



## Potential Economic Loss Associated with Bur Oak Blight Disease on Bur Oak in Iowa

### Background

Bur oak (*Quercus macrocarpa*) is common across Iowa. In 2011, bur oak ranked second among all tree species as measured in volume of sawtimber 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.

Recent observations by Iowa Department of Natural Resources (IDNR) foresters and investigations by Iowa State University (ISU) have identified a serious threat to bur oak. Bur oak blight (BOB; *Tubakia iowensis*) is a disease that shows symptoms of v-shaped brown discoloration of leaves and browning of veins (see picture to the right). Unlike other European and Asian *Tubakia spp.* that are endophytes, causing minor leaf spotting, BOB can cause severe defoliation that can lead to mortality of branches or entire trees.

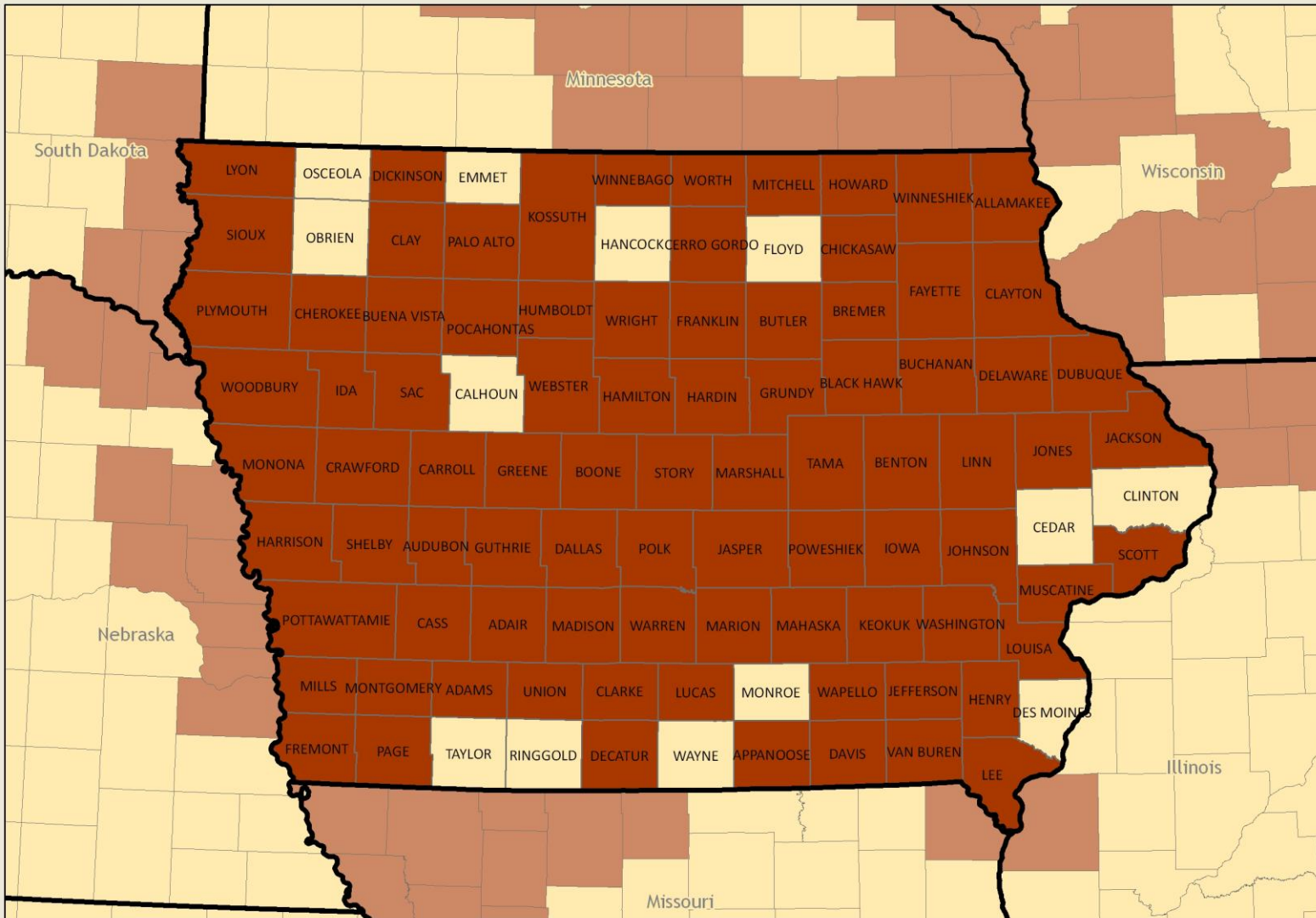


Bur oak leaf infected with BOB

Bur oak blight is caused by an undescribed species of *Tubakia*. Thus far, the disease is known from eastern Nebraska to southern Minnesota and southwestern Wisconsin, and it appears to be spread across all of Iowa. It is not clear if the fungus is new to this region or if a shift in climate (more early-season rain events) have made this disease more noticeable over the last two decades.

Bur oak trees infected with BOB tend to retain the infected leaves overwinter and not drop the leaves in the fall like a healthy bur oak would do. These infected leaves overwinter on the tree and act as a source of inoculum for the healthy leaves that emerge in the spring and grow against the infected leaves from the previous year. The succulent emerging leaves become infected with BOB and the symptoms progress slowly until the leaves start browning in late summer.

Based on reports of bur oak blight to the Iowa State Plant Insect and Disease Clinic in 2012, 86 counties in Iowa reported the presence of the disease. Within these counties there are approximately 29 million (90%) bur oaks out of Iowa's over 32 million bur oak trees growing. The map on the following page shows the distribution of bur oak blight in relation to the existing forest resource. ISU and the IDNR are working with their U.S. Forest Service counterparts to keep a watchful eye on Iowa's valuable bur oak resource.



# BUR OAK BLIGHT 2012

Other Midwest States    Iowa

Not Found	Not Found
Found	Found

Data on counties where *Tubakia iowensis* has been confirmed in midwestern states was taken from the September 2012 ISU distribution map. The map was included at <http://www.public.iastate.edu/~tcharrin/BOB.html>.

## **Control**

Recent trials using macro injections of the fungicide Alamo™ appear to have assisted trees with their ability to recover from bur oak blight. The Alamo™ injections did have some phototoxic effects to bur oak trees requiring very careful measurements of the pesticide. In each injected tree, a Certified Arborist familiar with the fungicide did the work to limit the leaf burning as a result of the phototoxicity of the fungicide.

The trees appeared to be symptomless for the first two seasons after being injected. However, it is very likely that subsequent injections would be required when bur oak blight starts to defoliate the tree again. As always, it is important to have bur oak blight diagnosed by the ISU identifiers before injecting the trees again. This control has an average cost of \$15 per inch of diameter of the tree trunk. Given the treatment method, and cost associated with it, the injection would only be suggested for high value street or yard bur oak trees. No feasible treatments have been identified for control in forest settings.

## **Management Solution**

Proper woodland and community tree management have a critical role in creating healthy trees. The best insurance a landowner can have when managing their woodlands is to maintain a diversity of tree species; while ensuring an appropriate number of trees are growing on each acre. The best management plan for communities is to create diversity by not having more than 10% of any one species represented. These simple management plans provide the best defense against emerging forest health threats.

## **Wildlife Impacts**

A 2001 National Fish and Wildlife Service survey discovered that 73% of bird watchers visit woodland areas to see some of their favorite birds. In fact, participation in bird watching is 12% higher in Iowa than the national average and ranks 5<sup>th</sup> among all states in participation rate by state.<sup>1</sup>

Acorns produced by bur oaks are eaten by many species of birds and mammals including deer, squirrels, mice, rabbits, foxes, raccoons, grackles, turkey, grouse, quail, blue jays, woodpeckers, and water-fowl.<sup>2</sup> The populations and health of wildlife often rise and fall with the availability of acorns in a forest. 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% of a deer's yearly diet. It has been estimated that in order to fulfill the needs of forest wildlife, 20 mast producing trees are necessary per acre. The number of trees per acre to produce an adequate supply of acorns

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<sup>1</sup> Pullis La Roche, Genevieve. *Birding in the United States: A Demographic and Economic Analysis*. Publication. Washington, D.C.: U.S. Fish and Wildlife Service, 2003. Print.

<sup>2</sup> <[www.fnr.purdue.edu/inwood/past%20issues/HowtoManageOakForestsforAcornProduction.htm](http://www.fnr.purdue.edu/inwood/past%20issues/HowtoManageOakForestsforAcornProduction.htm)>. December 13, 2012.

for forest wildlife will depend on the population of forest wildlife, weather, the size, age and health of those mast producing trees.<sup>3</sup>

In addition to being a source of food, bur oaks are currently a significant part of the largest forest type in Iowa. There are approximately 150,000 wild turkey and 400,000 deer that depend on forests for cover and search out oaks for mast before winter. If bur oak suffers the same fate from bur oak blight that elm suffered from Dutch elm disease, there will be a lot less suitable habitat for birds, wild turkey and deer. 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.

### Economic Impacts

Using existing data from Forest Inventory and Analysis plots, Timber Products Output surveys, Timber Price Trend reports and the most recent street tree inventories, we can estimate the potential economic cost of BOB in Iowa.

We can estimate the economic impact of bur oak blight to the wood products industry in Iowa based on current harvesting rates. For simplicity of analysis, we know that at some point there is going to be a decline in available bur oak for the wood products industry to utilize as a resource. We do not know how fast trees infected with this disease will deteriorate or how quickly the trees will be harvested to salvage their timber value. We do know that at some time in the future, the amount of bur oak that is harvested is going to decline. The next table shows the economic impact harvesting bur oak has annually at current harvesting rates and prices to forest landowners. The indirect rate shows the economic relationship that having a wood products industry has on other parts of the economy.

### Annual Statewide Wood Products Loss

Annual Volume Harvested (bdft)	992,457 <sup>4</sup>	Sawlogs
Estimated Economic value to Landowners	\$297,737	Assuming \$0.3/ bdft income
Estimated Economic Value to Sawmills	\$297,737	Assuming \$0.3/ bdft income
Estimated Economic Value to Manufacturers	\$297,737	Assuming \$0.3/ bdft income
Indirect Economic Impact	\$196,506	1.223 based on IMPLAN 2012
<b>Total Economic Impact</b>	<b>\$1,089,717</b>	

<sup>3</sup><<http://mdc.mo.gov/landwater-care/animal-management/deer-management/planning-ahead-wildlife-survival-white-tailed-deer->>.  
December 13, 2012.

<sup>4</sup>Miles, P.D. Forest Inventory EVALIDator web-application version4.01 beta. St.Paul, MN:U.S. Department of Agriculture, Forest Service, Northern Research Station. December 13, 2012 <http://fiatools.fs.fed.us/Evalidator4/tmattribute.jsp>

Based on 2011 estimates, Iowa had 1.1 billion board feet of merchantable size bur oak growing within 3 million acres of forest. The potential loss of income of this readily available resource to Iowa forest landowners is summarized in the table on the following page. This is the estimated timber value of the bur oak resource that exists today in Iowa's forests.

### Statewide Landowner Value

Total Merchantable Volume (bdft)	1,100,000,000 <sup>5</sup>	Sawlogs
Estimated Existing Economic value to Landowners	<b>\$330,000,000</b>	Assuming \$0.3/ bdft income

Tree canopy for Iowa communities averages 12%.<sup>6</sup> Losses from affected urban trees include the cost of removing the tree, its "landscape value" and the cost of replacing that tree. Landscape value is a catch-all term that includes everything from a tree's aesthetic value to its impact on property values, pollution removed from the environment and utility costs. Losses from affected urban trees are not annual, but rather a one-time phenomena, although spread out over many years. These numbers assume residential trees on private property represent the same percentages for bur oak as is being documented during street tree inventories. Community street tree inventories do not take into account bur oak occurring in city parks and other urban areas or on private residential areas. Communities and homeowners will bear the cost burden of removing dead trees caused by bur oak blight.

### Statewide Urban Tree Loss

Number of Bur Oak Trees <sup>7</sup>	702,000	Based on 26 million urban trees <sup>8</sup>
Removal Costs <sup>9</sup>	\$351,000,000	\$500/ tree
Replacement Costs	\$105,300,000	\$150/ tree
Landscape Value <sup>10</sup>	\$157,248,000	\$224/ tree annually
<b>Total Economic Impact</b>	<b>\$613,548,000</b>	

To determine the total economic impact to the wood products industry, annual industry losses are calculated in the table below using existing harvesting rates. Little is known about the how

<sup>5</sup> Miles, P.D. Forest Inventory EVALIDator web-application version 4.01 beta. St.Paul, MN:U.S. Department of Agriculture, Forest Service, Northern Research Station. December 13, 2012 [http://fiatools.fs.fed.us/Evalicator\\_4/tmattribute.js](http://fiatools.fs.fed.us/Evalicator_4/tmattribute.js)

<sup>6</sup> Nowak, David J.; Greenfield, Eric J. 2010. Urban and community forests of the North Central West region: Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota. Gen. Tech. Rep. NRS-56. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 70 p.

<sup>7</sup> Iowa community Forestry Tree Inventories, 23 communities, average number of street trees.

<sup>8</sup> Nowak, David J.

<sup>9</sup> Average removal and stump grinding costs, communication with Iowa arboriculture industry.

<sup>10</sup> Estimated using i-Tree STRATUM Analysis

fast bur oak blight will cause its host to die. There are not any known viable treatments to help trees in forested areas at this time. Assuming this disease takes 20 years to infect every bur oak tree in Iowa, we can estimate losses by determining the net present value (NPV) of each year's impact. NPV translates future dollars into today's dollars, using a discount rate. One way of thinking about NPV is to imagine paying for future losses by putting some money in the bank today. For example, putting \$100 in the bank today at a 4% interest rate could pay for \$104 in damages next year.

**Net Present Value Calculation of Loss of Bur Oak over the next 20 years in Woodlands; assuming 4% discount rate and indirect impact rate of 22%.**

Year	Wood Products Industry (Future Dollars)	Present Value (2011 Dollars)
2011	\$ 54,486	\$ 52,389
2012	\$ 108,972	\$ 100,752
2013	\$ 163,458	\$ 145,314
.....	.....	.....
2028	\$ 1,035,231	\$ 491,364
2029	\$ 1,089,717	\$ 497,334
Total (during spread)		\$ 6,819,183
Years 2030 on (Total)	\$ 1,089,717	\$ 12,433,323
<b>Total Present Value of the loss</b>		<b>\$ 19,252,506</b>
Discount Rate		4%
<b>Total Annualized Value of the Loss</b>		<b>\$ 770,100</b>

**Conclusion**

Under these assumptions, the total impact of Bur Oak Blight to Iowa's wood products businesses is over **\$19 million** or an annualized loss of approximately **\$770,000** in 2011 dollars for now into perpetuity for Iowa's economy. The result changes with the discount rate (for example, the total present value of losses go up if the discount rate goes down to the current Federal Funds rate target of 0.25%). Additionally, other economic losses would include non-timber products like nut production, reduced wildlife habitat and over a **\$600 million** loss of

services from community trees. If Iowa can slow the spread, or find a solution to stop the spread of Bur Oak Blight – losses to homeowners, wildlife, forest landowners and the wood products industry can be mitigated.

Dr. Thomas Harrington at Iowa State University is looking for leaf samples of bur oak blight from across Iowa and in neighboring states. Late season (August and September) appearance of necrosis (browning) of the main veins of leaves is the best symptom. Anthracnose may also result in veinal necrosis of bur oak leaves, but anthracnose begins much earlier in the season. Substantial leaf mortality is evident with BOB, and symptoms are usually more severe on the bottom half of the affected tree crowns. No other oak species are affected.

If you have potential BOB material, please contact Dr. Thomas Harrington at [tcharrin@iastate.edu](mailto:tcharrin@iastate.edu) or 515-294-0582 for instructions or questions. A photograph may help diagnosis. A permit for shipping samples across state lines can be sent to you.

## References

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