North Dakota Forest Service

North Dakota Forest Health Highlights 2010

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

NDSU

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Introduction

This report summarizes forest health highlights observed in North Dakota during 2010. Forest pest surveys are summarized and specific forest insects, diseases and damaging abiotic agents 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. This report serves as an overview of the most notable emerging forest health issues in relation to their effect on the sustainability and societal value of North Dakota's 772,427 acres of forested resources[1].

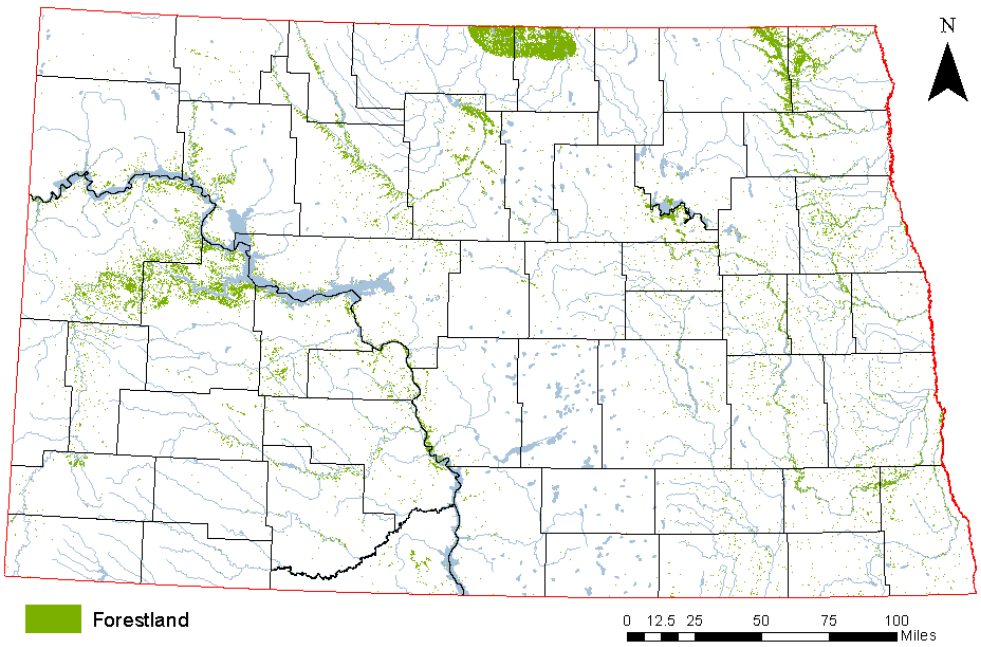


Figure 1: Forest Land in North Dakota

[1] *Since completion of the 2009/2010 Biennial Forest Health Report was postponed until after the 2011 field season, we were able to infer that large aspen tortrix was likely the primary defoliator of aspen in the Turtle Mountains in 2009/2010. A later conversation with NDSU entomologist Gerald Fauske confirmed that he had been collecting high amounts of large aspen tortrix moths in the Turtle Mountains as early as 2008.

Section |

Weather-related Trends

Precipitation/Temperature Extremes

North Dakota is experiencing what has been referred to as a "wet cycle" characterized by above-average precipitation levels. Many parts of the state experienced historically significant spring flooding and also periodic summer flooding associated with high rainfall. This was indeed the case in 2010. Because this wet cycle has been in progress for the past decade, slough and lake levels have been on the rise, leading to tree stress and inciting factors detrimental to tree health and mortality.

Higher than normal spring precipitation in April and May in 2010, in addition to a slightly higher than normal temperature, could have led to the high severity of initial infections of moisture-dependent diseases in 2010, such as ash and oak anthracnose (*Gnomoniella fraxini* and *Discula quercinia*, respectively), apple scab (*Venturia inaequalis*) and frogeye leaf spot (*Botryosphaeria obtusa*). Significantly higher than normal growing season precipitation across many parts of the state in 2010 likely led to the perpetuation of these diseases (Figure 2).

The Devils Lake Basin

During 2009 and 2010, the water level in the Devils Lake basin continued to rise and inundating an increasing acreage of areas containing forest resources. As water levels rise, forestland and treed recreational areas are lost as trees die due to the adverse effects of inundated soils during the growing season.

The extent of lost forested acreage has not been quantified annually and will, therefore, be the focus of future work using satellite imagery and geospatial analysis.

Flooded trees on the shores of Devils Lake.

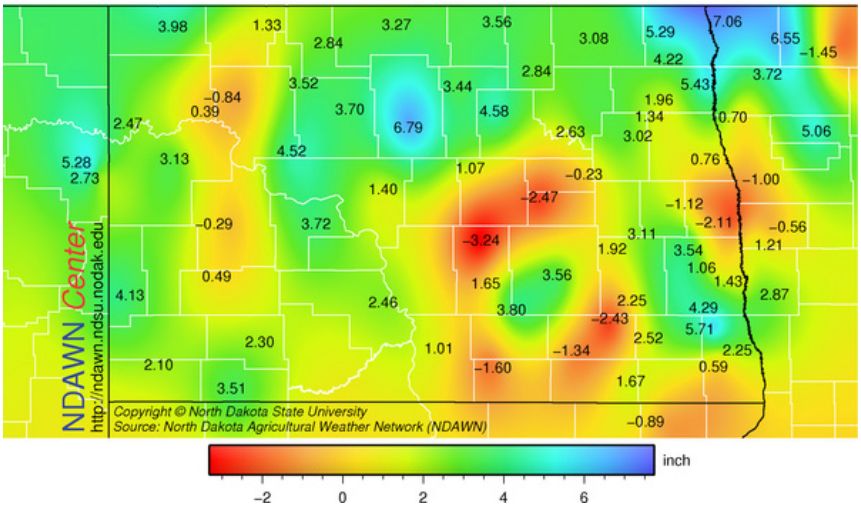


Figure 2: Departure from normal rainfall during the growing season of 2010

Section II

Overmaturity and Limited Natural Regeneration

Overmaturity and limited natural regeneration threatens the future sustainability of North Dakota's forests. Natural regeneration is hindered by the lack of processes that promote regeneration (flooding, prescribed fire and harvesting) or processes that limit regeneration (herbivory). More than three-quarters of the forest stands in North Dakota are 40 years old or older. Therefore, the lack of regeneration is an issue of concern within a majority of forest types in North Dakota (Kotchman 2010). This issue is most prominent in the state's aspen (*Populus tremuloides*) forests, riparian forests dominated by cottonwood (*Populus deltoides*), and riparian forests with an overabundance of green ash (*Fraxinus pennsylvanica*).

Section III

2010 Forest Pest Surveys

Emerald Ash Borer

In 2010, 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 North Dakota Forest Service (NDFS) placed approximately 249 'purple sticky prism traps' throughout North Dakota. There were no emerald ash borer (EAB) (*Agrilus planipennis*) detections in 2010.

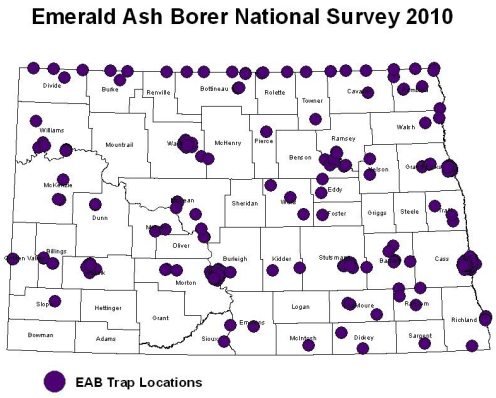


Figure 3: 2010 EAB trap placement, courtesy of the North Dakota Department of Agriculture

As well as serving as a detection tool, the purple traps also have proven to be a powerful tool for increasing public awareness of the potential threat of EAB. Cooperative trapping and outreach efforts are ongoing and focus on larger communities, parks, campgrounds and areas along major transportation routes. Due to the abundance of ash trees in North Dakota, communities, natural forests and conservation plantings, continued cooperative efforts to monitor for EAB will remain a high priority.

Gypsy Moth

Cooperative trapping efforts involving the NDDA, APHIS PPQ and NDFS devised and carried out a trapping plan consisting of 358 traps surveying approximately 229,120 acres. There were no detections of gypsy moth (*Lymantria dispar*) in 2010.

Section IV

Insect Trends

Forest Tent Caterpillar and Large Aspen Tortrix (LAT)

Severe forest tent caterpillar (FTC) (*Malacosoma disstria*) defoliation was noticed west of Grand Forks in the Turtle River State Park and the surrounding areas in 2010. Species hit hardest were bur oak (*Quercus macrocarpa*) and American basswood (*Tilia americana*). Additional FTC defoliation was reported in multiple areas around the Turtle Mountains region. Specifically, the International Peace Garden, on the North Dakota-Manitoba, Canadian border, reported heavy defoliation from FTC. The tribal forester on the Turtle Mountain Chippewa Reservation reported he had encountered heavy defoliation, presumed to be FTC, on a number of their forest inventory plots.

A winter egg mass survey carried out in areas of the Turtle Mountains, where heavy defoliation by FTC was reported, yielded zero egg masses. This, in addition to other physical evidence and first-hand reports of heavy webbing at the branch tips and numerous "rappelling" larvae, led to the inference that these cases of defoliation were caused by an agent other than FTC. An aerial survey on June 22, 2011, [1]and further ground truthing efforts revealed the defoliation was caused by the large aspen tortrix (LAT) (*Choristoneura conflictana*). Approximately 20,500 acres of defoliation was recorded in the Turtle Mountains. [2]In retrospect, a major proportion of the reported defoliation in 2009 and 2010 likely was the result of large aspen tortrix and not the forest tent caterpillar, which seems to be relatively uncommon in the Turtle Mountains in 2011.

A forest tent caterpillar larvae feeding on a leaf.

From left to right: large aspen tortrix larva, cocoon, cocoon folded and webbed in a leaf and adult (photo of the adult by Ed Holsten, USDA Forest Service).

[2] An aerial survey was conducted in June 2011 by the U.S. Forest Service, Region 1. Forest health-related GIS data collected during the flight was used by the North Dakota Forest Service to estimate defoliated acres. This information has not been published officially as of December 31, 2011.

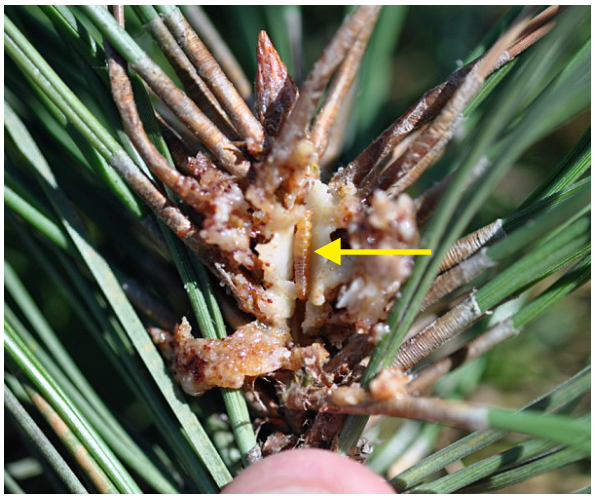
Yellowheaded Spruce Sawfly

Areas east of Bismarck reported higher than normal yellowheaded spruce sawfly (YHSSF) (*Pikonema alaskensis*) numbers in 2010. This, in addition to reports of a higher incidence of forest tent caterpillar and other defoliating insects, points to an overall increase in this class of forest pests impacting forest health across woody plant species and environments.

Yellowheaded spruce sawfly *Pikonema alaskensis* larvae and damage (Photos by Mike Kangas, NDFS).

Ponderosa Pine Tip Moths

In 2010, homeowner reports of tip moth damage focused on Cass, Burleigh and Cavalier Counties. Tip moth damage also was seen near Casselton, outside of Carrington and in Valley City. Since reports of pine tip moth came from many different geographical areas in 2010, the assumption is that this pest can be commonly encountered in many areas across the state. Unfortunately, a positive identification of the specimens was not possible due to the absence of the insect in the area of damage or the presence of very immature larvae with no easily distinguishable features. The generic identification of tip moth was based on the type and location of damage.



Unidentified tip moth excavated from a pitch nodule on ponderosa pine.

Section V

Disease Trends

Dothistroma Needle Blight

The first discovery of Dothistroma needle blight (*Dothistroma pini*) in Pembina County in the northeastern corner of North Dakota was a significant forest health event in 2010. The disease was found in multiple locations within two mature planted ponderosa pine (*Pinus ponderosa*) stands. This find could have important implications, especially for the North Dakota Christmas tree growing and nursery industries and for pine plantings in general.

Dothistroma needle blight in Jay Wessels Wildlife Management area, Pembina County, ND,

Anthracnose of Ash and Oak

Foliar diseases, such as ash anthracnose (*Gnomoniella fraxini*) of green ash (*Fraxinus pennsylvanica*) and oak anthracnose (*Discula quercinia*) of bur oak (*Quercus macrocarpa*), have been especially prevalent in 2010. Reports from across the state indicate the widespread occurrence of these diseases is due to higher than normal precipitation in most parts of the state (figure 2). High levels of infection in previous years and more than adequate precipitation during the primary infection period in spring aided the establishment of these diseases. This, combined with consistent high moisture levels throughout the growing season, led to a heavy infection year causing severe defoliation in many areas across the state. Defoliation was especially conspicuous in urban areas where full defoliation was reported in large sections of Grand Forks, Bismarck, Fargo and Williston. This trend of heavy leaf infection levels has been seen in sequential years, which suggests that these back-to-back defoliation events could represent a significant stress to ash and oak trees in affected areas.

Green ash and bur oak leaves showing symptoms of ash anthracnose infection (Photos by Joseph O'Brien, USDA Forest Service).

Aspen Stem Disease

Internal decay of live aspen trees is common within mature aspen (*Populus tremuloides*) stands, particularly those older than 60 years. Stem decay caused by the fungus *Phellinus tremulae* reduces the amount of usable wood within a stand and increases the probability of stem breakage. The wood volume loss due to this stem decay has been increasing as the aspen resource continues to age in the Turtle Mountains. Similarly, mortality of large diameter trees due to Hypoxylon canker (*Hypoxylon mammatum*) contributes to the deterioration of older stands.

The damage caused by these pests should not be perceived as unnatural but rather as a reflection of a disturbance regime shift. Without disturbance (whether by fire, harvesting, bulldozing, or other means) to encourage vigorous aspen regeneration, pests and environmental factors deteriorate the aging aspen and give way to other species.

Aspen stem decay conk and cross section of an aspen bole showing active decay (Photo by Mike Kangas, NDFS).

Picture 8: Casting of the lower needles of Colorado blue spruce needles (left) and a closeup view of the fruiting bodies (sporodochia) of stigmina needle cast (right) (photos by Jim Walla, NDSU).

Stigmina Needle Cast

Stigmina needle (*Stigmina lautii*) cast of Colorado blue spruce (*Picea pungens*) and Black Hills spruce (*Picea glauca var. densata*) continues to be prevalent in the eastern half of the state. This needle disease has become far more prevalent than rhizosphaera needle cast (*Rhizosphaera kalkhoffii*) as a pathogen of spruce. High moisture conditions in 2010 (Figure 2) have contributed to the increased prevalence and severity of stigmina needle cast in the eastern half of North Dakota.

Dutch Elm Disease

Dutch elm disease (*Ophiostoma ulmi*) is present in all 53 North Dakota counties and continues to kill elm (*Ulmus americana*) trees across the state. In larger communities, especially Fargo, Grand Forks and Bismarck, aggressive Dutch elm disease management has maintained low levels of yearly elm mortality within city limits. In rural areas and smaller towns lacking municipal forestry programs and/or adequate funding for managing tree resources, elm populations are much lower due to a lack of preventative action. In riparian corridors and natural forest areas, elm trees continue to persist on the landscape in small populations, despite the widespread presence of the Dutch elm disease fungus and its vectors.

An elm tree infected with Dutch elm disease. (Photo by Linda Haugen USDA Forest Service, A. Bergdahl, NDFS)

Armillaria Root Rot

Armillaria root rot (*Armillaria spp.*) is a very common, although seldom recognized, fungal root pathogen that is generally only able to exploit stressed and weakened trees. Recurring widespread flooding during the growing season in past years has led to an increase in reports of this opportunistic pathogen, especially in riparian areas. Small pockets of Armillaria infection also have been reported in overmature forests in the Turtle Mountains. Because Armillaria is not easily detected (it grows and spreads along tree roots and under the bark of the lower portions of the tree), it is underreported and very likely much more abundant than realized.

Severe Armillaria root and butt rot (shoe string rot) infesting an ash tree in a riparian forest that had experienced multiple years of periodic summer flooding.

Ash Heart Rot

The decay fungus *Perennioporia fraxinophila* can be found very commonly across North Dakota on green ash trees (*Fraxinus pennsylvanica*) growing under stressful conditions. Decay of the main stem often leads to stem breakage, which poses a hazard to people and property. This pathogen is specifically included in this report due to the seemingly ubiquitous nature of this fungal pathogen in urban and rural environments in all areas of the state.

Ash heart rot caused by the fungus *Perennioporia fraxinophila* (Photo by Mike Kangas, NDFS).

Section VI

Other General Tree Health Trends

Iron Chlorosis

Various species of trees and shrubs commonly experience significant health problems due to the high alkalinity of many North Dakota soils. A major tree and shrub health issue resulting from these high pH soil conditions is iron chlorosis. In recent years and especially in 2010, moist, below-average soil temperatures, have led to an increase in iron chlorosis incidence and severity.

Herbicides

Herbicide damage continues to be a commonly encountered problem on trees and shrubs in urban and rural environments. A substantial percentage of homeowner inquiries about tree and shrub health are due to the improper or careless selection and/or application of pesticides.

Improper Cultural Practices

Improper planting, mulching, pruning, watering, fertilization practices, etc., mostly by private homeowners, 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.

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