IOWA DEPARTMENT OF NATURAL RESOURCES

Iowa's 2015 Forest Health Highlights

December 2015

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Contents

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Iowa's Forest Health Highlights

Introduction

Each year the Iowa DNR Bureau of Forestry cooperates with numerous agencies to protect Iowa's forests from insects, diseases, and other damaging agents. These programs involve ground and aerial surveys, setting up pheromone traps, following transects for sampling, collecting samples for laboratory analysis, and directing treatments for specific problems during the growing season. After each growing season, the Forestry Bureau issues a summary report regarding the health of Iowa's forests

This year's report begins with a brief summary of weather events, Iowa's land characteristics, and several survey summaries for insects, diseases, and invasive plants that have the potential to impact the health of Iowa's forests. The 2015 Forest Health Highlights will focus first on the Forest Service's Major Forest Pest List (Page 4) and then cover the additional damaging agents that DNR surveyed.

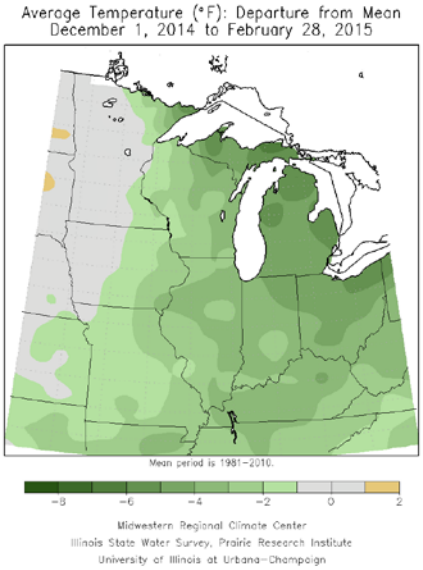
Weather Review

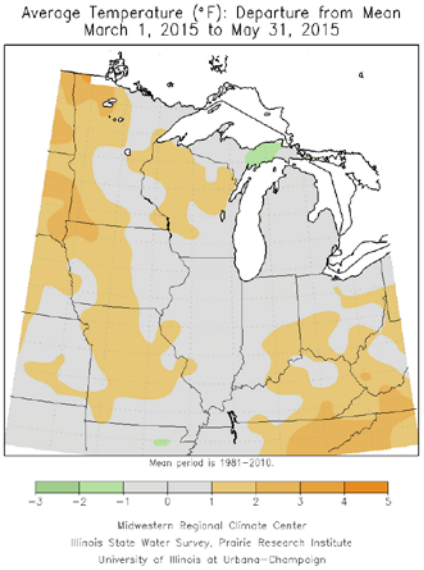
These winters brought about several challenges for Iowa with colder than average temperatures and slightly lower precipitation. The colder temperature (5-10° colder than average) was occasionally broken by several days in January that went above freezing, which caused many conifers to break winter dormancy. The repeated breaks in winter dormancy allowed for winter desiccation and eventual tree death in many conifer species throughout the state. The entire state experienced a much warmer than normal spring with most all of Iowa receiving normal rainfall events. The warmer wet spring helped encourage the occurrence of Anthracnose (a fungal leaf disease) on sycamore and many other benign fungal leaf diseases throughout the state.

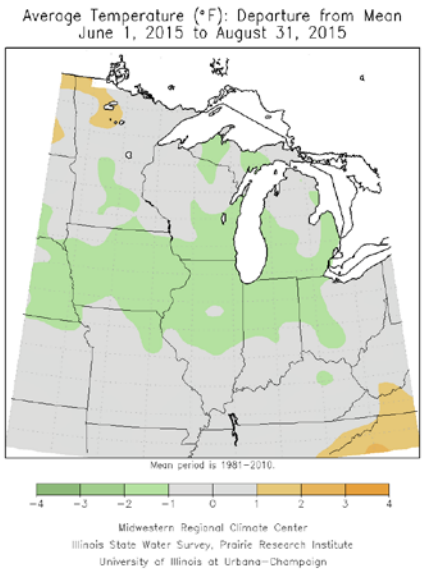
Most of the state experienced slightly cooler than normal summer temperatures and summer rainfall events were much higher than normal statewide. The prior year's drought conditions were eliminated by consistent statewide rainfall. Only extreme Northeast Iowa and Southeast Iowa are still experiencing drought conditions. The continued summer rains exacerbated the fungal leaf diseases and numerous reports of bur oak blight were made.

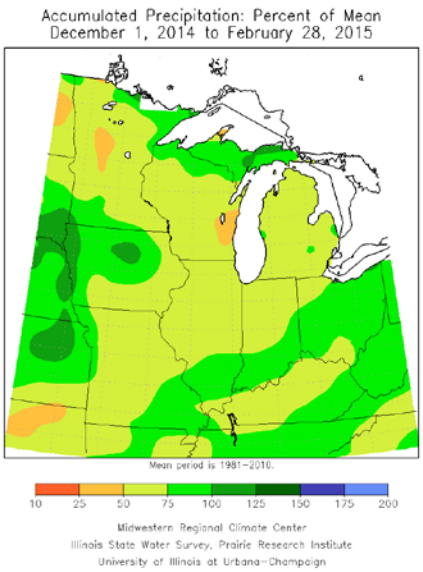
DNR will continue to monitor the winter effects on the conifers in Iowa. The reports of winter desiccation have nearly doubled since the 2014 Forest Health Highlights, despite the consistent rainfall. The conifers are unable to maintain dormancy during the winter months with temperatures fluctuating above and below freezing. The problem of winter desiccation, commonly called winter burn, is likely to continue into the future.

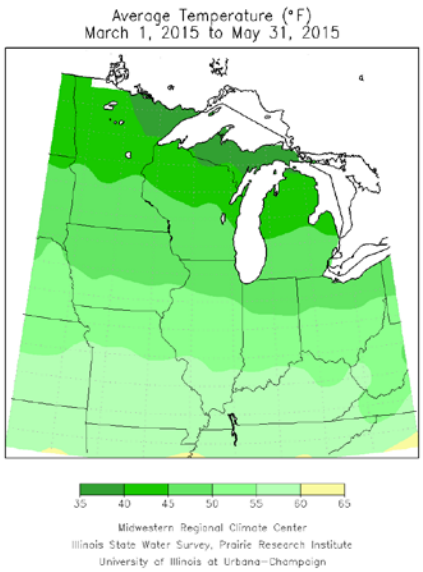
Utilizing deciduous trees in windbreaks instead of conifers may be more successful in the long term, based on the weather review in the past six Forest Health Highlights, potential impacts from insects, and potential impacts from needle blights and other fungi. Conifers appear succeed when grown as single specimen yard trees that are protected from the elements and have adequate airflow to reduce the fungal diseases. In windbreaks, deciduous trees tend to have less environmental problems, grow faster, and can provide benefits sooner than the conifers.

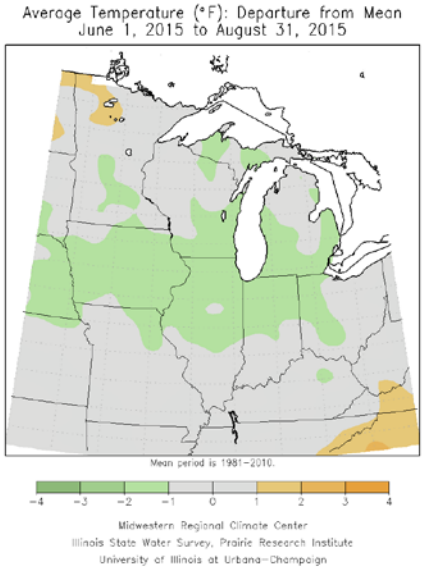






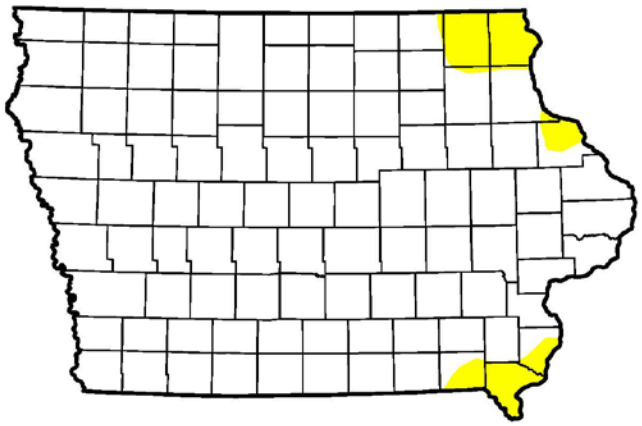






[Images provided by Midwest Climate Watch]

U.S. Drought Monitor
Iowa



October 6, 2015
(Released Thursday, Oct. 8, 2015)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	94.99	5.01	0.00	0.00	0.00	0.00
Last Week 9/29/2015	94.52	5.48	0.00	0.00	0.00	0.00
3 Months Ago 7/7/2015	100.00	0.00	0.00	0.00	0.00	0.00
Start of Calendar Year 12/30/2014	93.01	6.99	0.00	0.00	0.00	0.00
Start of Water Year 9/29/2015	94.52	5.48	0.00	0.00	0.00	0.00
One Year Ago 10/7/2014	99.99	0.01	0.00	0.00	0.00	0.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
David Miskus
NOAA/NWS/NCEP/CPC

http://droughtmonitor.unl.edu/

U.S. Drought Monitor

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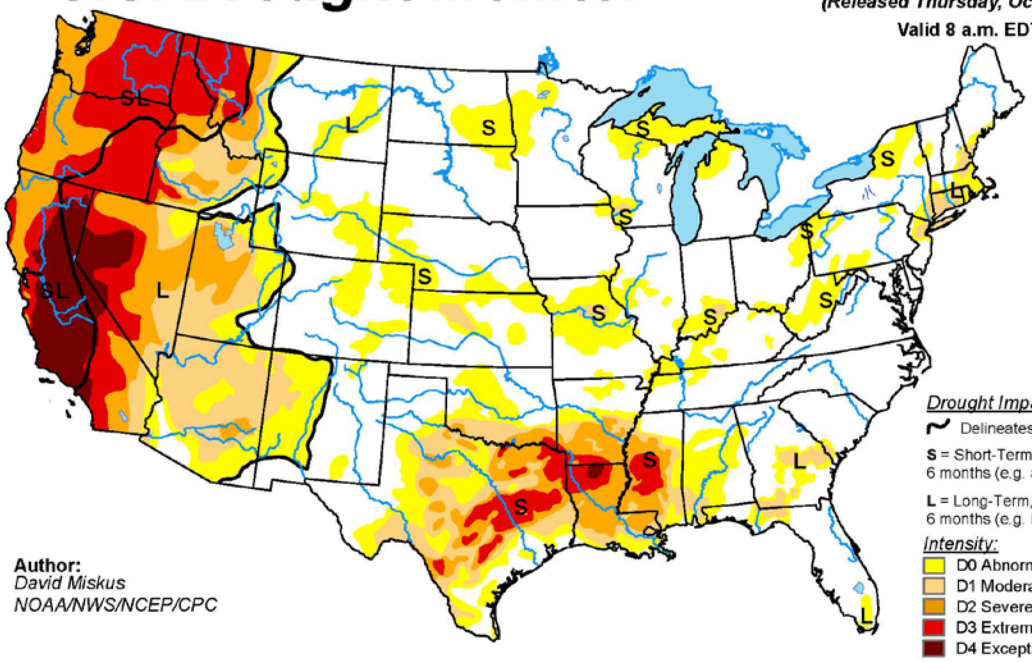

Author:
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NOAA/NWS/NCEP/CPC

Drought Impact Types:

Delineates dominant impacts

S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)

L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

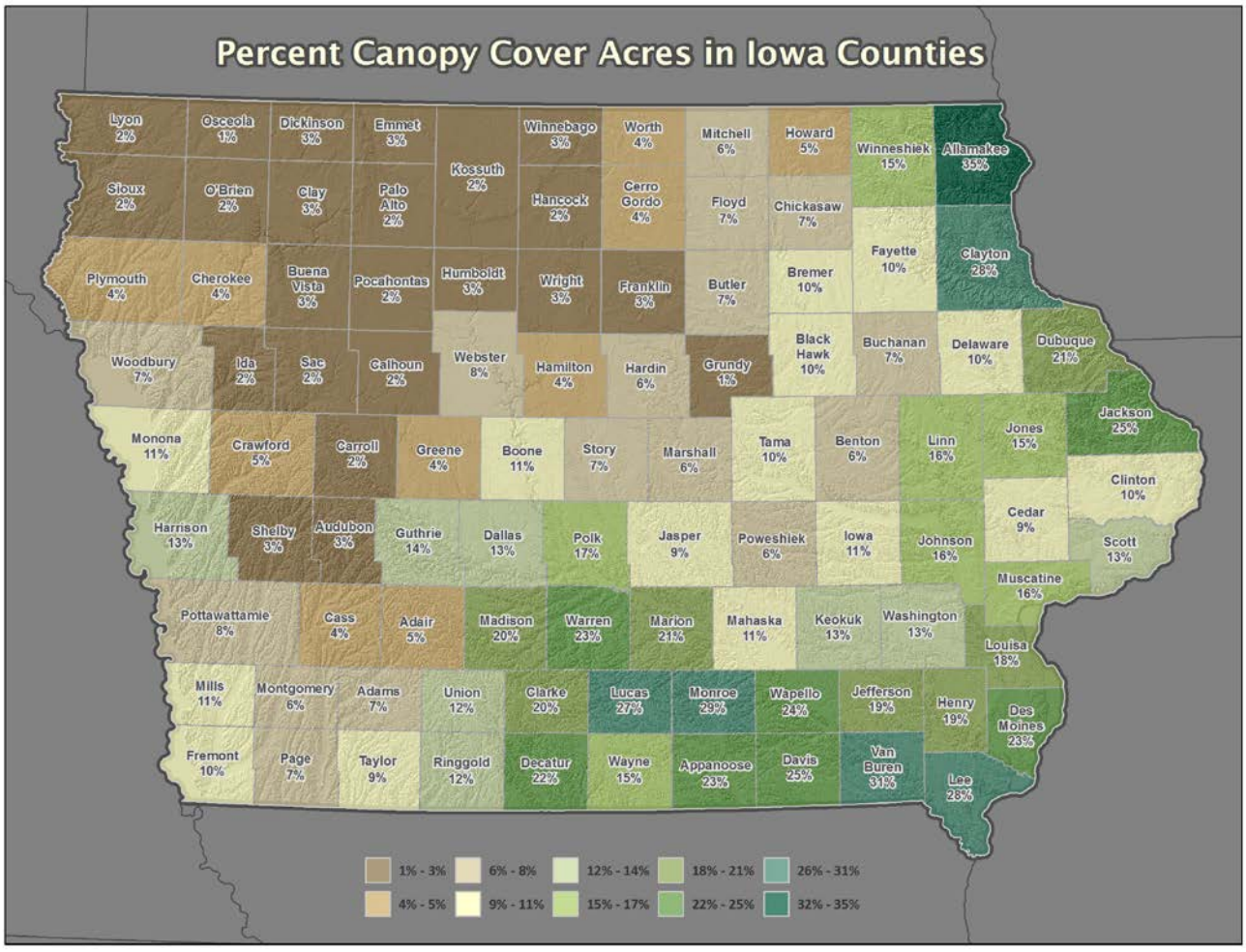
http://droughtmonitor.unl.edu/

Land Characteristics

Iowa has approximately 2.85 million acres of forested land representing a decrease from 3.1 million acres in 2012. Most of Iowa's forests are native hardwood with oak, hickory, maple, basswood, walnut, ash, elm, cottonwood, and many other hardwood species. Less than 3% of Iowa's forests are conifer forests. There are currently 1.06 million acres of oak-forest in Iowa.

Nearly 95% of the Forest Inventory Analysis (FIA) plots found one or more invasive plants competing with natives. The data also showed that over half of the live trees in Iowa are the preferred tree species by the nonnative pest gypsy moth. In addition, the average annual tree growth has declined while the average annual tree mortality has increased. Much of Iowa's small forests and trees in fence rows have been cleared to allow for more profitable row cropping. The FIA data also indicated that succession to shade tolerant hardwoods (maples/ironwood) replacing shade intolerant hardwoods (oak/hickory) is continuing. These are alarming forest health trends. (Miles, P.D. Wed Mar 25 20:46:53 MDT 2015. Forest Inventory EVALIDator web-application version 1.6.0.01. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Northern Research Station.)

Currently, there are 186 businesses in Iowa which utilize the wood grown in Iowa's forests. The forest products industry contributes over $3.9 billion each year to Iowa's economy, including over 18,000 jobs for Iowans (Analysis by E.M. (Ted) Bilek, Economist, USDA Forest Service, Forest Products Laboratory, Madison, WI). Additional details can be found on page 192 of *Iowa's Forest's Today*.



United States Forest Service Major Pests List

This is a national list. Pests highlighted in red do not pertain to Northeastern Area and do not need to be reported. The items in blue have no known impact in Iowa at this time.

Non-Native Pests

Asian Longhorned Beetle
Balsam Woolly Adelgid
Beech Bark Disease
Browntail Moth
Butternut Canker
Dogwood Anthracnose
Emerald Ash Borer
Goldspotted Oak Borer
Gypsy Moth
Hemlock Woolly Adelgid
Laurel Wilt
Oak Wilt
Port-Orford-Cedar Root Disease
Sirex Woodwasp
Sudden Oak Death
Thousand Cankers Disease
White Pine Blister Rust
Winter Moth

Native Pests

Armillaria Root Disease
Aspen Leafminer
Bur Oak Blight
Douglas-Fir Beetle
Douglas-fir Black Stain Root Disease
Fir Engraver
Forest Tent Caterpillar
Fusiform Rust
Heterobasidion Root Disease
Jack Pine Budworm
Jeffrey Pine Beetle
Large Aspen Tortrix
Mountain Pine Beetle
Northern Spruce Engraver
Pine Black Stain Root Disease
Polyphagous Shot Hole Borer
Port-Orford-Cedar Root Disease
Southern Pine Beetle
Spruce Beetle
Spruce Budworm
Subalpine Fir Mortality
Western Five-Needle Pine Mortality
Western Pine Beetle
Western Spruce Budworm
Yellow-Cedar Decline

United States Forest Service Major Pests List: Armillaria Root Disease

Year: 2015
State: Iowa
Forest Pest
Common Name: Armillaria Root Disease
Scientific Name: *Armillaria spp.*
Hosts: Hardwoods and Conifers
Setting: N/A
Counties: N/A
Survey Methods: Ground
Acres Affected: N/A
Narrative: Armillaria root disease is fairly common in Iowa. The crown symptoms consist of branch dieback and crown thinning. The fungi produces a mycelial fan in recently killed trees just underneath the inner bark that often have a strong "mushroom" odor. The most common sign are the rhizomorphs that are produced just under the bark, and sometimes just on the bark surface. The rhizomorphs look like "shoestring", which is why this fungi is something called the shoestring fungi.

If a landowner needs assistance with armillaria root disease, please contact Tivon Feeley (DNR Forest Health Program Leader) at 515-275-8453 or the ISU Plant Diagnostic Clinic at 515-294-0581. More information can be found here.

Figure 1. Armillaria rhizomorphs under the bark. (Image: Robert L. Anderson, USDA Forest Service, Bugwood.org).

United States Forest Service Major Pests List:
Asian long-horned beetle

Year: 2015
State: Iowa
Forest Pest
Common Name: Asian long-horned beetle
Scientific Name: *Anoplophora glabripennis*
Hosts: Maple, horsechestnut/buckeye, willow, elm, birch, and sycamore
Setting: N/A
Counties: N/A
Survey Methods: Ground
Acres Affected: N/A
Narrative: Asian long-horned beetle has not been identified in Iowa. In the past, state legislative funds allowed DNR to follow up on suspect maples in 2010, 2011, 2012 and 2013. The maples were selected from community inventories as having advanced dieback, large exit holes, and no obvious reason for the decline (e.g. girdling roots, construction damage, or planting depth).

However, due to shrinking budgets, no formal survey work was conducted for Asian long-horned beetle in 2015. DNR asks all citizens to assist in the future monitoring efforts of this pest.

If beetles are found (Figure 1.) contact Christine Markham (USDA National Coordinator) at 919-855-7328 and Robin Pruisner (State Entomologist) at 515-725-1465. Asian long-horned beetle information can be found here.

Figure 2. Adult Asian long-horned Beetle (Image: Dennis Haugen, USDA Forest Service, Bugwood.org).

United States Forest Service Major Pests List:
Bur Oak Blight

Year 2015
State: Iowa
Forest Pest
Common Name: Bur Oak Blight
Scientific Name: *Tubakia iowensis*
Hosts: Bur oak
Setting: Rural Forests, Nursery, and Urban
Counties: Statewide (Calhoun, Emmett, O'Brien, and Osceola counties added in 2015)
Survey Methods: Aerial, Ground, General Observation, and Culturing
Acres Affected: Approximately 2,000 acres
Narrative: Bur oak blight has been recognized in Iowa for only the last 10 years. However, it is suspected that the fungus that causes the disease has probably been here much longer. Theories on why bur oak blight has increased include: a shift in climate temperatures, more frequent rain events, older mature trees might be more susceptible, and that trees are more susceptible on sites that have a history of grazing or construction.

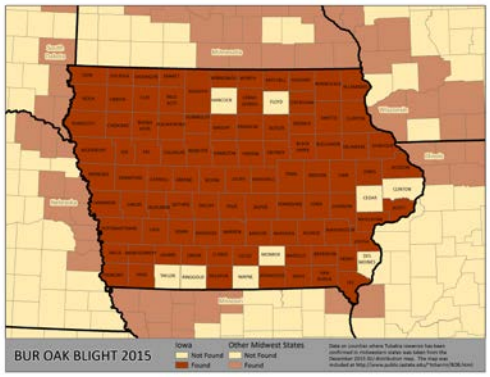
The disease can be found in most counties in Iowa, causing severe decline and mortality. Chemical injections with propiconazole (Alamo) seem to control bur oak blight. However, some chemical burning (phytotoxic effects of the chemical) does occur. This control method works well in urban settings.

Currently, control measures have not been identified for woodland trees. Severely declining bur oaks have been harvested (salvaged) before they die. The estimated acres affected reflect the approximate acres of woodland salvage cuts. This does not reflect the urban damage, which cannot be quantified at this time.

Research is being conducted on various native bur oaks that may have some tolerance to the bur oak blight fungus. Seeds have been collected from bur oaks that seem to show some resistance and are being grown and the DNR State Forest Nursery in hopes to prevent further damage. All samples bur oak blight should be sent into the ISU Plant Diagnostic Clinic at 515-294-0581.

Bur Oak Blight Background

Bur oak (*Quercus macrocarpa*) is common across Iowa. In 2008, bur oak ranked second among all tree species as measured in volume of saw timber on forest land. Bur oak provides substantial value for wood products and is an important source of wildlife habitat and mast (acorns) to many game and non-game species. Bur oak blight (BOB; *Tubakia iowensis.*) is a disease that can cause severe defoliation, leading to mortality of branches or entire trees.



Based on reports of BOB to the Iowa State Plant Insect and Disease Clinic in 2013, 87 counties in Iowa reported the presence of the disease. Within these counties there are over 8.7 million bur oaks out of Iowa's over 32 million bur oak trees growing. However, the disease has been observed by DNR foresters across the state.

Economic Impacts

The total impact of BOB to Iowa's forest landowners and wood products businesses is estimated to be $19 million or an annualized loss close to $770,000 in perpetuity for Iowa's economy. Other economic losses include non-timber products like nut production, reduced wildlife habitat and a $964 million loss of community tree derived benefits such as energy savings, property value, storm water retention, carbon sequestration and tree removal and replacement costs. Communities and homeowners will bear the cost burden of removing dead trees caused by BOB. The loss of bur oak within the oak-hickory forest type will negatively impact the economic contribution of $1.5 billion that fish and wildlife recreation provides to Iowa's economy.

Wildlife Impacts

Acorns produced by bur oaks are eaten by many species of birds and mammals. A reduction in the number of bur oak trees in Iowa's forests caused by bur oak blight will affect a wide variety of game and non-game species of wildlife. A primary fall and winter food for deer is acorns, composing around 54 percent of a deer's yearly diet during years acorn seed is available—otherwise the next preference is corn.

Management Solution

Proper woodland and community tree management have a critical role in creating healthy trees. The best insurance policy a landowner can have when managing their woodlands is by maintaining a diversity of tree species; while ensuring an appropriate number of trees are growing on each acre. The best course of action for communities is to have a tree inventory and a community tree resource plan. Good woodland and tree care under the direction of a forester or an arborist is the best defense against all forest health threats.

(Images: Aron Flickinger, DNR; Map: Created by DNR based on locations provided by Dr. Harrington, ISU.) A full map of bur oak blight can be found here.)

United States Forest Service Major Pests List: Butternut Canker

Year 2015
State: Iowa
Forest Pest
Common Name: Butternut Canker
Scientific Name: *Ophiognomonia clavigignenti-juglandacearum*
Hosts: Butternut
Setting: Rural Forest
Counties: Statewide
Survey Methods: General Observation
Acres Affected: Eastern half of Iowa (Scattered throughout roughly 2 million acres)
Narrative: Butternut canker is found throughout Iowa, but is largely concentrated in the Eastern half of Iowa where butternuts occur. The disease is fatal to native non hybrid butternuts.

DNR has previously collected seed from 20 native butternut trees and has established an Iowa butternut orchard in the Loess Hills. The 20 butternut trees displayed outstanding growth in Western Iowa (where the canker is rarely found) and no signs of butternut canker were found in 2015.

No formal survey work was conducted on butternut canker in 2015. No suspect samples were submitted to DNR. No damage was reported in 2015.

If a landowner needs assistance with butternut canker, please contact Tivon Feeley (DNR Forest Health Program Leader) at 515-275-8453 or the ISU Plant Diagnostic Clinic at 515-294-0581.

Figure 3. Examples of canker found on butternut trees (Image: Minnesota Department of Natural Resources Archive, Minnesota Department of Natural Resources, Bugwood.org).

United States Forest Service Major Pests List:
Emerald Ash Borer

Year	2015
State:	Iowa
Forest Pest	
Common Name: Emerald Ash Borer	
Scientific Name: *Agrilus planipennis*	
Hosts:	All Ash (*Fraxinus)* species
Setting:	Rural Forest, Nursery, Urban
Counties:	Allamakee, Appanoose, Black Hawk, Boone, Bremer, Cedar, Clinton, Dallas, Davis, Des Moines, Dubuque, Henry, Jasper, Jefferson, Keokuk, Lee, Linn, Lucas, Mahaska, Marion, Monroe, Montgomery, Muscatine, Polk, Poweshiek, Scott, Story, Union, and Wapello.
Survey Methods:	Aerial, Ground, General Observation, and Trapping
Acres Affected:	64,302 aerial acres
Narrative:	Emerald ash borer (EAB) was identified and confirmed in Iowa on May 14, 2010 on Henderson Island in Allamakee County. EAB has since been confirmed in Appanoose, Black Hawk, Boone, Bremer, Cedar, Clinton, Dallas, Davis, Des Moines, Dubuque, Henry, Jasper, Jefferson, Keokuk, Lee, Linn, Lucas, Mahaska, Marion, Monroe, Montgomery, Muscatine, Polk, Poweshiek, Scott, Story, Union, and Wapello counties. Since the insect was already widespread, a statewide quarantine was issued February 4, 2015. DNR visually inspected 286 ash trees in 12 counties in 2015. The surveys found EAB in Dallas, Montgomery Polk, and Poweshiek Counties. Unlike previous years, purple traps were not placed on a grid by PPQ. Instead, they were made available to DNR and IDALS to place on suspect trees to help determine if EAB is present. This tool has helped to determine if EAB was present in trees that could not be bark peeled. None of the deployed purple traps were positive in 2015. If a landowner has an ash tree that they believe has emerald ash borer please contact Tivon Feeley (DNR Forest Health Program Leader) at 515-725-8453 or Robin Pruisner (State Entomologist) at 515-725-1465. Emerald ash bore information can be found here and the Iowa DNR.

Emerald Ash Borer Background

Emerald ash borer (EAB; *Agrilus planipennis*) is a small green invasive wood boring beetle that attacks and kills ash trees. The adults live on the outside of ash trees feeding on the leaves during the summer months. The larvae look similar to white grubs and feed on the living plant tissue (phloem and cambium) underneath the bark of ash trees. The trees are killed by the tunneling activity of the larvae under the tree's bark, which disrupts the vascular flow.

(Images from top to bottom: Howard Russell, Michigan State University, Bugwood.org, James W. Smith, USDA APHIS PPQ, Bugwood.org, and David Cappaert, Michigan State University, Bugwood.org)

EAB is a highly invasive forest pest that has the potential to kill nearly 100 percent of the native ash trees of any size, age, or stage of health where it is present. Over 50 million ash trees outside of Iowa have been killed where EAB is present. Much of Iowa's forestland is populated with ash trees, and Iowa's community street trees are heavily planted with ash cultivars. The US Forest Service 2012 inventory indicates that there are 52 million woodland ash trees and 3.1 million urban ash trees in Iowa. Trees attacked by EAB can die within two years. Once EAB killed trees are discovered in a community nearly all ash trees in that community will be dead in five to six years.

Economic Impacts

The total impact of emerald ash borer to Iowa's forest landowners and wood products businesses is over **$27 million** or an annualized loss of **$1 million** until the ash population has been depleted.

Other economic losses include non-timber products such as reduced wildlife habitat and an over **$4.1 billion** loss of community tree derived benefits such as energy savings, property value, storm water retention, carbon sequestration and tree removal and replacement costs. Communities and homeowners will bear the cost burden of removing dead trees caused by EAB.

Wildlife Impacts

Ash has moderate importance to wildlife as a food source. Seeds are known to be eaten by wood ducks, finches, and cardinals.

Management Solution

It is suggested that woodland owners harvest the high value ash trees and work with DNR District Foresters on a long term management plan for woodlands to determine what species should be managed for that will "replace" the ash niche. There are many management options for urban trees that included various chemical insecticide treatments to control emerald ash borer and removing and replacing the tree with a suggested replacement tree. Some of the urban management option can be found by clicking here.

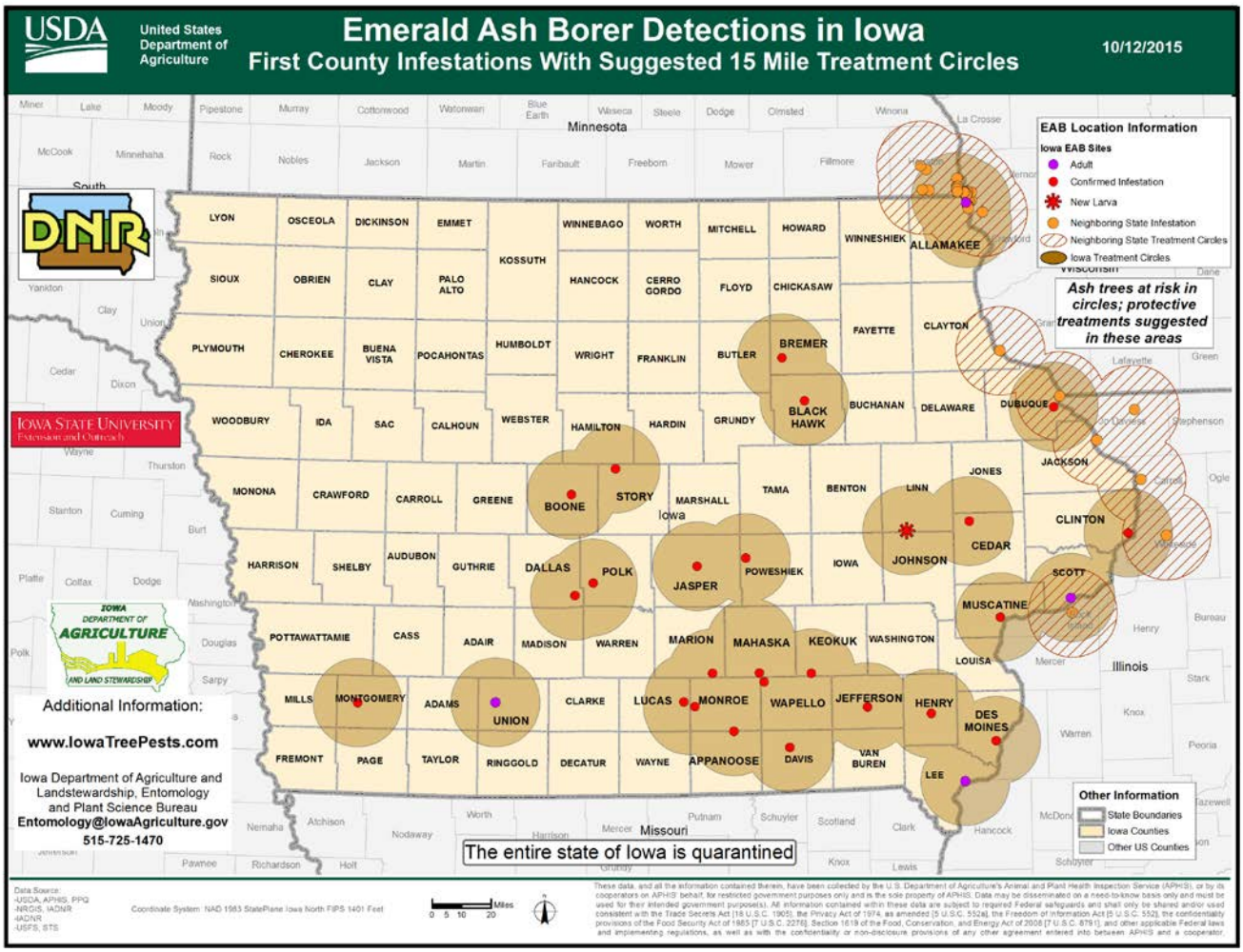


Figure 4. Locations of the emerald ash borer infestations, as of December 2015. Please note that the entire State of Iowa is now quarantined for EAB. The target circles around each infestation represent a 15 miles radius. The target circles are done to assist landowners that are considering chemical treatments. The current recommendations from the Iowa EAB Team are not to chemically treat an ash tree until your property is within one of the target circles. (Image: Tivon Feeley, DNR)

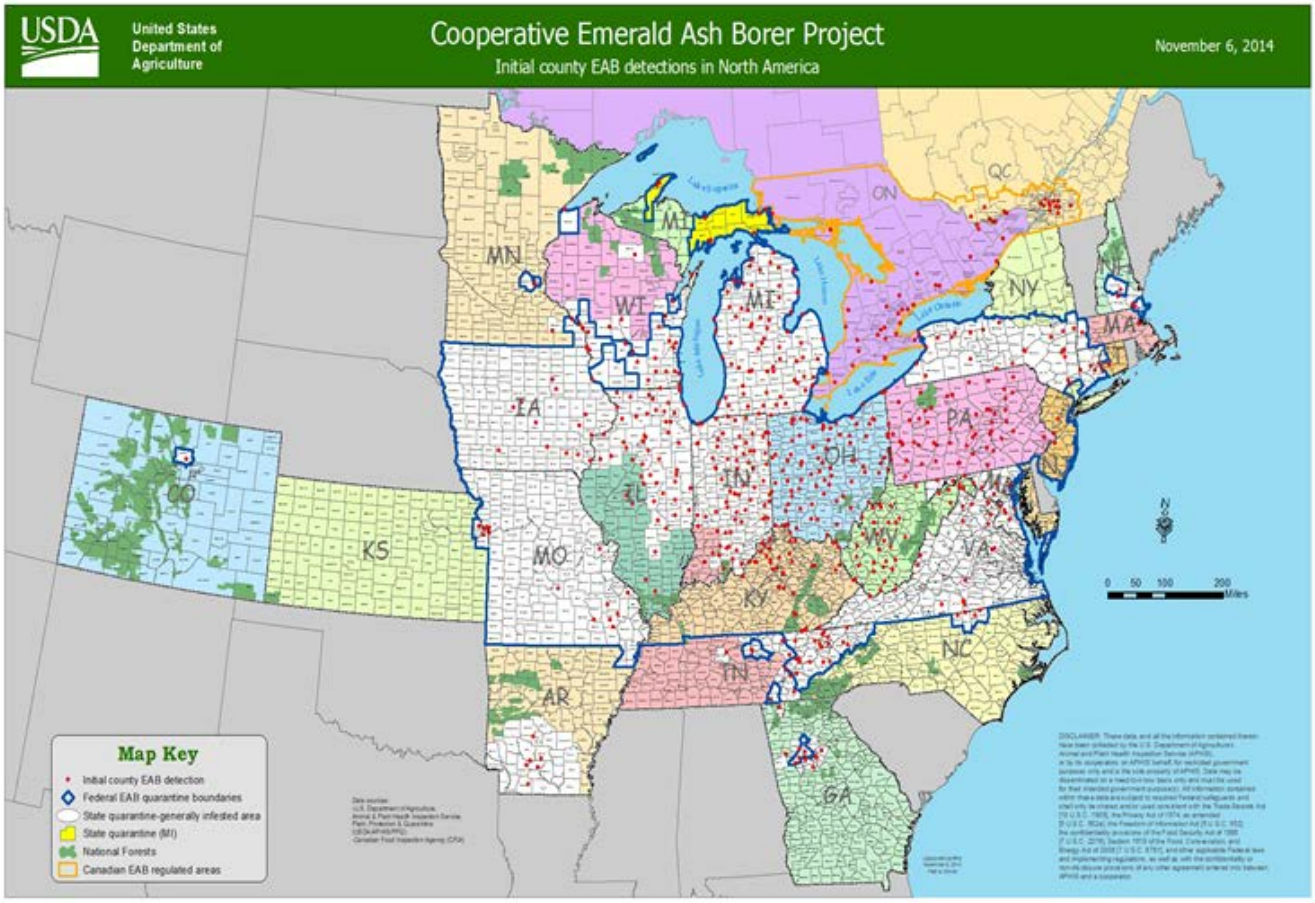


Figure 5. Locations of the current quarantined counties or states for emerald ash borer. DNR and partners will continue to trap and monitor the state through 2015. (Image provided by USDA-APHIS-PPQ and additional emerald ash borer information is posted here.)

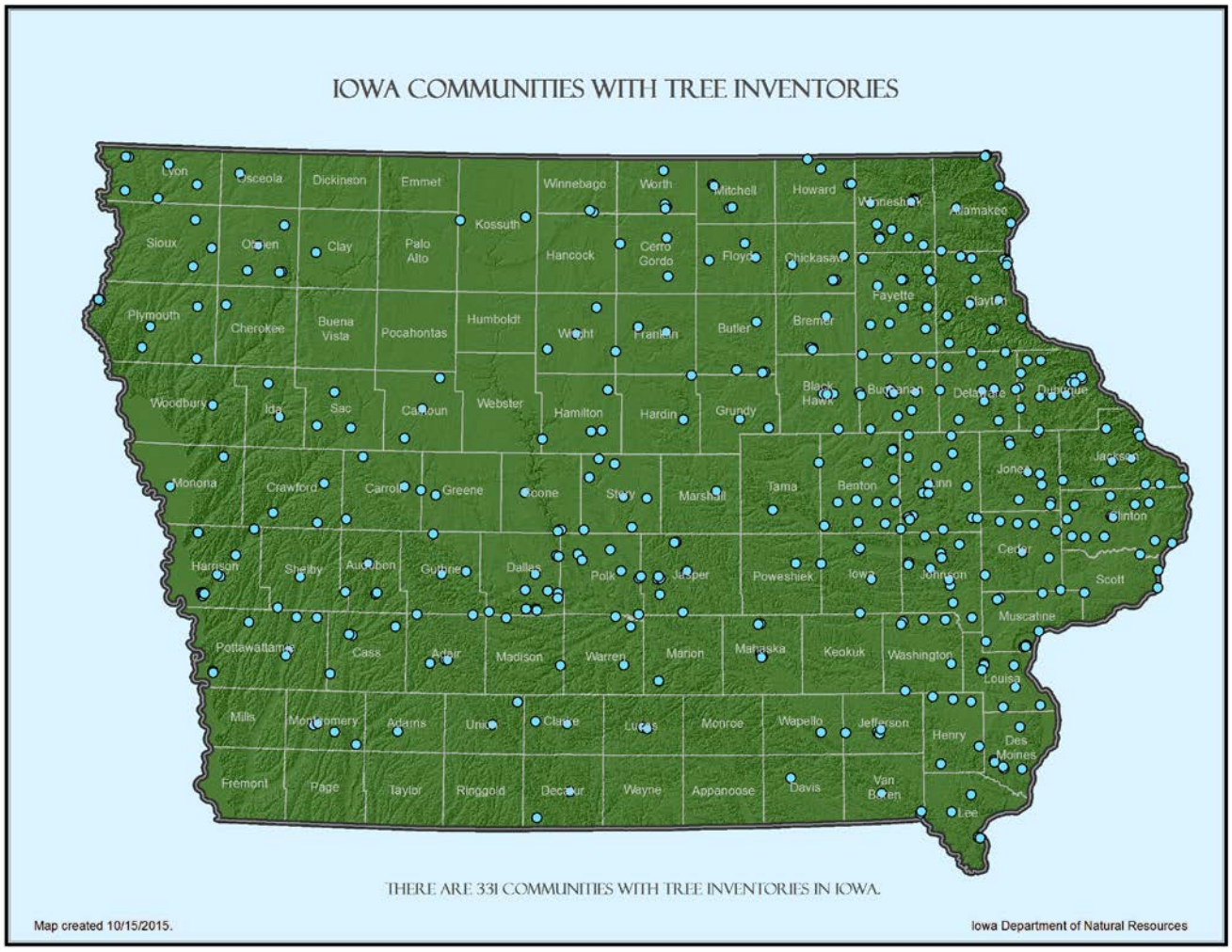


Figure 6. The map above details the locations where the community street tree inventories have been conducted. Every publicly owned ash street tree was inspected for signs and symptoms of emerald ash borer following the US Forest Service's Emerald Ash Borer Survey Guidelines. A total of 250 communities, of the 331 inventoried, have received urban forest management plans that include ash phloem reduction and tree diversification (Image: Tivon Feeley, DNR).

United States Forest Service Major Pests List:
Forest Tent Caterpillar

Year	2015
State:	Iowa
Forest Pest	
Common Name:	Forest Tent Caterpillar
Scientific Name:	*Malacosoma disstria*
Hosts:	Many tree species
Setting:	Rural Forests and Urban
Counties:	Allamakee, Winneshiek, Howard, Chickasaw, Fayette, Clayton, and Delaware
Survey Methods:	Ground and General Observation
Acres Affected:	Approximately 800 acres
Narrative:	Iowa DNR started receiving reports of forest tent caterpillars in Northeast Iowa in late May. Forest tent caterpillars are native and commonly found throughout the United States. The forest tent caterpillars have regional outbreaks every 6 to 16 years.

This is the fifth year of outbreak of forest tent caterpillars. The populations appear to be dropping and are expected to be minimal in 2016.

Figure 7. The picture above shows forest tent caterpillars on the main stem of a young tree. (Image: Robert Honeywell, DNR).

United States Forest Service Major Pests List:
Gypsy Moth

Year 2015
State: Iowa
Forest Pest
Common Name: Gypsy Moth
Scientific Name: *Lymantria dispar*
Hosts: Oak, spruce, maples, elms, and many more
Setting: Rural Forests and Urban
Counties: Statewide
Survey Methods: Pheromone Delta Traps
Acres Affected: None
Narrative: Gypsy moth has repeatedly been captured in Iowa, but the population level has effectively been controlled by environmental conditions, *entomophaga* (fungal pathogen of gypsy moth), and mating disruption. Feeding damage has not occurred to Iowa's trees.

Iowa captured 269 male moths in 2013, 225 male moths in 2012, 478 male moths in 2011, and a state record 2,260 male moths in 2010. The state record capture in 2010 prompted the state's largest aerial treatments using pheromone flakes to disrupt mating.

This year's capture of 338 male moths is much higher than last year's capture of 46 male moths and the moths are concentrated within a few pockets within Iowa. Iowa participates in a National "Slow the Spread: project that evaluates the moth captures and recommends treatment options. The computer algorithm did not assign any treatment blocks for 2015, but did identify four area to delimit (add more traps) and monitor during the 2015 trapping season. Three treatment sites have been identified for 2016 totaling 13,520 polygon acres. Mating disruption will likely be used to treat these blocks. There are fifteen areas to delimit in 2016 to ensure that Iowa does not have an isolated early infestation. More gypsy moth information can be found here.

About STS: This nonprofit organization was established for the purpose of aiding in the implementation of the U.S.D.A. National Slow the Spread of the Gypsy Moth Project. The National Slow the Spread Project is part of the U.S.D.A.'s national strategy for gypsy moth management.

Gypsy moth is a destructive, exotic forest pest that was accidentally introduced into the United States in 1869. It is currently established throughout the northeast and parts of the upper mid-west. it feeds on over 300 species of trees but oaks are most preferred.

- 75 million acres have been defoliated by gypsy moth since 1970.
- Gypsy moth defoliation causes extensive tree mortality, reduces property values, adversely affects commerce and causes allergic reactions in sensitive individuals that come in contact with the caterpillars.
- Most (almost 70%) of the susceptible hardwood forests in the United States have not been infested by gypsy moth and are still at risk.

  Since Congress funded the Slow the Spread Program (STS) in the year 2000, eleven states located along the leading edge of gypsy moth populations, in cooperation with the USDA Forest Service, have implemented a region-wide strategy to minimize the rate at which gypsy moth spreads into uninfested areas. As a direct result of this program, spread has been dramatically reduced by more than 70% from the historical level of 13 miles per year to 3 miles per year. In its first 6 years, this program prevented the impacts that would have occurred on more than 40 million newly infested acres.

- STS reduces spread of this destructive pest to 3 miles per year, which will prevent infestation of more than 150 million acres over the next 20 years.
- STS protects the extensive urban and wildland hardwood forests in the south and upper mid-west.
- STS protects the environment through the use of gypsy moth specific treatment tactics.
- STS unifies the partners and promotes a well-coordinated, region-wide action based on biological need.
- STS yields a benefit to cost ratio of more than 4 to 1 by delaying the onset of impacts that occur as gypsy moth invades new areas.

Philosophy

While traditional approaches to gypsy moth management address potentially defoliating populations occuring in generally infested areas, the STS project focuses on populations in the area between that of general infestation and generally uninfested. In this transition zone, populations are low and somewhat discontinuous. Male moths are the primary population indicators, and other life stages are rarely found. The project attempts to meet its goals by conducting intensive monitoring with pheromone-baited traps in order to detect isolated or low-level populations in the transition zone. Although all available tactics to control gypsy moth populations will be considered, emphasis is placed upon the most environmentally benign tactic which meets management objectives.

Design

The STS Project is composed of two types of management areas: the Action Area, where STS management strategies are applied, and the Evaluation Area, where normal state and federal management strategies are maintained. Data from the Evaluation Area, along with data from surrounding state gypsy moth surveys, will be used to assess the efficacy of STS management strategies in the Action Area. Intensive monitoring within the Action Area is the foundation of the project and provides the trap catch data used in a decision-making algorithm to determine the appropriate management activities.

Gypsy Moth Background

Gypsy Moth is a European insect species introduced in Boston, MA in 1869 as an experiment to help provide silk for the textile industry. This exotic insect continues to spread west from that introduction site and defoliate native forests.

(Images: USDA APHIS PPQ, Bugwood.org, and Tivon Feeley, DNR

Establishment of gypsy moth in Iowa will affect the survival of mature trees. The larvae of this insect will feed on the leaves of over 300 host species during the important summer growing season, a time when a trees leaves are converting sunlight to energy. Repeated defoliation that occurs several years in a row on the same tree will deplete the stored nutrients, leading to the decline of that tree. In 2010, a record number of 2,260 male gypsy moths were captured in 31 Iowa counties.

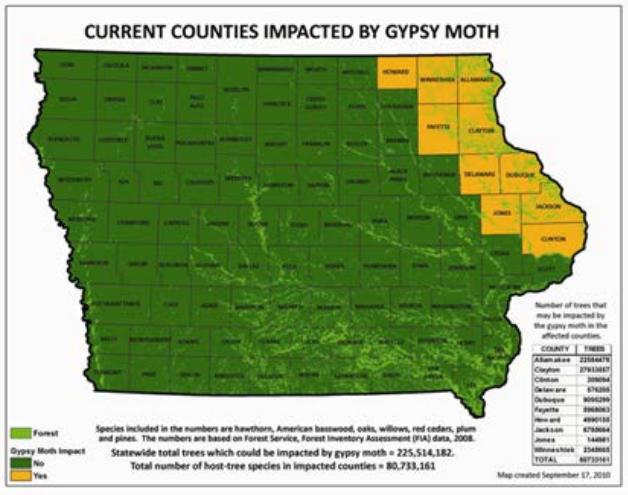
Economic Impacts

The total estimated impact of Gypsy Moth to Iowa's forest landowners and wood products businesses is over **$551 million** or an annualized loss of over **$22 million** in perpetuity for Iowa's economy. Other economic losses include non-timber products like seed production, reduced wildlife habitat and a **$6.8 billion** loss of community tree derived benefits such as energy savings, property value, storm water retention, carbon sequestration and tree removal and replacement costs. Communities and homeowners will bear the cost burden of removing dead trees caused by Gypsy Moth.

The loss of oaks and other preferred tree species of gypsy moth will negatively impact the economic contribution of **$1.5 billion** that fish and wildlife recreation provides to Iowa's economy.

Wildlife Impacts

Oak leaves are a preferred food source for Gypsy moth caterpillars. Acorns produced by oaks are eaten by many species of birds and mammals. A reduction in the number of oak trees in Iowa's forests caused by repeated defoliation from gypsy moth caterpillars will affect a wide variety of game and non-game species of wildlife. A primary fall and winter food for deer is acorns, composing around 54 percent of a deer's yearly diet during years acorn seed is available—otherwise the next preference is corn.



Management Solution

Proper woodland and community tree management have a critical role in creating healthy trees. The best insurance policy a landowner can have when managing their woodlands is by maintaining a diversity of tree species; while ensuring an appropriate number of trees are growing on each acre. The best course of action for communities is to have a tree inventory and a community tree resource plan. Good woodland and tree care under the direction of a forester or an arborist is the best defense against all forest health threats.

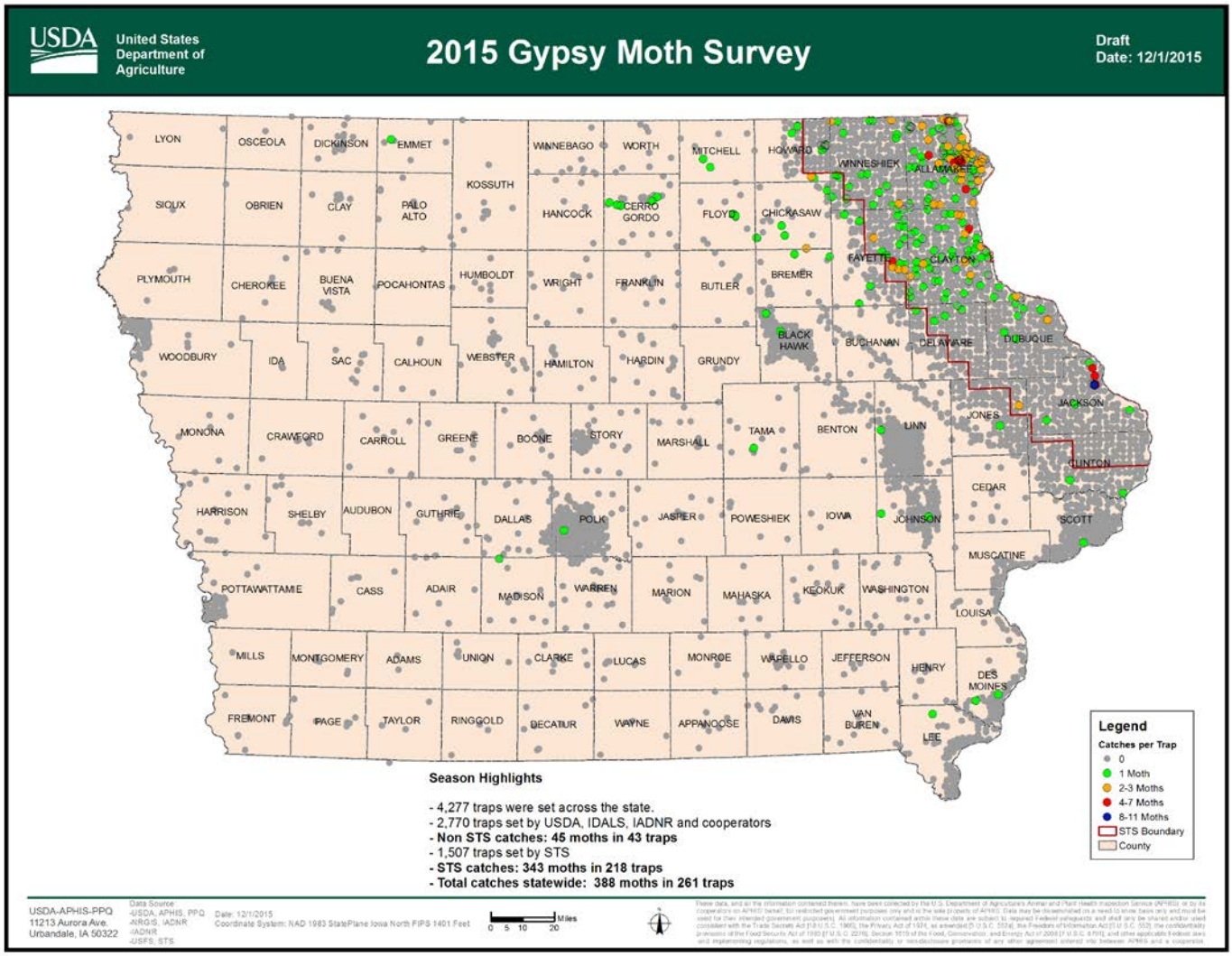


Figure 8. The map above details the locations of all the gypsy moth traps and the number of moths captured in them during the 2015 trapping season. The total male moth capture was 338 male moths. This number is up from the 2014 capture of 46 male moths. (Image: Tivon Feeley, DNR).

United States Forest Service Major Pests List: Heterobasidion Root Disease

Year 2015
State: Iowa
Forest Pest
Common Name: Heterobasidion root disease
Scientific Name: *Heterobasidion spp.*
Hosts: Conifers (All)
Setting: N/A
Counties: Lucas and Van Buren
Survey Methods: N/A
Acres Affected: N/A
Narrative: Heterobasidion root disease has been identified in Iowa, and is a pest that can occur throughout Iowa on pines or red cedar. Historically it has been reported on jack pine in Stephens State Forest and white pine in Shimek State Forest. No other survey work was conducted for Heterobasidion root disease. If a landowner suspects Heterobasidion root disease, please contact the ISU Plant Diagnostic Clinic at 515-294-0581.

Figure 9. Example of heterobasidion root disease. (Image: William Jacobi, Colorado State University, Bugwood.org)

United States Forest Service Major Pests List:
Oak Wilt

Year 2015
State: Iowa
Forest Pest
Common Name: Oak Wilt
Scientific Name: *Ceratocystis fagacearum*
Hosts: All Oak Species
Setting: Woodlands and Urban
Counties: Statewide
Survey Methods: Aerial and Ground
Acres Affected: 3,237 acres
Narrative: DNR received very few oak wilt samples this year. There were a total of 42 oaks tested for oak wilt and only 19 trees were positive for oak wilt. All trees were cultured and oak wilt was confirmed by fungal morphology.

The majority of the samples came from the southern half of Iowa. DNR helped develop two management plans in 2015. DNR followed up on the management plans implemented in 2014 and found very little evidence of oak wilt spread. At this time, it appears that the control efforts works have prevented the spread of oak wilt. DNR will continue to monitor these plots in 2015 to ensure that oak wilt remains under control.

If a landowner feels that they have discovered oak wilt, please contact the ISU Plant Diagnostic Clinic at 515-294-0581.

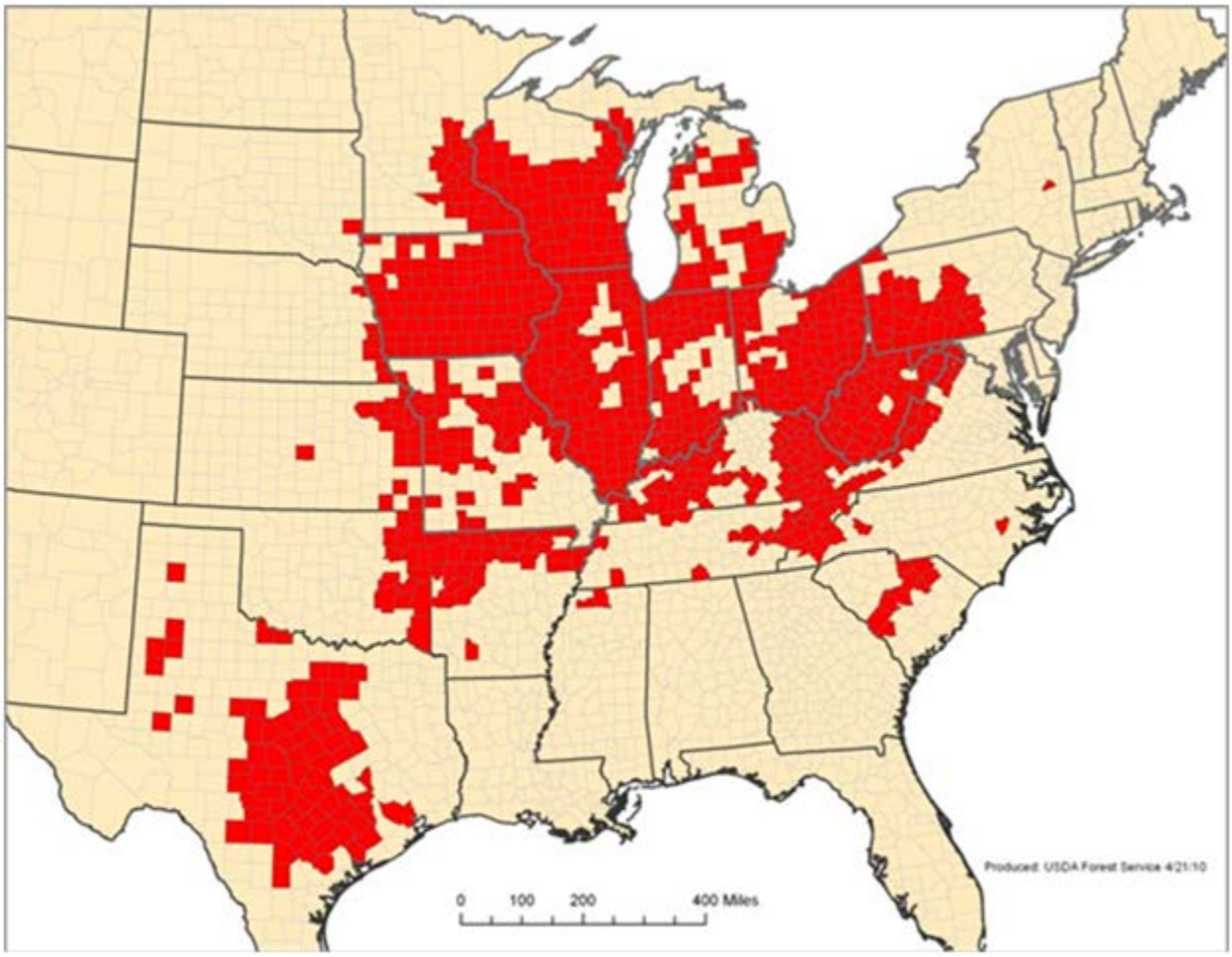


Figure 10. The map above details the counties in Iowa with confirmed oak wilt. Oak wilt may occur in the non-red counties, but has not been confirmed by the ISU Diagnostic Clinic. (Image: Quinn Chavez, USFS).

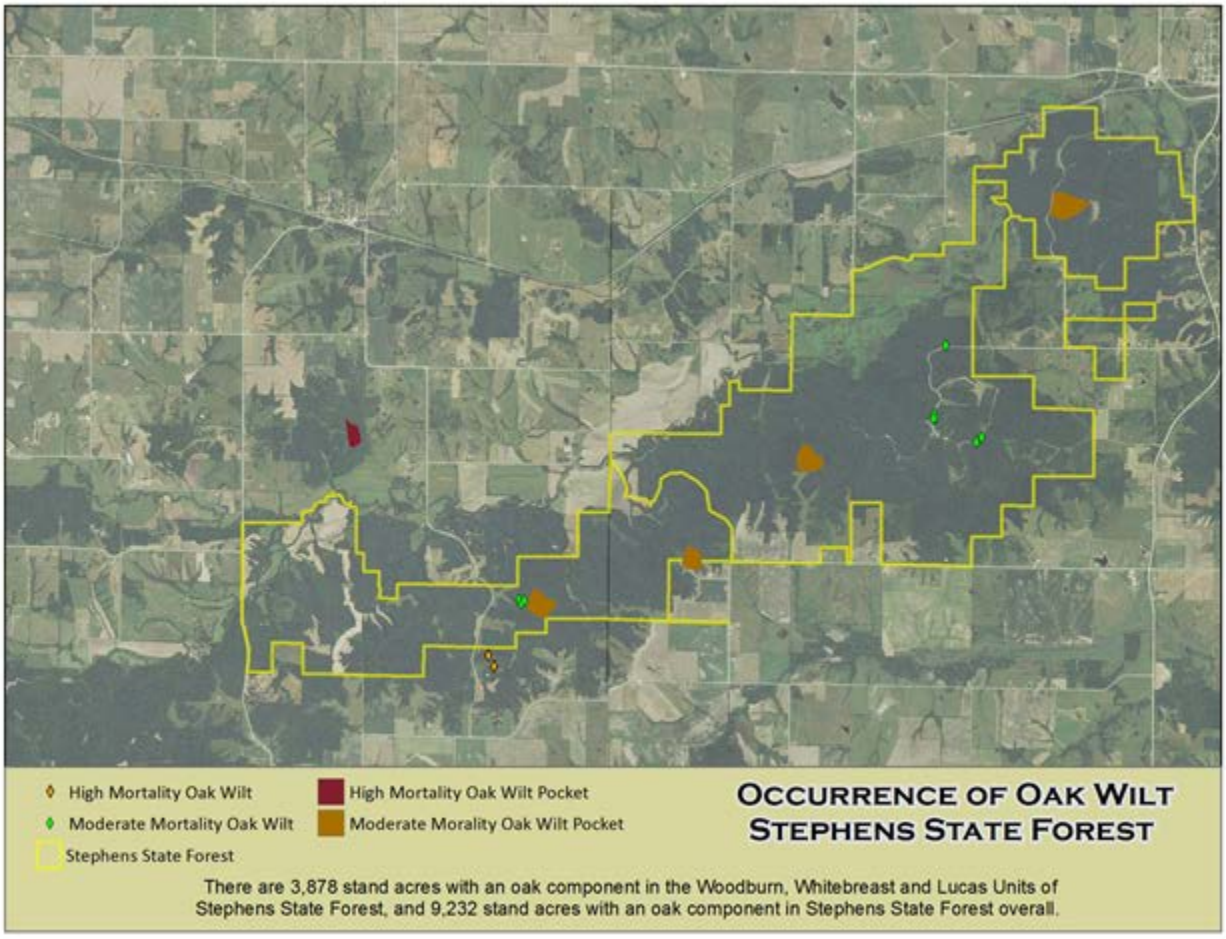


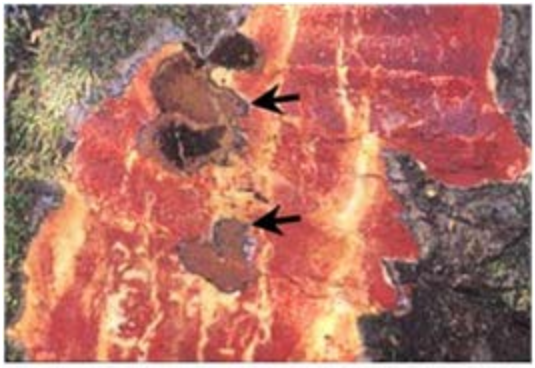
Figure 11. The map above details the occurrence of wilt as diagnosed by the DNR Lab at the Stephens State Forest during 2014. A variety of management plans including salvage cuts, trenching, and chemical girdling have been implemented in 2014. DNR will follow up in 2016 to determine the success of controlling oak wilt at the Stephens State Forest. Preliminary survey work indicates that the level of oak wilt occurrence is lower than in 2014 and now isolated into manageable pockets within the forest. (Image: Tivon Feeley, DNR 2014 Oak Wil Occurrence)

United States Forest Service Major Pests List: Sudden Oak Death

Year 2015
State: Iowa
Forest Pest
Common Name: Sudden Oak Death
Scientific Name: *Phytophthora ramorum*
Hosts: All Oaks
Setting: Rural Forests, Nursery, and Urban
Counties: Statewide
Survey Methods: Water Testing and Soil Testing
Acres Affected: N/A
Narrative: Iowa received notice of several "trace forward" of suspected sudden oak death in 2015, meaning that potentially infected plant material had been shipped to Iowa. The areas included Ames, Ankeny, Burlington, Coralville, Davenport, Dubuque, Kalona, Waterloo, and West Des Moines areas. PPQ conducted plant testing that was all negative. Stream baiting, to test for sudden oak death was not conducted in 2015 and is not planned for 2016. The plant testing and early detection results indicate that there is no threat at this time.

If a landowner suspects that they sudden oak death, please contact Tivon Feeley (DNR Forest Health Program Leader) at 515-725-8453 or Robin Pruisner (State Entomologist) at 515-725-1465.

Ooze bleeds from a canker on an infected oak.



Black zone lines are found under diseased bark in oak.

Figure 12. Two examples of the oozing canker found on an infected tree. The black lines under the bark are also symptomatic of sudden oak death. (Images: Joseph O'Brien, USDA Forest Service Pest Alert, and Bugwood.org)

United States Forest Service Major Pests List: Thousand Cankers Disease

Year 2015
State: Iowa
Forest Pest
Common Name: Thousand Cankers Disease
Scientific Name: *Pityophthorus juglandis and Geosmithia morbida*
Hosts: Walnut
Setting: Rural Forests, Nursery, and Urban
Counties: Statewide
Survey Methods: Ground, General Observation, and Culturing
Acres Affected: None
Narrative: A total of 1,126 walnut trees were selected for the 2015 walnut twig beetle survey. A Lindgren four funnel dry trap with the walnut twig beetle pheromone developed by Contech was placed in a declining walnut tree for the survey.

The traps were left on the trees for three weeks before being moved to another tree during the months of May, June, July, August, and part of September. The following beetle species were collected during the survey: *Xyleborus atratus, Ambrosiodmus tachygraphus, Hylocurus rudis, Xylosandrus germanus, Xyleborinus saxeseni, Xyloterinus politus, Xylosandrus crassiusculus, Pityophthorus lautus, Pityophthorus crinalis,* and *Pityophthorus consimilis*. Two undescribed subspecies of *Pityophthorus lautus* were collected this year. There were a total of 7,577 ambrosia beetles, *Pityophthorus* beetles, and weevils that were collected. There were numerous other beetles, not of concern, collected (i.e. Japanese beetle, June bugs…) but not counted as part of the survey.

The highest beetle captures occurred during the months of May and June. The captures decreased after those months despite the lack of drought conditions. Further trapping in 2015 will help determine the trapping trends in Iowa. No walnut twig beetles were identified. In addition to *Pityophthorus juglandis,* a weevil *Stenomimus pallidus* has now been associated with Thousand Cankers Disease. It is not known if this weevil occurred in any of the traps during 2015. If a landowner has walnut trees that they believe have thousand cankers disease, please contact the ISU Plant Diagnostic Clinic at 515-294-0581.

(Images: starting far left and clockwise: Bruce Blair, DNR; Whitney Cranshaw, Colorado State University, Bugwood.org. and Steven Valley, Oregon Department of Agriculture, Bugwood.org.)

Thousand Cankers Disease Background

Since the 1990's, black walnut has been dying in Western U.S. The deaths are caused by a walnut twig beetle (*Pityophthorus juglandis*) that carries a fungus (*Geosmithia morbida*) which is spread as the beetle tunnels through tree tissues. The insect disease complex had been named thousand cankers disease (TCD).

The introduction of TCD into Iowa would have disastrous effects economically to the wood industry in the state and the rest of the nation. Iowa has the third largest volume (979 million board feet) of saw log size black walnut in the world.

Economic Impacts

The estimated total impact of TCD to Iowa's forest landowner and wood products businesses is more than **$547 million** or an annualized loss of **$43 million** in perpetuity for Iowa's economy. Other economic losses would include non-timber products like nut production, reduced wildlife habitat and a **$1.3 billion** loss of community tree derived be fits such as energy savings, property value, storm water retention, carbon sequestration and tree removal and replacement costs. Communities and homeowners will bear the cost burden of removing dead trees caused by TCD.

Wildlife Impacts

Black walnut has moderate importance to wildlife as a food source. Seeds are eaten by woodpeckers, foxes, and squirrels.

Management Solution

Proper woodland and community tree management have a critical role in maintaining healthy trees. The best insurance policy a landowner can have when managing their woodlands is preventing introduction of the pests and good silviculture practices. The best course of action for communities is to have a tree inventory and a community tree resource plan that manages healthy trees and has sanitation practices after removing dead and dying walnuts. More information on prevention can be found here.

Figure 13. One of the Lindgen funnel traps that were used in conjunction with the walnut twig beetle pheromone. The traps were placed at sawmills, communities, and campgrounds. (Image: Shane Donegan, DNR)

Figure 14. A look inside the Lindgren Funnel trap capture chamber. The picture shows two pheromone pouches and a 3 inch long strip of dog collar that was used to kill the beetles that entered the capture chamber. (Image: Shane Donegan, DNR)

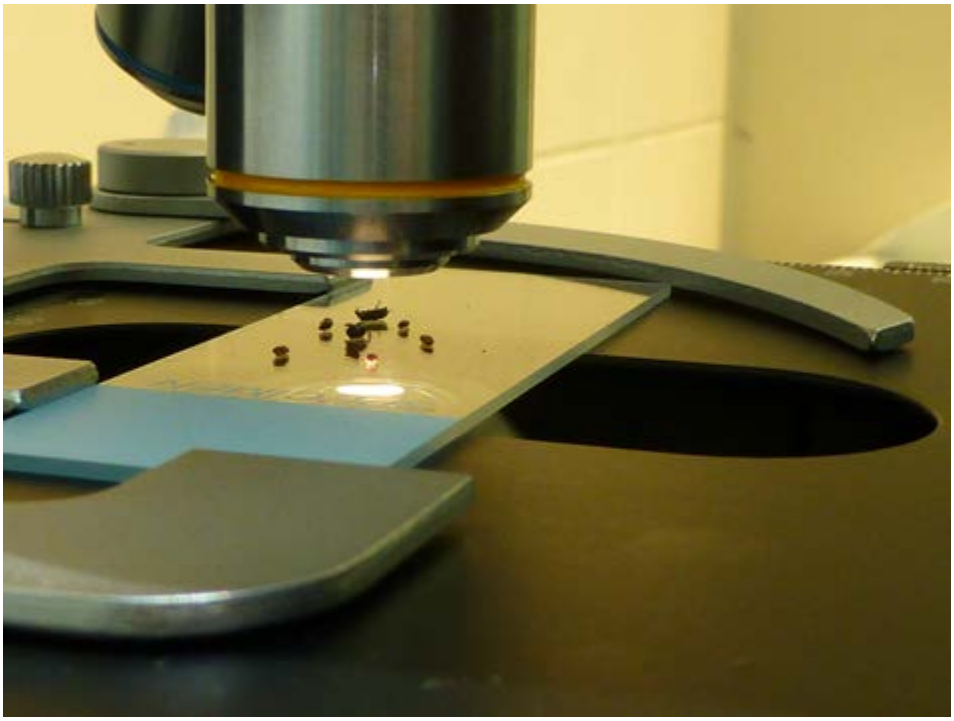


Figure 15. Microscopes were used to help identify the beetle captured. The walnut twig beetle is about 1/4 of an inch long. (Image: Shane Donegan, DNR)

Figure 16. Pictured above is a *Pityopthorus* sp. (not *P. juglandis*) that was captured and sent in for identification. (Image: Shane Donegan, DNR)

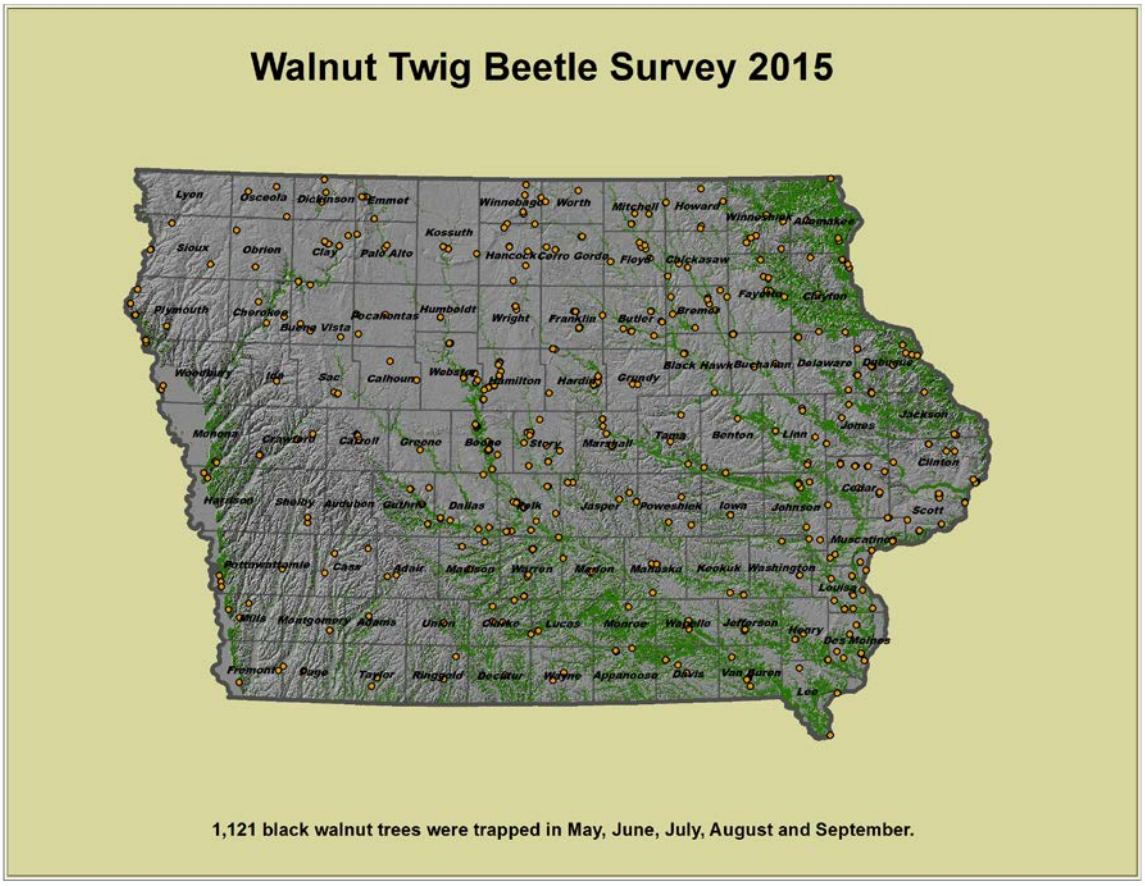


Figure 17. The locations of the 1,121 survey traps for walnut twig beetle throughout the state. (Image: Tivon Feeley, DNR)

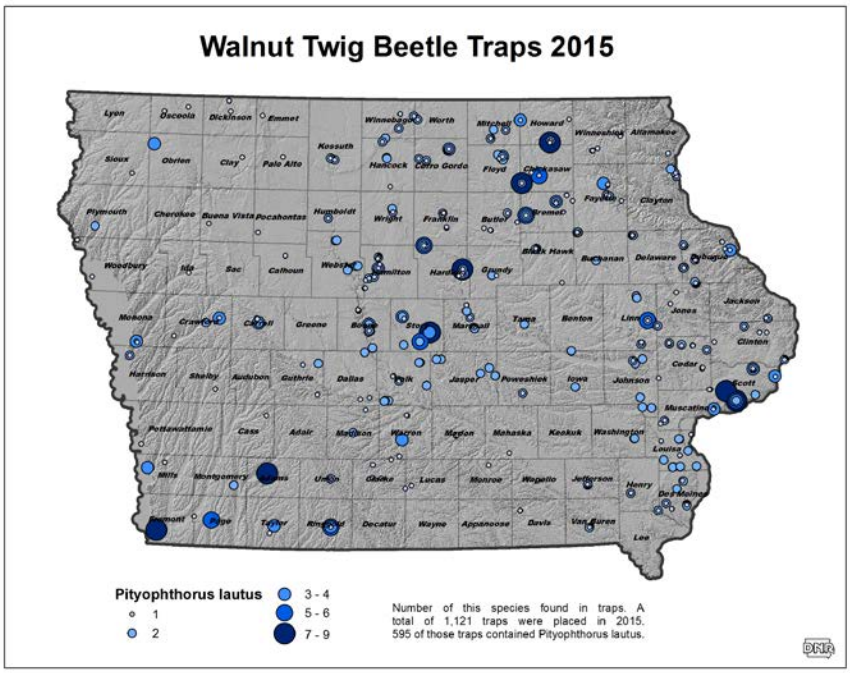


Figure 18. Pictured above is the locations where *Pityopthorus lautus* (not *P. juglandis*) was captured, showing the success of the funnel traps. (Image: Tivon Feeley, DNR)

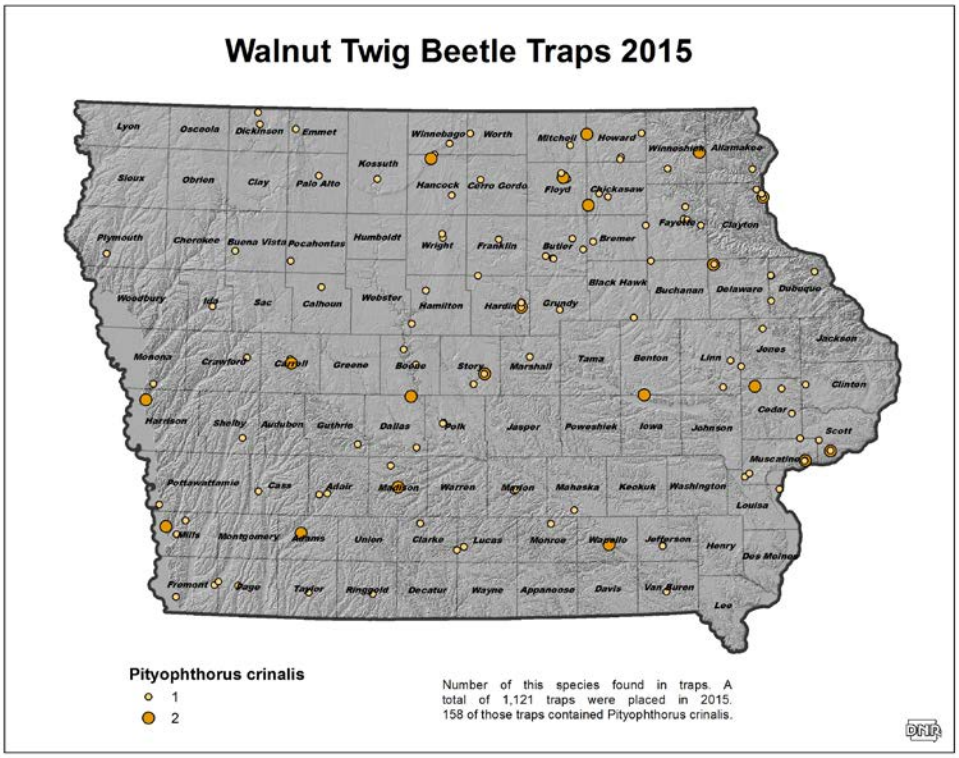


Figure 19. Pictured above is the locations where *Pityopthorus crinalis* (not *P. juglandis*) was captured, showing the success of the funnel traps. (Image: Tivon Feeley, DNR)

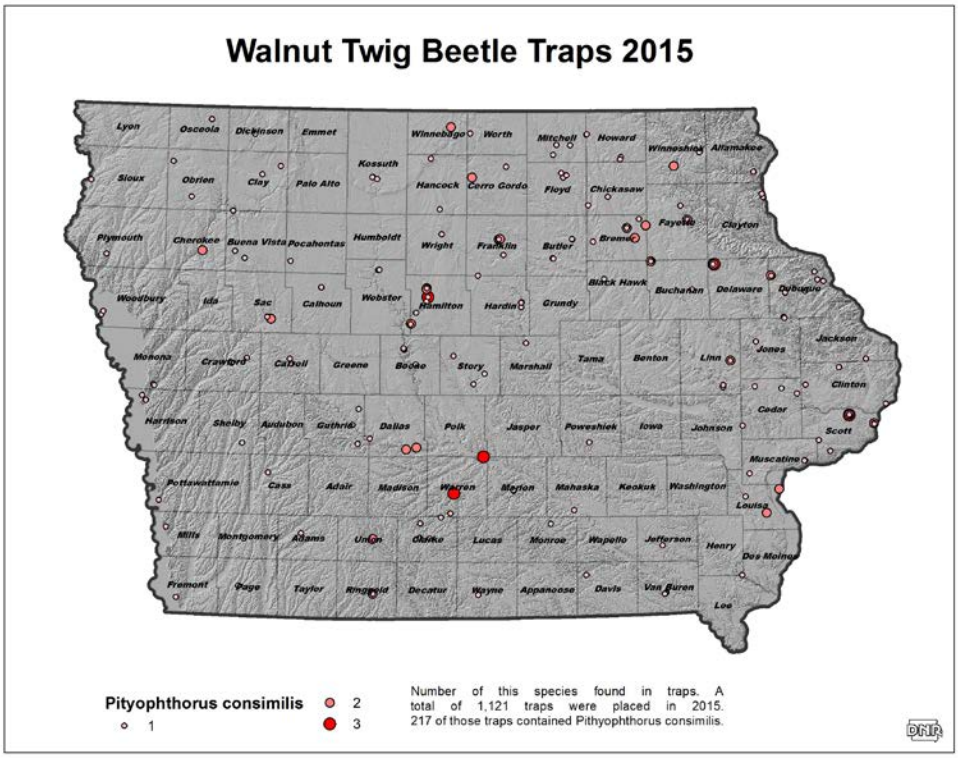


Figure 20. Pictured above is the locations where *Pityopthorus consimilis* (not *P. juglandis*) s captured, showing the success of the funnel traps. (Image: Tivon Feeley, DNR)

United States Forest Service Major Pests List: Blister Rust

Year 2015
State: Iowa
Forest Pest
Common Name: White Pine Blister Rust
Scientific Name: *Cronartium ribicola*
Hosts: White Pine
Setting: N/A
Counties: N/A
Survey Methods: N/A
Acres Affected: Unknown
Narrative: White pine blister rust has been identified in Iowa, and is a pest that can occur throughout the native white pine range in Iowa. No additional funds were available to conduct survey work. No suspect samples were submitted to DNR or the ISU Plant Diagnostic Clinic. No other survey work was conducted for white pine blister rust. If a landowner suspects white pine blister rust they should contact the ISU Plant Diagnostic Clinic at 515-294-0581.

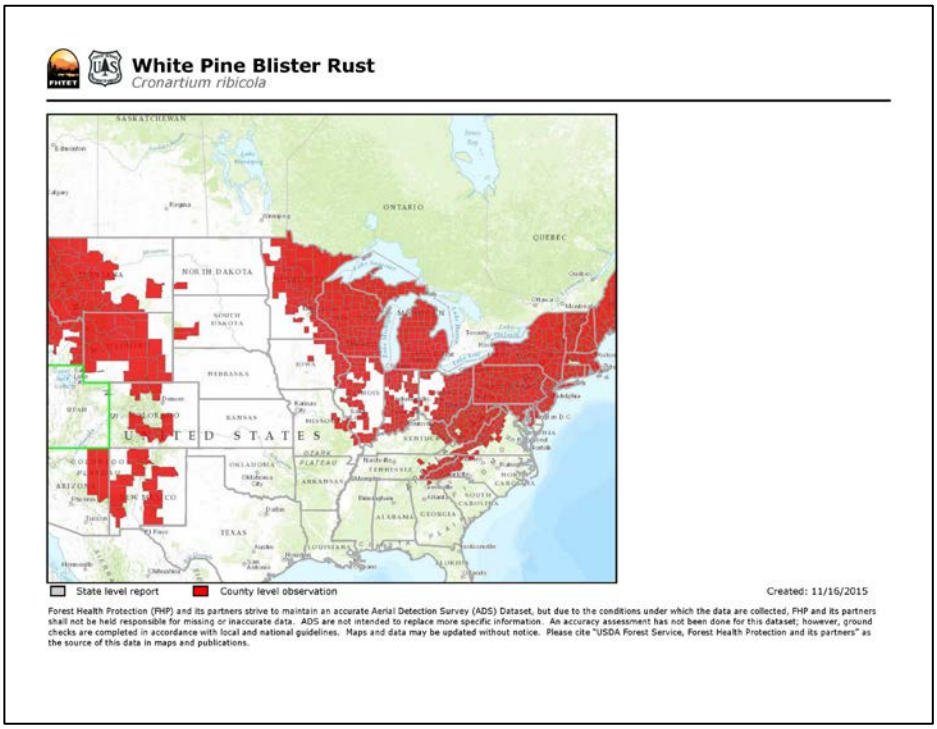


Figure 21. The range map for known areas of white pine blister rust (Map: USFS FHTET)

Figure 22. Rust spores on an infected tree. (Image: Brian Geils, USDA Forest Service, Bugwood.org)

Additional Pest Surveyed:
Pine Shoot Beetle

Year 2015
State: Iowa
Forest Pest
Common Name: Pine Shoot Beetle
Scientific Name: *Tomicus piniperda*
Hosts: All Pines
Setting: Rural Forests, Nursery, and Urban
Counties: Statewide
Survey Methods: N/A
Acres Affected: Unknown
Narrative: Pine Shoot Beetle was identified September 18, 2006 and all counties in Iowa were quarantined for pine shoot beetle. Since the entire state is quarantined, no further monitoring has been needed. If a landowner needs assistance with management options for the pine shoot beetle, please contact the ISU Plant Diagnostic Clinic at 515-294-0581.

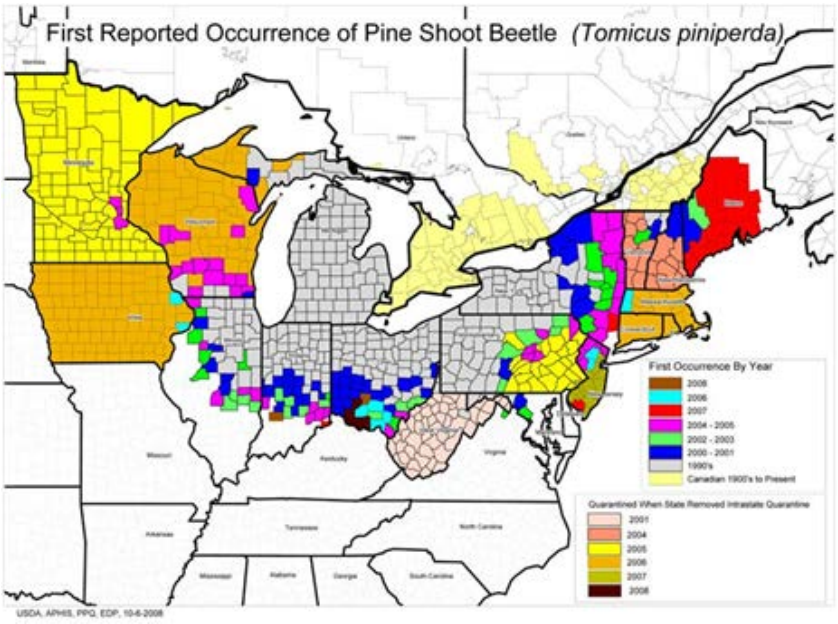


Figure 23. The map above shows the quarantined areas for pine shoot beetle. (Image: by USDA-APHIS-PPQ)

Pine Shoot Beetle Background

The pine shoot beetle (*Tomicus piniperda* L.) is an introduced pest that attacks pines. It was first discovered in the US at a Christmas tree farm near Cleveland, Ohio, in July 1992. A native of Europe, the beetle attacks new shoots of pine trees, stunting the growth of the trees. The pine shoot beetle may also attack stressed pine trees by breeding under the bark at the base of the trees. The beetles can cause severe decline in the health of the trees, and in some cases, kill the trees when high populations of the beetle exist.

In May, 2006, USDA-APHIS-PPQ confirmed the presence of pine shoot beetle (PSB) in Dubuque and Scott counties. A Federal Order was issued effective June 22, 2006 placing Dubuque and Scott counties under a Federal quarantine for interstate movement of PSB regulated articles. Iowa Department of Agriculture and Land Stewardship (IDALS) was provided a copy of the Federal Order as well as additional information concerning the pine shoot beetle, and was requested to consider placing a state PSB quarantine for intrastate movement of PSB regulated articles from Dubuque and Scott Counties. However, after considerable review, IDALS declined to implement an intra-state quarantine for PSB. Therefore, a Federal Order was issued effective September 18, 2006 for quarantine of the entire state of Iowa for PSB, *Tomicus* piniperda.

The quarantine affects the following pine products, called “regulated articles”:

- Pine nursery stock
- Pine Christmas trees
- Wreaths and garlands
- Pine logs/lumber (with bark attached)

All pine nursery stock shipped from Iowa to a non-regulated state must be inspected and certified free from PSB. This inspection and certification must occur just before shipping. Small pine seedlings (less than 36 inches tall, and 1 inch in diameter) and greenhouse grown pines require a general inspection of the whole shipment. All other (larger) pine nursery stock shipments must have 100% tip-by-tip inspection.

Figure 24. The picture above shows the pine shoot beetle and the damage it causes to branches. (Images: Steve Passoa, USDA APHIS PPQ, Bugwood.org)

Additional Pest Surveyed:
Dutch Elm Disease

Year 2015
State: Iowa
Forest Pest
Common Name: Dutch Elm Disease
Scientific Name: *Ophiostoma ulmi or Ophiostoma novo-ulmi*
Hosts: Elm
Setting: Rural Forests and Urban
Counties: Statewide
Survey Methods: Ground, General Observation, and Culturing
Acres Affected: All native elm
Narrative: Dutch elm disease was introduced to North America in the 1930's and began killing millions of native elm trees. Dutch elm disease has been identified in all of Iowa's counties, and it's estimated that just over 95 percent of the urban elm trees have succumbed to this disease.

The fungus is native to Asia and was introduced to Europe shortly after World War I. From Europe, it traveled to North America in the 1930's in crates made from infected elm logs. The disease quickly infected elms across the United States since our native elms did not have natural resistance to the introduced pathogen.

Dutch elm disease was reported statewide in 2015. The 2015 season appeared to have a high occurrence of Dutch elm disease.

Figure 25. Areas were Dutch elm disease is generally known to occur within the continental United States. (Image: Tivon Feeley, DNR)

Additional Pest Surveyed:
Hickory Mortality

Year 2015
State: Iowa
Forest Pest
Common Name: Hickory Mortality
Scientific Name: *Fusarium solani* and *Ceratocystis smalleyi*
Hosts: Bitternut Hickory and Occasionally Shagbark Hickory
Setting: Rural Forests and Urban
Counties: Statewide
Survey Methods: General Observation
Acres Affected: Approximately 900 acres
Narrative: Hickories have continued to decline statewide. Mortality has become fairly common within the range of bitternut hickory making it difficult to track and estimate the acres impacted. If a landowner suspects hickory mortality, they should contact the ISU Plant Diagnostic Clinic at 515-294-0581.

Figure 26. Hickory bark beetle attack. (Image: Dr. Jennifer Juzwik, USFS)

Figure 27. Associated cankers. (Image: Dr. Jennifer Juzwik, USFS)

Additional Pest Surveyed:
Invasive Plants

Exotic invasive species are plants that are non-native to an ecosystem and cause or are likely to cause economic or environmental harm to humans, crops, livestock, or natural plant and animal communities. The most common non-native species found in the FIA report as problematic in Iowa forests are multiflora rose, reed canarygrass, bush honeysuckle, garlic mustard, Japanese knotweed, autumn olive, common buckthorn, Japanese barberry, and oriental bittersweet (These are alarming forest health trends. (Miles, P.D. Wed Mar 25 20:46:53 MDT 2015. Forest Inventory DataMart web-application version 1.6.0.01. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Northern Research Station.)

. These invasive and exotic plants are out competing native forest species, diminishing fisheries and wildlife habitat, reducing water quality, reducing economic returns from forest management and tourism, and threaten long term forest sustainability and bio-diversity. In 2013 Oriental bittersweet, Japanese knotweed, garlic mustard, and Japanese hops were made illegal to distribute in the State of Iowa.

Known Invasive Plants in Iowa 2015

Key: NP= Not Present- Not known to exist in Iowa
I= Isolated- the species is infrequent, not commonly seen
LA= Locally Abundant- the species is present but is not in the majority of the counties
W= Widespread- commonly seen in the majority of counties in large or small populations

Species	Common Name	Abundance
Abutilon theophrasti	Velvetleaf	W
Ailanthus altissima	tree-of-heaven	W
Alliaria petiolate	garlic mustard	W
Berberis thunbergii	Japanese barberry	W
Bromus tectorum	cheatgrass	W
Butomus umbellatus	flowering rush	I
Carduus acanthoides	plumeless thistle	I
Carduus nutans	Musk thistle	W
Celastrus orbiculata	Oriental bittersweet	LA
Centaurea maculosa/beibersteinii	spotted knapweed	LA
Centaurea repens	Russian knapweed	I
Centaurea solstitialis	yellow starthistle	I
Cirsium arvense	Canada thistle	W
Cirsium spp.	thistle	W
Cirsium vulgare	bull thistle	W
Conium maculatum	poison hemlock	I
Coronilla varia	crown vetch	W
Daucus carota	Queen Anne's lace	W
Dipsacus fullonum/sylvestris	common teasel	I
Dipsacus laciniatus	cutleaf teasel	I
Dipsacus sativus	Indian teasel	NP
Elauagnus angustifolia	Russian olive	I
Elaeagnus umbellate	autumn olive	LA
Euonymus alatus	burning bush	LA
Euphorbia esula	leafy spurge	W

Species	Common Name	Abundance
Fallopia japonica	Japanese knotweed	LA
Frangula alnus/Rhamnus frangula	glossy buckthorn	I
Heracleum mantegazzianum	giant hogweed	NP
Hesperis matrionalis	dame's rocket	W
Humulusjaponicus	Japanese hop	LA
Lespedeza cuneata	Sericea lespedeza	I
Ligusturm japonicum	Japanese privet	NP
Ligustrum obtusifolium	blunt-leaved or border privet	I
Ligustrum sinense	Chinese privet	NP
Ligustrum vulgare	common or European privet	I
Lonicera fragrantissima	fragrant honeysuckle	NP
Lonicera japonica	Japanese honeysuckle	LA
Lonicera maackii	Amur honeysuckle	W
Lonicera standishii	Standish's honeysuckle	NP
Lonicera tatarica	Tatarian honeysuckle	W
Lonicera x *bella*	Bell's honeysuckle	I
Lonicera xylosteum	European fly honeysuckle	NP
Lythrum salicaria	purple loosestrife	W
Morus alba	white mulberry	W
Pastinaca sativa	wild parsnip	W
Potamogeton crispus	curlyleaf pondweed	I
Pueraria montana	kudzu	I
Rhamnus cathartica	common buckthorn	W
Rosa multiflora	multiflora rose	W
Tamarix spp.	salt cedar	I

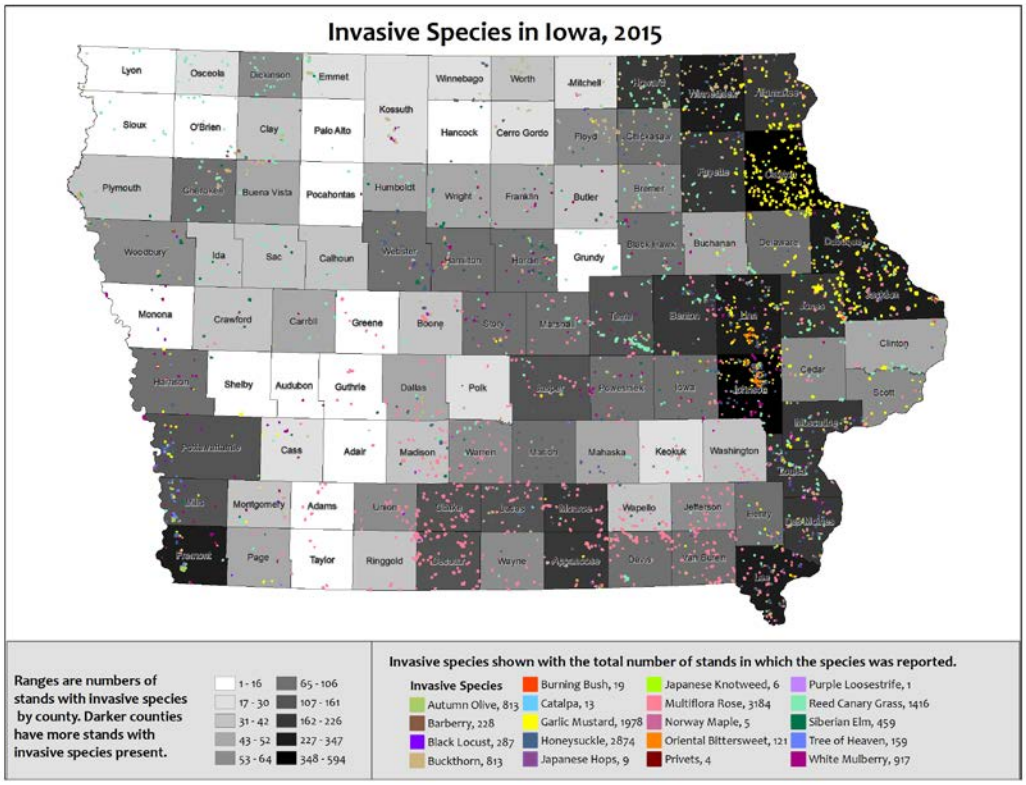


Figure 28. The map above details the locations of invasive species as identified by DNR District Foresters and the Forest Health Program Leader in 2015. Click here for a full sized map. (Image: Tivon Feeley, DNR)

State of Iowa

Executive Department

IN THE NAME AND BY THE AUTHORITY OF THE STATE OF IOWA

PROCLAMATION

WHEREAS, millions of dollars, both public and private, are spent each year for the control of invasive plants, insects, diseases, and animal species in Iowa's woodlands; and

WHEREAS, invasive species, such as emerald ash borer and oriental bittersweet, threaten Iowa's ecosystem by competing with and destroying native trees, and by disrupting the natural complex habitat system; and

WHEREAS, Iowa's woodlands, wildlands, and waterways draw hundreds of thousands of tourists and recreational users each year; and

WHEREAS, awareness of invasive species is an important first step towards behavior change, which can prevent the introduction and spread of invasive species; and

WHEREAS, Invasive Species Awareness Month is an opportunity for government to join forces with business, industry, conservation groups, recreation groups, community organizations, and citizens to take action against the introduction and spread of invasive species:

NOW, THEREFORE, I, Terry E. Branstad, Governor of the State of Iowa, do hereby proclaim the month of June, 2015 as

INVASIVE SPECIES AWARENESS MONTH

in Iowa.

IN TESTIMONY WHEREOF, I HAVE HEREUNTO SUBSCRIBED MY NAME AND CAUSED THE GREAT SEAL OF THE STATE OF IOWA TO BE AFFIXED. DONE AT DES MOINES THIS 18th DAY OF MAY IN THE YEAR OF OUR LORD TWO THOUSAND FIFTEEN.

Terry E. Branstad

TERRY E. BRANSTAD
GOVERNOR OF IOWA

ATTEST:

Paul D. Pate

PAUL D. PATE
SECRETARY OF STATE

Aerial Survey

Each year the DNR utilizes an airplane and a laptop or tablet with sketch mapping software on it to track forest health issues from above the tree canopy. A total of 627,888 acres of land were surveyed this year. The 2015 survey found silver maple and cottonwood trees throughout the state continued showing chlorotic (yellowing) leaves. It does not appear that this condition is solely drought related. Soil samples taken during 2015 determined this is not a nutrient deficiency problem. DNR will continue to monitor the chlorotic trees to see if there is a correlation with drought or other climate events.

Most counties along the route also showed signs of Dutch elm disease and the highest level of bur oak blight that DNR has mapped out. Scattered trees with lace bug damage were noticed throughout the state, with most of the tree damage occurring in Eastern Iowa. The aerial flights found the same levels of pine wilt and much lower levels of oak wilt than those that were noted in the 2014 aerial survey. The aerial flight continued to find large pockets of aspen declining in NE Iowa that has been the trend for the past three years. The cause of the aspen decline is unknown at this time. This is the second year that ash decline and mortality associated with EAB has been observed in the aerial surveys. This occurred only in areas where EAB was known to be established. Numerous conifers suffered severe winter desiccation, as detailed in the introduction. Overall, there were significantly higher forest health issues that were observed in the 2015 aerial survey. Bur oak blight, emerald ash borer, and storm damage were commonly seen impacting Iowa's landscape during this survey. A total of 43,563 acres of storm damage were mapped in 2015.

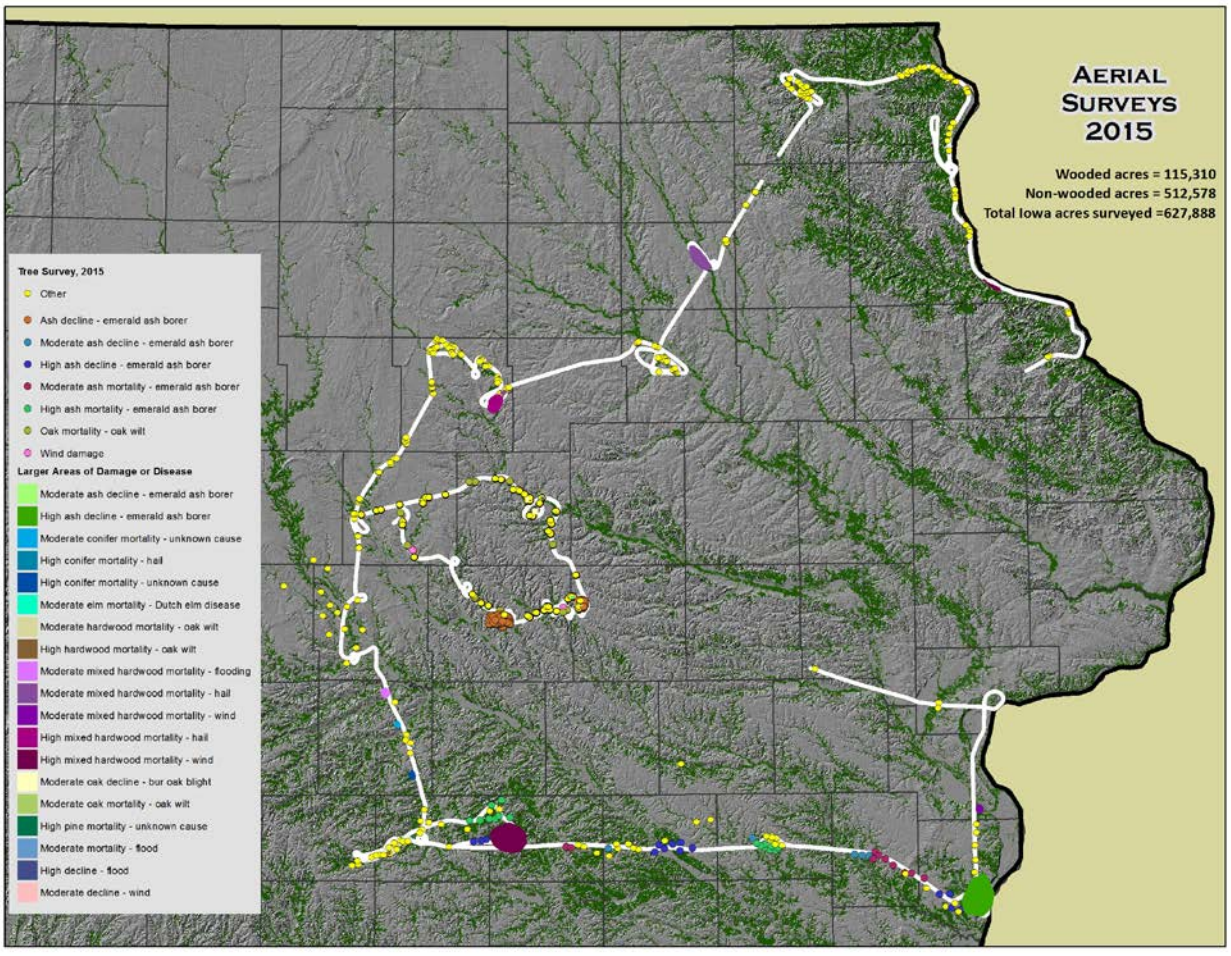


Figure 29. The map above shows the flight lines where the aerial mapping took place. (Image: Tivon Feeley, DNR)

Over the past several years, DNR has followed the impacts of the August 2009 hail storm on Pine Lake State Park and the town of Eldora, Iowa. The USFS has designed a series of useful tools to look at various biotic and abiotic pests causing changes in the forest landscape, the Forest Disturbance Monitor (FDM). FDM was designed and produced by the Forest Health Technology Enterprise Team (FHTET).

The aerial survey tool can be used to generate maps and display the disturbance from storms, fire, insects, diseases and more. The figure below details the changes that occurred in the forest landscape from 2009 to 2015. This tool can be used in both woodland and urban settings, and is free to the public to view and use.

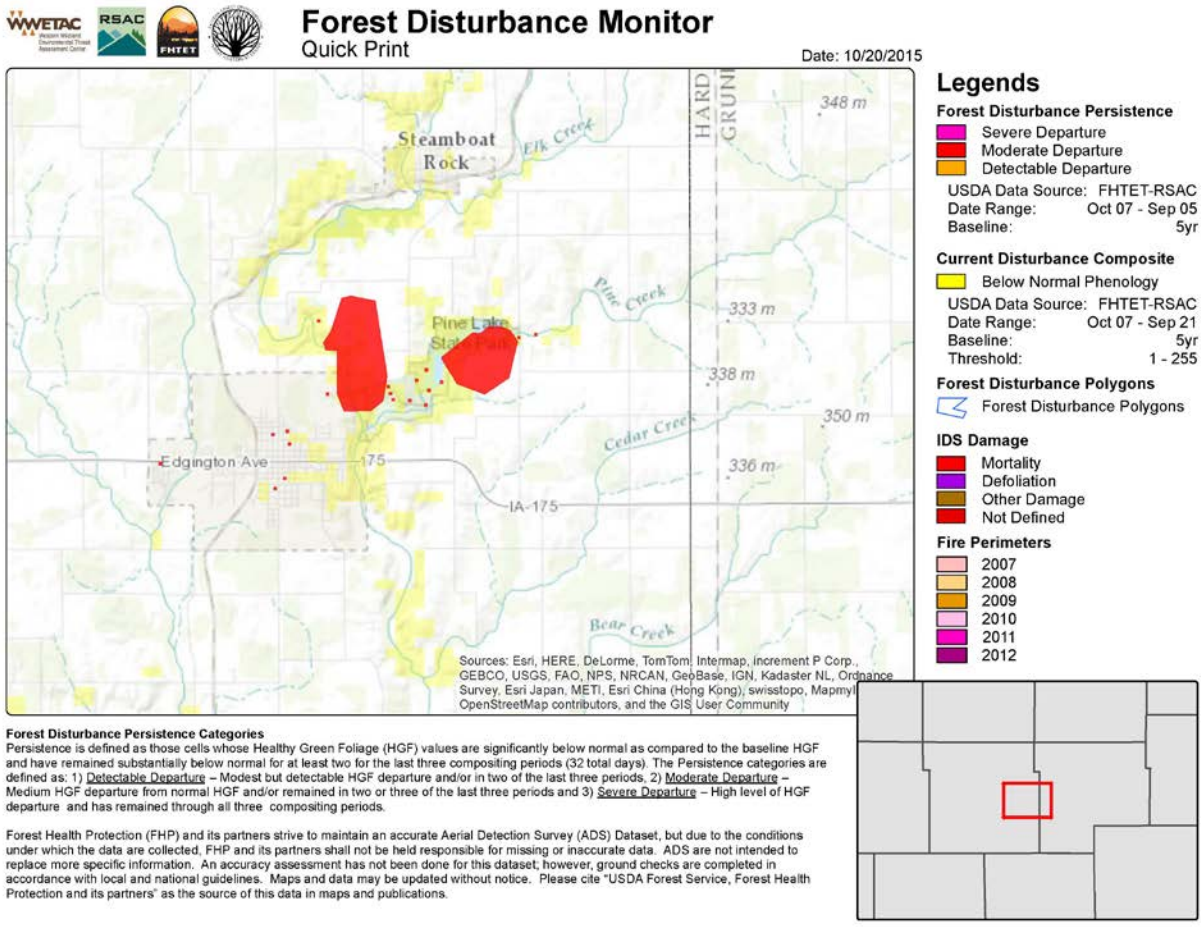


Figure 30. The map shows disturbances that took place to the forest type after the hail storm that is still detectable in 2015. (Image: USFS, FHTET)

Conclusion

Management plays an important role in creating a healthy Iowa forest. The best insurance a person can have when managing their woodlands is diversity of tree species with the appropriate number of trees per acre. These simple management strategies may help prevent excessive tree loss from a single pest and help maintain the trees' vigor, which may make them more resistant to potentially destructive insects and diseases. The best management plan for community forests is to not have more than 10% of any one species represented. Iowa forests play an important role by providing abundant forest products and amenities, including outdoor recreation opportunities, wildlife habitat, water quality, human health, and the economic benefits of a vast array of wood and wood fiber products.

Iowa's forests are facing an unprecedented level of invasive pests, chemical damage, wildlife pressure, and improper management. Emerald ash borer, gypsy moth, bur oak blight, and thousand cankers disease on walnut could have a 91.6 billion dollar impact on Iowa's woodlands and community trees. No longer will passive management allow for woodlands to be "preserved" in the condition that they are in today. Learning about your woodlands and how each component affects another will make it easier for Iowa's woodlands to be managed for long term health. If you need technical assistance with your woodlands contact your district forester for assistance.

The Bureau of Forestry, through cooperation with other agencies, has programs in place to monitor forest stressors which have potential to move into Iowa and damage our forests. Those programs operated vigorously during 2015, and plans are in place for a similar continued vigorous forest health program operation in 2015. Those programs existed in part from funding received by USFS grants and the State of Iowa Woodland Health Appropriation.

However, budget constraints limit the amount of work for important matters such as: oak tatters, aspen decline, additional oak wilt pockets, and the much needed additional community assistance in managing new emerald ash borer infestations. Additional funds are needed for these important forest health issues to be addressed in 2015.

DNR would like to thank its collaborators from USDA-Forest Service, USDA-APHIS-PPQ, Iowa State University Extension, Iowa Department of Agriculture and Land Stewardship, and Department of Natural Resources Foresters.

"There are those who say that trees shade the garden too much, and interfere with the growth of the vegetables. There may be something in this: but when I go down the potato rows, the rays of the sun glancing upon my shining blade, the sweat pouring down my face, I should be grateful for shade."
-Charles Dudley Warner

Useful Phone Numbers and Websites

DNR Forestry Bureau has an updated forest health page.

DNR maintains an emerald ash borer resource page.

Iowa Department of Agriculture and Land Stewardship Tree Health Page.

Iowa State University's Pest Management and the Environment page host information on emerald ash borer, gypsy moth, and much more.

The Iowa State University Plant Disease Clinic has been assisting Iowa for nearly 50 years and is still available to answer plant disease questions. From flowers to trees they are ready to help. Contact them at 515-294-0581 or check them out here.

For the creepy and crawling things on your plants, don't forget to contact Iowa State University Extension Entomology. They can help you identify the insect and discover the best control measures. Contact them 515-294-1101.

Check out the DNR landowner assistance web page.

Be sure to look at the updated Iowa DNR website.

Additional web resources for learning about invasive species are:

- Center for Invasive Plant Management- Invasive Plant Management on-line textbook
- National Invasive Species Information Center
- USDA-APHIS website for invasive species
- Forest Service website
- Natural Resource Conservation Service website
- Woodland invasive species in Iowa brochure produced by Iowa State University

DNR Forest Health Program Leader Contact Information

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