

North Dakota Forest Service



NDSU

North Dakota Forest Health Highlights 2012

An account of forest health issues
of interest in North Dakota.

Introduction

This report summarizes forest health highlights observed in North Dakota during 2012. Weather trends of significance, forest pest and health surveys are summarized, and specific forest insects, diseases and damaging abiotic agents of current concern are described.

The information presented in this report was compiled from various sources and methods, including site visits, forest surveys and personal communication with natural resource professionals. The conclusion of this report contains an overview of the most notable emerging forest health issues in relation to their effects on the sustainability and societal value of North Dakota's tree and forest resources.

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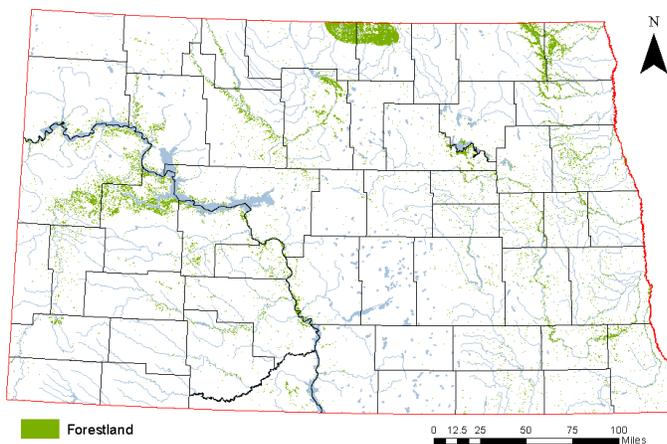


Figure 1: Forestland cover in North Dakota.
(North Dakota Forest Service)



Section I

Weather-related Trends

One of the driest years on record (13th driest growing season since 1895) (Figure 2) (Akyüz and Mullins, 2012) led to drought-related tree problems and the failure of a larger than usual percentage of new plantings. This statewide dry-weather trend began in late August 2011 and continued through the winter and the following growing season, leading to significant precipitation deficits during a 13-month period (Figure 3).

This was in strong contrast to 2011, which was among the wettest years on record (12th wettest growing season since 1895) (Figure 4) (Akyüz and Mullins, 2011). This wet weather had a significant impact on trees in many areas of the state, especially the Missouri and Souris River basins, where historic, long-term flooding occurred in 2011.

Whether too wet or too dry, the growing seasons of 2011 and 2012 were stressful to trees, and the impacts of these extreme weather patterns on forest health were seen in 2012 and will continue to be seen in the coming years.

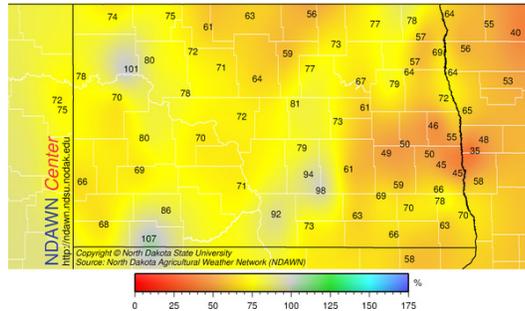


Figure 2: Percent of normal rainfall during the growing season of 2012.

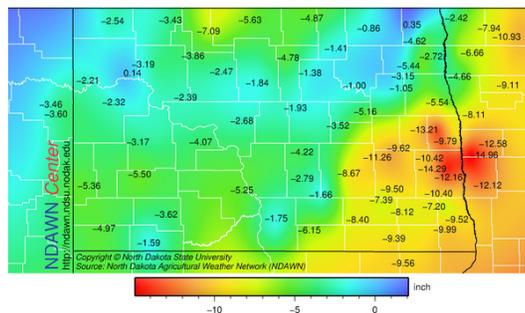


Figure 3: Departure from average rainfall from September 2011 to October 2012 showing precipitation deficits across North Dakota.

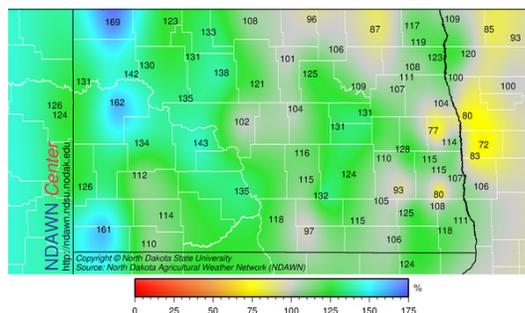


Figure 4: Percent of normal rainfall during the growing season of 2011.

City	Temperature Ranking	Precipitation Ranking
Bowman	The warmest	21st driest
Bismarck	23rd warmest	52nd driest
Fargo	2nd warmest	10th driest
Minot	5th warmest	14th driest
Cavalier	6th warmest	28th driest
Williston Exp. Station	21st warmest	37th driest
North Dakota Average	8th warmest (118 years)	13th driest (118 years)

Figure 5: April-September 2012 average temperature and precipitation rankings for select areas of North Dakota. (A. Akyüz and A.B. Mullins, NDSU)

II. Surveys

Insect Surveys: Cooperative Insect Trapping Efforts

Gypsy Moth

In 2012, 355 traps were placed, effectively sampling 227,200 acres. No gypsy moth (*Lymantria dispar*) were detected in 2012. No positive finds for gypsy moth have occurred in North Dakota since 2005 (Mike Kangas, personal contact).

EAB

In 2012, a cooperative effort by the North Dakota Department of Agriculture (NDDA), U.S. Department of Agriculture Animal and Plant Health Inspection Service Plant Protection and Quarantine (APHIS PPQ) and the North Dakota Forest Service (NDFS) placed 393 “purple sticky prism traps” throughout North Dakota (Figure 6). No emerald ash borer (EAB) (*Agilus planipennis*) were detected in 2012.

Winter Dieback of Freeman Maple Cultivars: Assessment 2012

Maple cultivars have become very popular across the northern plains in recent years due to their fast growth rate and vibrant fall color. In recent years, the Freeman maple cultivars (*Acer x freemanii*) ‘Autumn Blaze®’ and ‘Sienna Glen®’, which are selections from hybridizations of red maple (*Acer rubrum*) and silver maple (*Acer saccharinum*), are planted very commonly in newer housing areas and overall have become highly favored trees in the community setting.

In the spring of 2012, tree resource managers across North Dakota voiced concern regarding large-scale dieback and mortality of Freeman maple cultivars. Especially the newest plantings installed in the past few years showed various levels of dieback from the top down and in many cases 100 percent mortality (Figures 7 and 8).

Emerald Ash Borer National Survey 2012

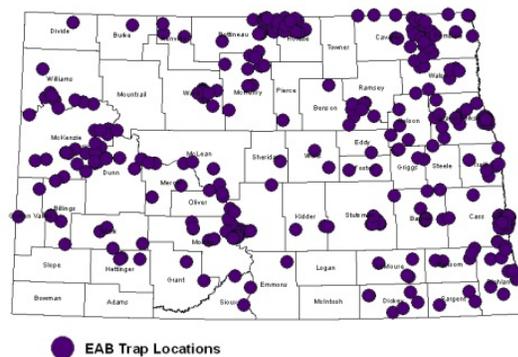


Figure 6: Emerald ash borer trapping locations in 2012. (North Dakota Department of Agriculture)



Figures 7 and 8: Typical pattern of dieback seen statewide on more recently planted Freeman maple cultivars. The photo on the left is from a new development in Bismarck and the right photo is a newer planting in Valley City. (A. Bergdahl, North Dakota Forest Service)

This dieback and mortality was not accompanied by any signs of insect or pathogen attack. The cause of this dieback was determined to be weather-related: unusually warm weather in the fall that may have interfered with the process of hardening off, or unusual early warming events in the spring that may have activated growth, followed by cold snaps that could have resulted in frost injury to vulnerable tissues.

Although the cause of dieback may never be known exactly, questions began to arise about the suitability of Freeman maple cultivars for our region. The primary question was: Which of the two most commonly planted maple cultivars performed better in the challenging conditions of the previous year?

Rather than providing a clear answer to this question, the results of this assessment instead reinforced the fact that principles of sound cultural practices need to be followed when installing and establishing new plantings. For example, this assessment found that trees of smaller diameter that were not mulched were far more likely to have sustained weed-whip/mower damage, and weed-whip and mower damaged (unmulched) trees had much higher levels dieback ratings (Figure 9).

A properly mulched zone around new plantings eliminates the need to use a weed-whip or mower close to the main stem of a tree, thus limiting the occurrence of damage to the main stem. Uninjured trees likely were better able to mediate environmental stress, and this seemed more true for Sienna Glen® maple (Figure 10).

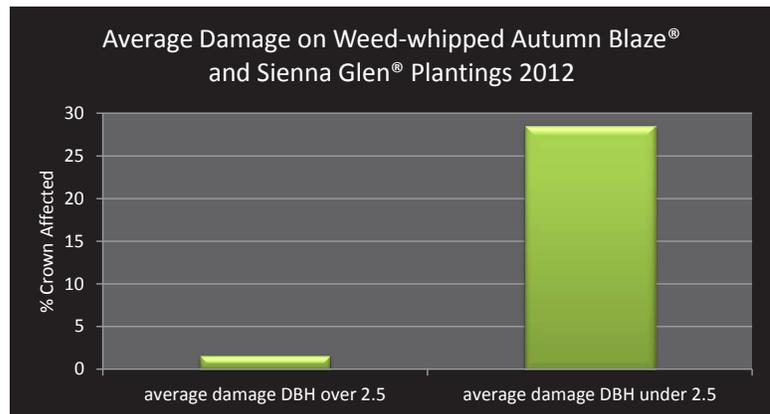


Figure 9: Average crown damage ratings for all trees above or below 2.5 diameter showing weed-whip damage. (2012 Maple Cultivar Winter Damage Assessment (2013), North Dakota Forest Service, NDSU)

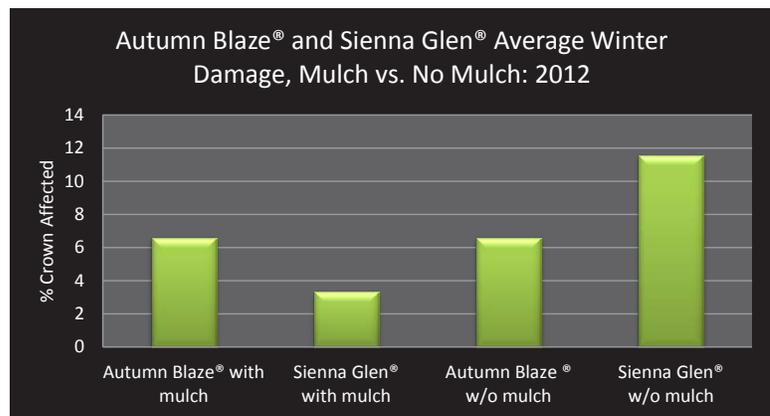


Figure 10: Effect of mulch on Autumn Blaze® and Sienna Glen® maple cultivar average crown damage ratings. (2012 Maple Cultivar Winter Damage Assessment (2013), North Dakota Forest Service, NDSU)

Insect Trends of Concern

Japanese Beetle

The Japanese beetle was detected in a number of locations in North Dakota in 2012: Grand Forks, Bismarck, Fargo, Minot, Oakes, Taylor, West Fargo and rural Foster County. This is a tree pest of concern due to its strong feeding preference for the foliage of American basswood (*Tilia americana*) and little-leaf linden (*Tilia cordata*). It also is a serious pest of many woody horticultural plants. Lindens are a popular tree in urban plantings and are an important component of our natural forests, especially in riparian areas.



Figure 11: Japanese beetle adults and the impact of their feeding. (Utah State University Extension Service)

Large Aspen Tortrix (LAT)

In 2012, areas in the Turtle Mountains that were heavily defoliated by LAT in 2011 were revisited. While LAT still was active and easily found in these areas, the population was lower and the defoliation less severe than in 2011. The reason for this is unclear and may indicate a decrease in population following a population peak in 2011. This trend would fit the boom-and-bust population cycle that often characterizes lepidopteran defoliators such as LAT.

Two-lined Chestnut Borer

Several visual surveys for two-lined chestnut borer (TLCB) (*Agrilus bilineatus*) damage to bur oak were carried out in Fargo at multiple locations by the Red River, and sites in the Sullys Hill National Game Preserve and Sheyenne State Forest. This was done as a baseline survey to establish a point of reference for future conditions of TLCB in these areas.



Figure 12: Two-lined Chestnut Borer. (Robert Haack, USDA Forest Service, Bugwood)

In the Red River corridor through Fargo, TLCB damage was apparent and found frequently in association with armillaria root disease. Which pest came first was not immediately clear; however, both pests are indicators of primary stressors, which could include chronic stress via prolonged inundation of the root horizon. Further, the drought conditions between September 2011 and the entire growing season of 2012 (Figure 3) likely will cause further stress to oak trees, possibly leading to an increase in TLCB mortality.

TLCB was not readily apparent at Sullys Hill and in the Devils Lake Hills region in general. This area has experienced heavy outbreaks of two-lined chestnut borer in the past (Bill Hodus, personal contact), which has raised some concern that the extreme weather conditions in the past five years could be a predisposing factor for another such outbreak. These areas will be monitored in the coming years.

A severe wind event in the Sheyenne State Forest in 2009 caused severe branch breakage in many bur oaks in the area, according to a 2010 ice damage survey of the area. Following this stress event, populations of two-lined chestnut borer, already commonly found in the area, were predicted to increase rapidly in the following years. This outbreak has not been seen, but the area will continue to be monitored.

Pathogen Trends of Concern

Linden Leaf Blotch

Linden leaf blotch (*Didymosphaeria petrakiana*) was encountered in North Dakota for the first time in 2012. This is significant because it is one of the few leaf diseases affecting American basswood and little-leaf linden (*Tilia americana* and *Tilia cordata*, respectively), commonly planted in community settings in our region. This disease is not considered significant to tree health because the effects are mostly aesthetic; the blotches develop on leaves later in the year (mid-July in North Dakota in 2012) and it is thought to only mildly inhibit overall photosynthesis. The disease has been observed only in one location on American basswood in a riparian area in Cass County and has not been found in other areas of the state.



Figure 13: Fungal blotches typical of the linden leaf blotch pathogen on American basswood in Cass County. (A. Bergdahl, North Dakota Forest Service)

Brown Spot Needle Blight

Brown spot needle blight (*Mycosphaerella dearnessii*), a needle disease was detected for the first time in North Dakota in 2011. A small-scale disease outbreak occurred in a Christmas tree plantation outside of Enderlin, N.D., in Ransom County. The infected Scots pine (*Pinus sylvestris*) trees were six to eight years old. The source of the outbreak has not been determined. The Christmas tree producer no longer is producing and selling trees, and the trees in the most heavily infected area were destroyed in early 2012. The assumption is the disease still is on the site, existing in lower levels on other host trees.



Figure 14: Brown spot needle blight found in Ransom County in 2011 (top). (A. Bergdahl, North Dakota Forest Service) Brown spot needle blight fruiting bodies on Scots pine needles (left) (University of Illinois Extension Service)

General Insect and Disease Trends of Significance in 2012

Insects

- **Pine tip moths** (*Retinia metallica*, *Ryacionia* spp.) continue to be encountered regularly across North Dakota. Reports of cone worm (*Dioryctria* spp.) in the Bismarck area have been common. The causal agents of the tip damage have not been identified to species, although the type of damage and the host and pest distributions suggest the listed genera.
- **Native borers of ash trees**, especially ash bark beetles (*Hylesinus* spp.), redheaded ash borer (*Neoclytus acuminatus*) and ash-lilac borer (*Podosesia syringae*), continue to contribute to the decline of ash trees in urban and rural environments. Carpenterworm (*Prionoxystus robiniae*) also is encountered commonly in green ash (*Fraxinus pennsylvanica*) in our region. These pests often are found in home plantings and windbreaks stressed by herbicide drift from adjacent agricultural areas. The stressed condition of these trees makes them favored targets of these secondary pests.
- **Bronze birch borer (BBB)** (*Agrilus anxius*) damage was seen commonly in Jamestown and Valley City, and was extensive in the Washburn area in 2012. European weeping birch was particularly targeted by this flat-headed, phloem-feeding borer. Mature trees, as well as newer plantings, were seen succumbing to infestation. Drought stress commonly is thought of as a predisposing factor leading to BBB infestation. The increase in the occurrence of this insect in certain areas, despite the wetter years leading up to 2012, is unknown.
- **Fall webworm** (*Hyphantria cunea*) defoliation was seen commonly in 2012, especially in Shubert (Canada Red) chokecherry (*Prunus virginiana* var. *Shubert*) plantings in urban and rural areas in the eastern half of the state.



Figure 15: Tip moth larva in an opened pitch mass at the tip of a ponderosa pine twig in Barnes County. (A. Bergdahl, North Dakota Forest Service)



Figure 16: Two European weeping birches with typical top-down dieback characteristic of bronze birch borer attack, Washburn, N.D. (A. Bergdahl, North Dakota Forest Service)



Figure 17: Fall webworm nest in a Shubert Chokecherry tree in Towner, N.D. (A. Bergdahl, North Dakota Forest Service)

Diseases

- **Anthracnose of green ash** (*Gnomoniella fraxini* on *Fraxinus pennsylvanica*) and **bur oak** (*Apiognomonina quercina* on *Quercus macrocarpa*) disease levels were down in 2012 due to the very dry weather during the initial infection period in the spring and throughout the growing season.



Figure 18: Stigmata fruiting bodies on the underside of second-year needles. (Jim. Walla, NDSU)



Figure 19: Plum pocket-infected fruit in Cass County. (A. Bergdahl, North Dakota Forest Service)



- **Stigmata needle cast** continues to be the most prevalent disease of spruce (*Picea spp.*) trees in conservation and homeowner plantings. Needle cast fungi still were encountered commonly in 2012, although the dry weather may have contributed to a lower overall amount of disease.
- **Plum Pockets** (*Taphrina communis*) is a common disease of plum fruit and leaves.
- **Dutch elm disease (DED)** (*Ophiostoma ulmi*), which is present in all 53 North Dakota counties, continues to be a disease of significance. This is especially true in western communities, where the DED epidemic is at a point at which new infections of mature trees are very common and the devastation of this disease is very prevalent. As an example, Williston reported that 2012 was the city's worst DED year on record.
- **Armillaria root rot** (*Armillaria spp.*) is expected to increase in the coming years. It is linked to the various statewide flooding events that occurred (or continued to occur) since 2009 and especially during the 2011 growing season. No information is available on the species occurrence and distribution of armillaria root rot species in North Dakota. In 2012, armillaria was found associated with areas flooded during the growing season of 2011.
- **Fire blight** (*Erwinia amylovora*) continues to be a commonly encountered problem on apple trees and caragana in North Dakota. Despite the dry weather during the growing season of 2012, other common diseases of apple such as **black rot** (*Botryosphaeria obtusa*) and **apple scab** (*Venturia inaequalis*) remained significant. Foresters suspect that these diseases have continued to be significant due to homeowner irrigation practices. Homeowners who do not take measures to avoid spraying water directly on the crown of trees unknowingly create conditions for the development of these diseases.

Figure 20: Crabapple tree with severe fire blight in Valley City, N.D. (A. Bergdahl, North Dakota Forest Service)

- **Ash heart rot** (*Perenniporia fraxinophila*) is found extensively in association with mature green ash trees statewide. This seems to be more of a natural phenomenon linked to increasing tree age. While green ash trees with extensive heart rot provide crucial habitat for avian and mammalian cavity nesters in forest settings, ash heart rot represents a risk to life and property in inhabited rural areas and especially more urban settings. Due to the high percentage of ash in North Dakota communities, steps to mitigate risk associated with ash heart rot should be a priority in small cities and towns.

Abiotic

- **Herbicide damage** continues to be a commonly encountered agent of damage to trees and shrubs in urban and rural environments. Improper or careless selection and/or application of pesticides constitute a substantial percentage of homeowner inquiries regarding tree and shrub health in North Dakota.
- **Iron chlorosis** develops in various tree and shrub species due to the high alkalinity of many North Dakota soils; it is a significant primary stressor. In recent years, and especially in the spring/early summer of 2011, moist, below-average soil temperatures led to an increase in iron chlorosis incidence and severity. Chronic, severe iron chlorosis has in some cases led to secondary tree health problems and increased dieback seen in 2012.
- **Cultural practices**, such as improper planting, mulching, pruning, watering, fertilization practices and failure to remove landscape fabric, mostly by private home owners, constitute a major proportion of tree health issues responded to by the forest health specialist in North Dakota. Continued efforts to educate the public about proper tree care continues to be a priority of the North Dakota Forest Service, North Dakota State University and state and municipal entities involved in the care of tree resources.



Figure 21: Spruce tree (middle) suffering from herbicide exposure. Notice the spiral pattern of damage winding around the tree, which is typical of a root exposure to herbicide. (A. Bergdahl, North Dakota Forest Service)



Figure 22: Strappy, discolored bur oak leaves from herbicide exposure. (A. Bergdahl, North Dakota Forest Service)



Figure 23: Linden planting with cupped leaves and twisted growth exposed to an unknown formulation of herbicide in Casselton, N.D. (A. Bergdahl, North Dakota Forest Service)

References and Sources of Supplemental Information:

- Akyüz, A., and Mullins, B.A. 2012 Growing Season Weather Summary for North Dakota, North Dakota State University, Department of Soil Science, Oct. 30, 2012.
- Cranshaw W. 2004 Garden insects of North America: the ultimate guide to backyard bugs. Princeton University Press, New Jersey
- Elhard, C. 2012 North Dakota Department of Agriculture Emerald Ash Borer Update.
- Johnson, W., and Lyon, H. 1991. Insects that Feed on Trees and Shrubs, 2nd Edition. Cornell University Press, Ithaca. 560 p.
- Kotchman, L.; Claeys, T.; Kangas, M.; Anar, M.; Madurapperuma, B.; Oduor, P.; Wamono, A. (2011). Historic Flooding Maps: Inundated trees/forests along the Missouri and Souris River floodplains in North Dakota. North Dakota Forest Service/North Dakota State University. 56p.
- North Dakota Gypsy Moth Detection Survey Trapping Schedule, North Dakota Gypsy Moth Survey Committee, USDA PPQ. Version Jan. 12, 2011.
- Riffle, J., and Peterson, G., technical coordinators. 1986. Diseases of Trees in the Great Plains. Rocky Mountain Forest and Range Experiment Station, USDA Forest Service. GTR RM-129. 149 p.
- Sinclair, W.A., and Lyon, H.H. 2005 *Diseases of trees and shrubs* (No. Ed. 2). Comstock Publishing Associates
- North Dakota Agricultural Network: <http://ndawn.ndsu.nodak.edu/>



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Cover Photo: Turtle Mountain native forest along Lake Metigoshe. (A. Bergdahl, North Dakota Forest Service)

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