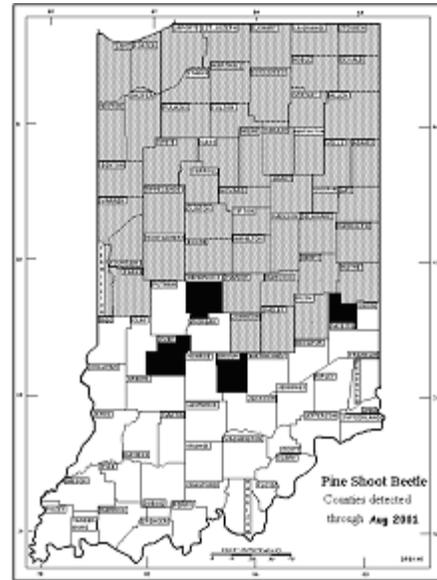
The distribution of Pine Shoot Beetle, *Tomicus piniperda*, added 4 new counties to the quarantine area in 2001 - Brown, Fayette, Hendricks and Owen. This is still a regulatory pest and not considered a serious threat to the health of the pine forests of the state.

Butternut canker affects trees throughout the state. Since 1995, landowners have reported butternut trees that may be tolerant or resistant to the disease. From



USDA, Forest Service, S&PF

these reports, nine butternut were located that may have possible resistance/tolerance to this disease. Reports of butternut continue each year; however work limitations have slowed the screening of the reported trees. Landowners are still encouraged to locate and report healthy butternut to their district forester, the forest health specialist or the Division of Forestry.



FOREST HEALTH MONITORING SURVEY

In 1996, Forest Health Monitoring (FHM) established 144 plots across the state. Of these, 38 plots had a forest condition. The FHM plot consists of 4 subplots with each subplot a fixed radius of 24 feet. FHM plots are located according to a national survey grid and are approximately 16 miles apart.

The information collected in the FHM survey is part of a national design. Thus, results of the survey are used to make comparisons and analysis on a national or forest type basis. Using the data to make analysis within state boundaries is not statistically sound as this time. However, the baseline data can give a "snapshot" of the trees and forests in Indiana at the start of the annual FHM survey.

On each subplot, information is taken on all trees 5.0+\" DBH. A microplot is used to collect information on seedlings (<1.0\") and saplings (1.0-4.9\"). The tree information collected consists of crown and damage measures. Crown measures are live crown ratio, crown density, foliage transparency, dieback, crown position, crown exposure and crown diameter.

The crown measures of foliage transparency, crown density, dieback and live crown ratio can be used to assess the tree's "health". Trees with low foliage transparency and dieback values and high crown density and live crown ratio have increased potential for carbon fixation, nutrient storage, survival and reproduction.

Using these measures and making comparisons between years, the FHM survey should identify a problem with a tree species or forest type. Once identified, a problem can be evaluated on a more localized basis to understand the problem and define management measures. The information below summarizes the survey findings.

	% Normal - <30%	% moderate/severe - >30%
Hardwoods	97	
Softwoods	92	
Maple		0.9
Elm		2.0
Oak		2.5
Ash		6.5

For **foliage transparency**, which is used to indicate defoliation, the survey found 97% of the hardwoods and 92% of the softwoods had normal transparency (<30%). Only maple, oak, elm and ash had any trees with moderate to severe transparency (30-50% & >50%).

Dieback is the amount of current years twigs that have died in the outer tree crown. No dieback was found on 84% of the hardwoods and 96% of the softwoods. Light dieback (6-20%) was observed on 13.7% of the hardwoods. Moderate to severe dieback (21-50% & >50%) was recorded on 1.6% of the hardwoods. By genus/species, Oak, elm, maple, ash and yellow poplar had the most dieback recorded.

	Hardwoods (%)
No Dieback	84
Light Dieback (6-20%)	13.7
Moderate/Severe (21-50%) & >50%	1.6

Crown density is the amount of foliage, twigs, branches, and seeds in the crown. The survey found 98.7% of all trees had average to good density (21-50% & >50%). Only hardwoods - elm, yellow poplar and black walnut - recorded trees with poor density (<20%). By genus/species, ash, aspen, and beech had more trees with average density than a good density. Maples had the highest percent of trees with good density for the hardwoods.

Genus/species	Average (21-50%)	Good (>50%)	Genus/species	Average (21-50%)	Good (>50%)
Sweetgum	16.7	83.3	Elm	38.8	57.1
Maple	22.5	77.5	Oak	48.2	51.8
Yellow poplar	22.7	75.0	Beech	53.8	46.2
Walnut	25.0	68.8	Ash	57.6	42.4
Basswood	33.3	66.7	Aspen	62.5	37.5
Hickory	37.7	62.3	Other hwds	46.1	50.8

For hardwoods, 64% of the trees had **Live Crown Ratios** greater than 40%; whereas the softwoods had 87% of the trees greater than 40%. Examining individual genus/species, there may be concern with ash, yellow poplar, black walnut and elm that had 40%, 58%, 57% and 66%, respectively, of the trees sampled with LCR >40%. This may indicate a problem in the "health" of this genus/species.

Live Crown Ration (Percent of Trees)	
	LCR >40% (%)
Hardwoods	64
Softwoods	87
Ash	40
Yellow poplar	58
Black Walnut	57
Elm	66

Damage indicators are cankers, open woods, decay conks, broken bole, brooms, dead terminals, discolored foliage and more. Decay indicators represented 70% of the damages recorded. The survey found no damage on 70% of the hardwoods and 91% of the softwoods. By genus/species, of all trees sampled, maple, ash, oak, hickory, elm, yellow poplar and beech had damage recorded more than other species. Within a genus/species, beech, maple and ash had the highest percentage of trees with damage. In the hardwoods, 8% of the trees sampled had more than one damage.

From the initial data, the "health" of ash, yellow poplar, elm and perhaps maple and oak in Indiana needs to be monitored for future change. The live crown ratio, crown density, crown transparency and crown dieback data for these genus/species indicate they may have a greater "health" concern than other genus/species.

Indiana DNR Division of Forestry, Forest Health

Phillip T. Marshall

Zachary Smith

Forest Health Specialist
Vallonia State Nursery
2782 W. Co. Rd. 540 S.
Vallonia, IN 47281
(812)358-9034
pmarshal@dnr.state.in.us

Forest Entomologist
Jasper-Pulaski State Nursery
15508 W 700 N
Medaryville, IN 47957
(219)843-6421
zsmith@dnr.state.in.us

For more information contact:

Burnell C. Fischer
State Forester
DNR Division of Forestry
402 West Washington St. Rm W296
Indianapolis, IN 46204
317.232.4105
email: bfischer@dnr.state.in.us

Forest Health Protection
Northeastern Area,
State & Private Forestry
USDA Forest Service
1992 Folwell Avenue
St. Paul, MN 55108
651.649.5244



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