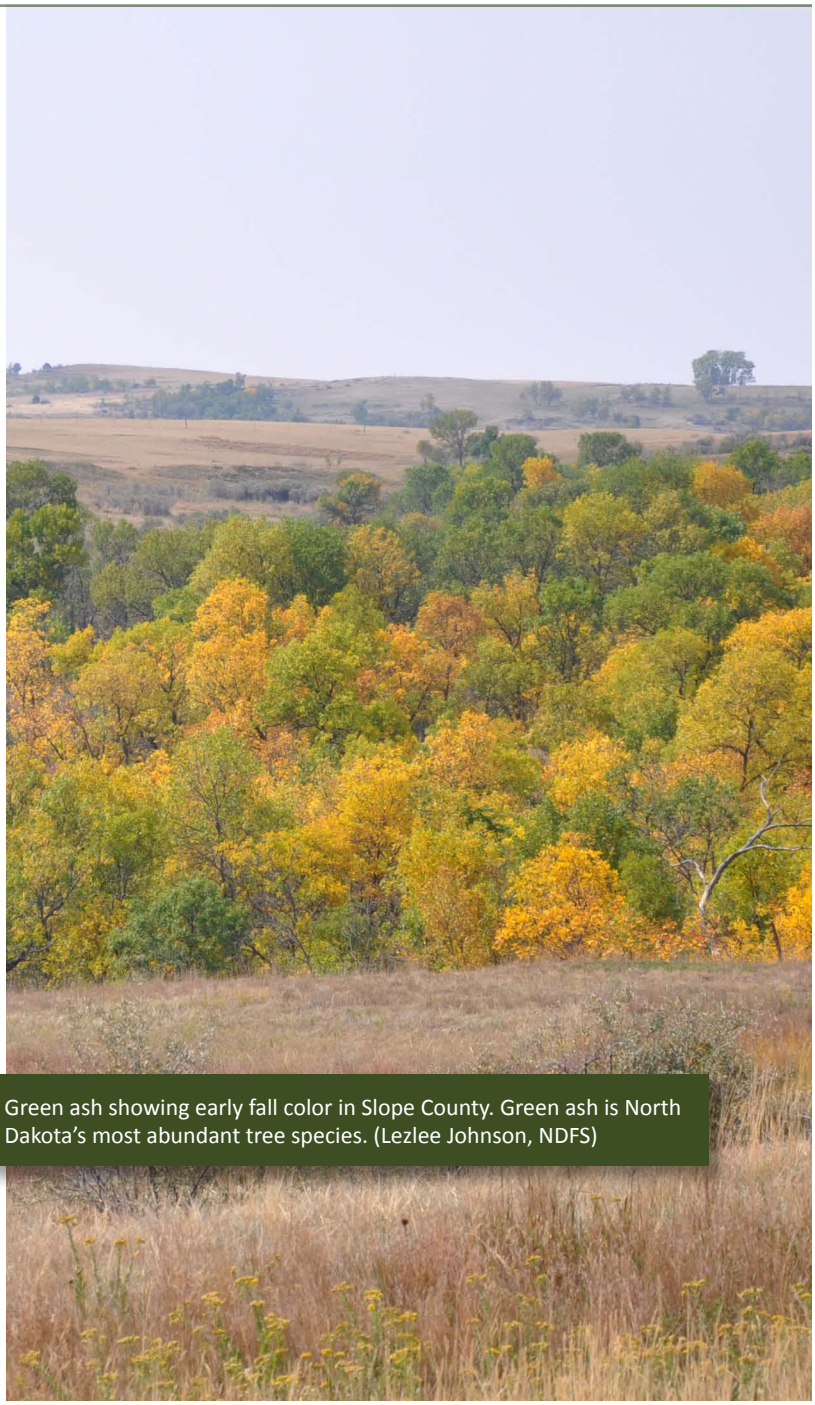
Forest Health Highlights:
North Dakota 2017

This report summarizes forest health observations and program activities in North Dakota in 2017 and includes an overview of notable emerging forest health issues. Site visits, forest health surveys and reports, and personal communication with natural resource and community forestry professionals form the basis of this report.

North Dakota contains approximately 814,900 acres of forestland, which accounts for 1.8 percent of the state's land area ("Forests of North Dakota 2017"). The top five species in the state by volume are cottonwood, bur oak, green ash, quaking aspen and Rocky Mountain juniper.

Conservation plantings such as windbreaks and living snow fences are a significant tree resource, once totaling as much as 55,000 miles of plantings.

Community trees provide valuable ecosystem services in the northern Plains environment. Two college campuses have achieved Tree Campus USA designation and 51 cities qualify as a Tree City USA.



Green ash showing early fall color in Slope County. Green ash is North Dakota's most abundant tree species. (Lezlee Johnson, NDFS)

Report compiled and written by Lezlee Johnson, forest health manager, North Dakota Forest Service (NDFS), and formatted by Dave Haasser, graphic designer, North Dakota State University (NDSU) Agriculture Communication

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Forest Health Surveys

Green Ash Underbark Temperature Monitoring

Emerald ash borer (*Agrilus planipennis*) (EAB) has not been discovered in North Dakota; however, it is one of the greatest threats to North Dakota forest health. EAB feeds on and kills green ash (*Fraxinus pennsylvanica*), the most abundant tree species in the state.

A green ash underbark temperature monitoring project, conducted during the winters of 2014-2015 and 2015-2016, is continuing during the 2017-2018 winter at four of five original locations across the state. Bergdahl (2016) cross-referenced the first two years' observations with Venette and Abrahamson's 2010 study reporting potential limits to EAB's cold-hardiness.

The inner bark on the south sides of trees is generally warmer than the ambient air temperature, and it was a full 10 degrees warmer on a day in Walhalla, N.D., when the ambient temperature dropped to minus 30 F. Bergdahl's initial conclusion was that we reasonably can expect that EAB will be able to survive North Dakota winters.

The Canadian Food Inspection Agency (CFIA) confirmed EAB in Winnipeg, Manitoba, just 60 miles north of North Dakota, in December 2017. The initial infestation appears to have begun at least five years previously (Ball, 2018), and in that time, has spread to adjacent street trees and park trees 1,500 feet away.

Winnipeg is in Canadian plant hardiness zone 3a, experiencing temperatures as low as minus 40 F. North Dakota's northern tier is in U.S. Department of Agriculture (USDA) hardiness zone 3b (Figure 2). It experiences temperatures as low as minus 35 F, while the rest of the state, in hardiness zone 4a, experiences temperatures as low as minus 25 F.

The underbark temperature monitoring project, the discovery of EAB survival in Winnipeg and EAB cold hardiness research all inform North Dakota's EAB response plan.

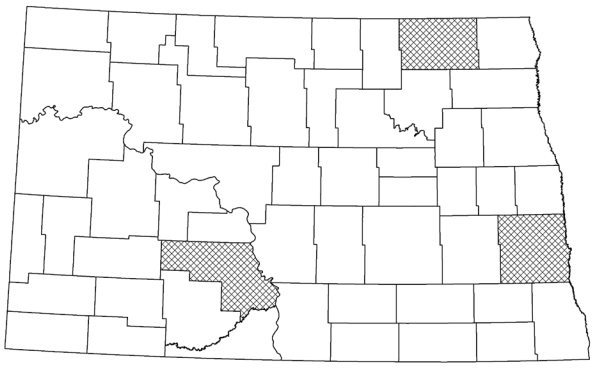


Figure 1: Green ash underbark temperatures were monitored at sites in Morton, Pembina and Cass counties. (Lezlee Johnson, NDFS)

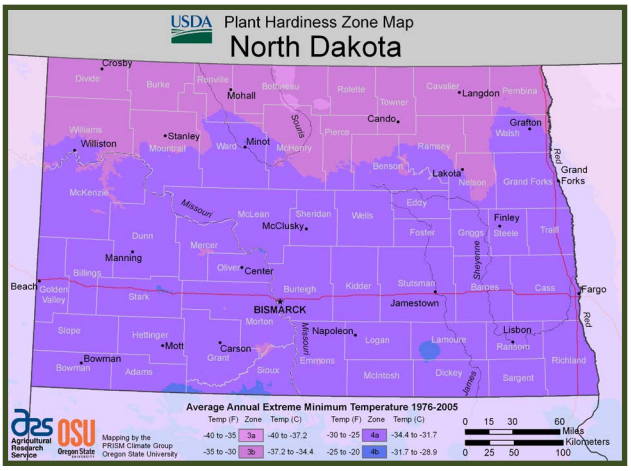


Figure 2: USDA plant hardiness zone map for North Dakota. The northern tier is in hardiness zone 3b (minus 35 F), and the rest of the state is in hardiness zone 4a (minus 30 F). (U.S. Department of Agriculture-Agricultural Research Service, Oregon State University)

Japanese Beetle and Exotic Wood-borer Surveys

The North Dakota Department of Agriculture (NDDA) conducts Japanese beetle (*Popillia japonica*) and exotic wood-borer trapping in North Dakota.

Japanese beetle is highly destructive and has a strong feeding preference for basswood (*Tilia Americana*) and littleleaf linden (*Tilia cordata*). Both trees are important in community forests. Basswood also is important in native forests and conservation plantings.

The NDDA reported that Japanese beetles have appeared in traps every year since 2012, when 139 beetles were trapped, mainly near nurseries. After a nursery stock supplier from Minnesota implemented safeguards, positive Japanese beetle finds decreased.

Finds increased again in 2014, appearing in golf courses and parks, as well as nurseries. By 2016, the numbers of Japanese beetles and their locations had increased.

In 2017, while the NDDA was launching a collaborative trapping effort involving 87 volunteers, 80 nurseries and 1,203 traps, officials discovered that infested nursery stock had been distributed statewide to nearly 80 nurseries. Most of the 1,467 Japanese beetles trapped in 2017 came from these nurseries. The NDDA plans additional trapping and educational outreach in 2018.

The 2017 exotic wood-borer survey trapped none of the exotic species of state/national concern at its eight trapping locations in cities and potential entry sites. All specimens collected from the families Scolytidae, Cerambicidae and Curculionidae were identified and recorded. New county species records were collected in McHenry and Sioux counties, neither of which had been surveyed before.

The Dakota Access Pipeline protest site in Sioux County was included as a potential entry site in 2017 due to massive firewood imports during Dakota Access Pipeline protests from April 2016 through February 2017. Firewood was imported from states with quarantines and known populations of emerald ash borer, gypsy moth (*Lymantria dispar),* pine shoot beetle (*Tomicus piniperda*) and other invasive forest pests.

All three of the survey's notable species are common farther south and east in the U.S. Ips beetles infest stressed spruce and pine trees, and prefer breeding in freshly cut wood. *H. pruinosus* is an ash bark beetle and *P. dentifrons* breeds in hackberry.

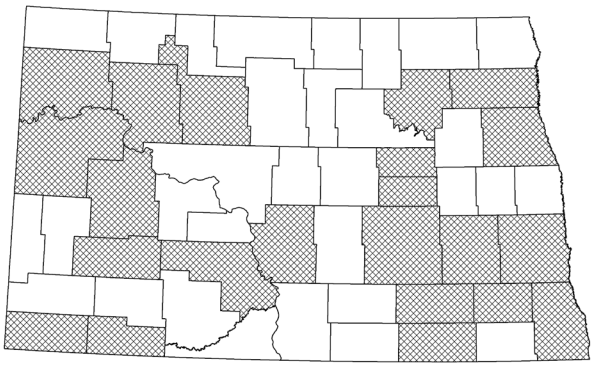


Figure 3: North Dakota Department of Agriculture trapped Japanese beetles (*Popillia japonica*) in 22 counties. (Lezlee Johnson, NDFS)

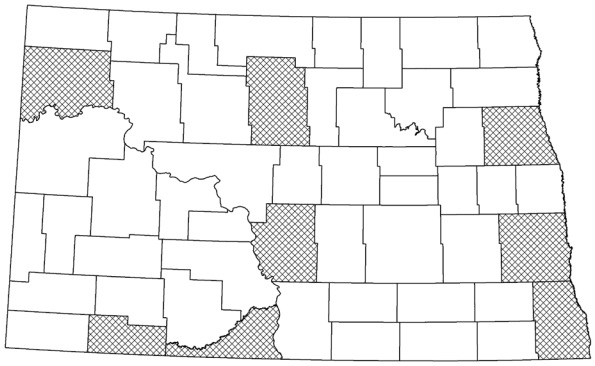


Figure 4: Exotic wood-boring insect survey trapping locations in cities and potential entry sites in eight counties. (Lezlee Johnson, NDFS)

Notable finds from the 2017 exotic wood-borer survey:

- A male and female six-spined ips (*Ips calligraphus*) were collected in Adams County. The only previous record is from Jamestown.
- *Hylesinus pruinosus* was recorded in Richland County. This is the third record of this species in the state.
- *Phloeotribus dentifrons* was recorded in Grand Forks County. This is the fourth record in the state.

Forest Health Surveys

Gypsy Moth Survey

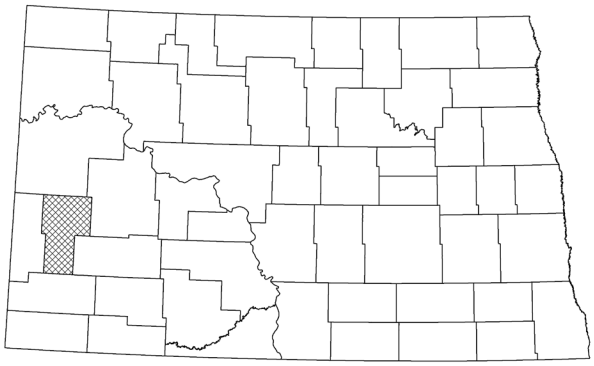


Figure 5: A male gypsy moth was trapped in Billings County. (Lezlee Johnson, NDFS)

The USDA Animal and Plant Health Inspection Service (APHIS) conducts gypsy moth and emerald ash borer surveys in North Dakota. A single adult male gypsy moth, the first since 2000, was trapped at Sully Creek State Park near Medora. The APHIS plans a delimiting survey in early summer 2018 to determine if this was a hitchhiker, as is suspected, or the result of an established population.

Emerald Ash Borer Survey

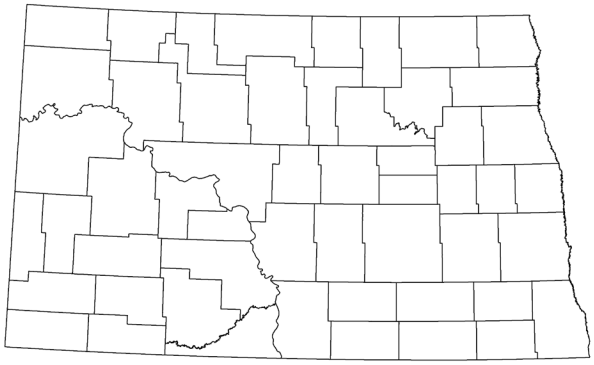


Figure 6: APHIS contractors placed 748 EAB traps. EAB was not found. (Lezlee Johnson, NDFS)

No emerald ash borers were detected in 748 traps that contractors placed in North Dakota in 2017. The APHIS has changed its EAB survey protocol for 2018 and will not place any traps in North Dakota. However, it will provide a limited supply of traps and lures. NDDA, NDFS, NDSU Extension Forestry and city foresters will conduct the statewide EAB survey.

Limber Pine Assessment

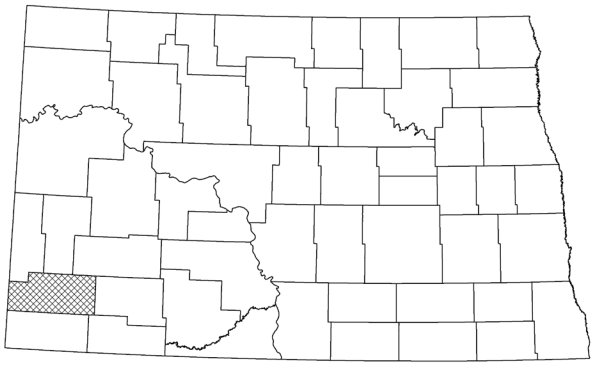


Figure 7: Slope County is home to a small limber pine population infected with an unknown needle blight. (Lezlee Johnson, NDFS)

Limber pine (*Pinus flexilis*) trees at the U.S. Forest Service Limber Pine Research Natural Area in Slope County appear to have an unknown needle blight. Jim Walla, forest pathologist with Northern Tree Specialties, led teams to visit the area to assess needle blight incidence and severity in 2015 and 2016. In 2017, he refined the sampling strategy so the data collected can be compared with data collected elsewhere in the limber pine range.

He guided a team to the area again in 2017 to collect samples and conduct tree health assessments. His initial observations in 2017 are that second-year needles had fewer symptoms in 2017 than in previous years, indicating that relatively little infection occurred in 2016.

Figure 8: Limber pine (*Pinus flexilis*) in Slope County. (Lezlee Johnson, NDFS)

Woodpeckers Foraging for Wasp Larvae on Bur Oak

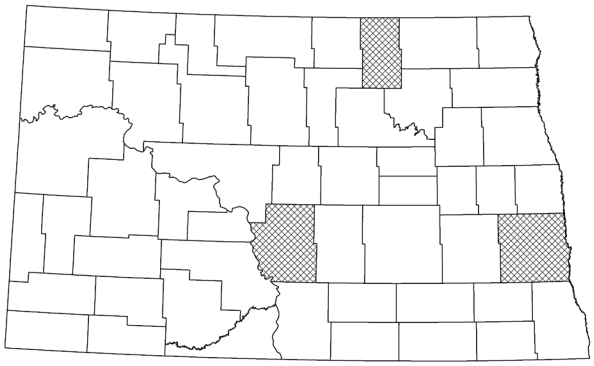


Figure 9: Woodpeckers foraging on bur oak were reported from Cass, Towner and Burleigh counties. (Lezlee Johnson, NDFS)

Bur oak (*Quercus macrocarpa*) bark shredding from an unknown causal agent first was reported in North Dakota in 2006. The symptoms reappeared in 2010-2011 and again in 2014, when they were reported in North Dakota, Iowa, Minnesota, Wisconsin and Montana.

In the winter of 2013-2014, NDFS and NDSU Extension Forestry assessed 200 oak trees in eight neighborhoods in Fargo. Samples of gall wasps emerging from wood collected in North Dakota, Montana, Colorado and Calgary, Alberta, were confirmed as *Callirhytis flavipes*. Downy woodpeckers (*Picoides pubescens*) damage the trees when foraging for the larvae infesting the bur oak bark. Severe damage leads to die-back, often of the tree's leader (Bergdahl, 2016).

Fargo, Cando and Bismarck reported foraging damage during the 2016-2017 winter. NDFS and NDSU Extension Forestry re-surveyed the original Fargo trees in 2017. Damage in the 2016-2017 winter was very light, in comparison with 2013-2014, and occurred on very few trees. Many of the trees that were damaged heavily in 2013-2014 displayed contorted growth or were missing in 2016-2017.

Figure 10: A downy woodpecker forages for *Callirhytis flavipes* larvae in the bark of a bur oak in Cando. (Photo courtesy of Rick Craig, Cando)

Weather and Abiotic Issues

Storms

Heavy snow and ice accumulations throughout much of the state damaged conifers and spreading deciduous trees in windbreaks and communities. Landowners reported more damage in central and western North Dakota, especially on small conifers and the lower branches of older conifers.

Snow hid the damage from view until March and April thaws. Winter storms also damaged boxelder (*Acer negundo*), particularly in older windbreaks in the eastern part of the state.

Figure 11: Spring thaw reveals snow and ice breakage in a Burleigh County windbreak. (Tom Claeys, NDFS)

Drought

This paragraph from the spring 2017 "North Dakota Climate Bulletin" details the beginning of the 2017 drought.

> **Drought:** Following the ninth wettest consecutive six-month period from September through February in North Dakota, this spring was the ninth driest. Even though the precipitation pattern changed as early as March, there was plentiful moisture trapped in the soil from the previous two seasons for spring planting. A cool start prevented planting and the other early season agricultural activities. It also slowed down the onset of the drought. However, after the temperatures bounced back to their normal range and even were above normal in some periods, evapotranspiration rates increased. Persistently dry conditions with increased evaporation demand intensified drought conditions rather rapidly by the end of the season. High wind, high evaporative demand and intense heat hampered germination. Locations in the drought-stricken areas started reporting blowing dust.

Supplemental watering has been critical for survival of newly planted trees, particularly in the west. Soil Conservation Districts (SCDs), responsible for planting most windbreaks and conservation trees, reported poor landowner compliance with watering recommendations and widespread planting failures.

The drought continued to develop as seen in this series of maps from the U.S. Drought Monitor.

U.S. Drought Monitor — North Dakota, 2017

http://droughtmonitor.unl.edu

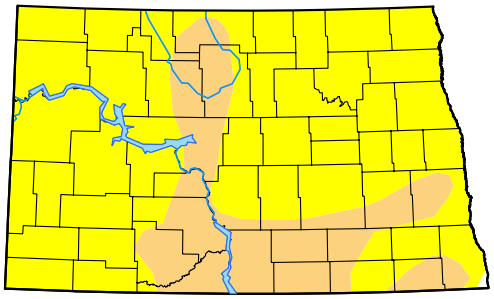
Author: Chris Fenimore, NCEI/NESDIS/NOAA

Intensity: D0 Abnormally Dry | D1 Moderate Drought | D2 Severe Drought | D3 Extreme Drought | D4 Exceptional Drought

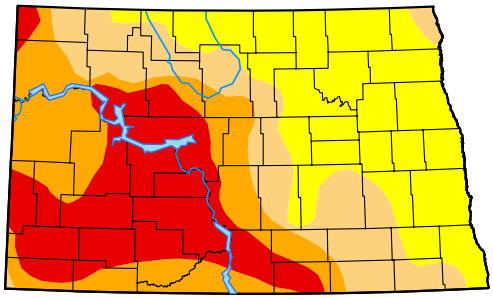
The Drought Monitor focuses on broad-scale conditions.Local conditions may vary. See accompanying text summary for forecast statements.

Figure 12: The 2017 drought began suddenly in May, worsened through the growing season and persisted into winter. (Maps courtesy of National Drought Mitigation Center-University of Nebraska Lincoln)

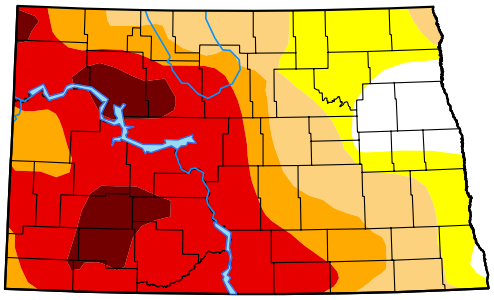
May 30



June 27



July 25



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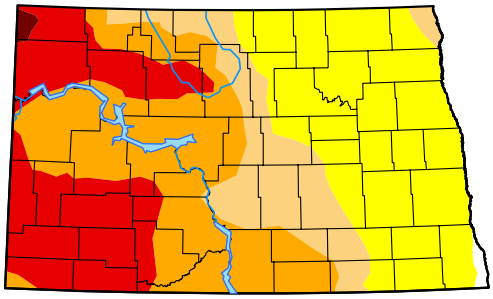
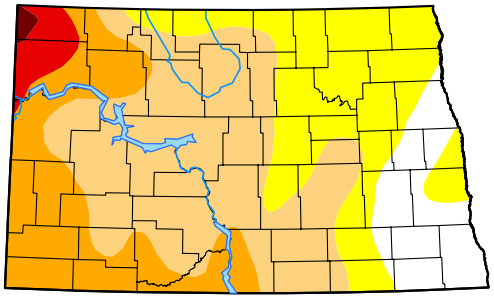


September 26



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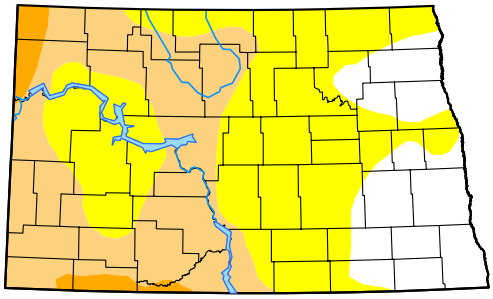

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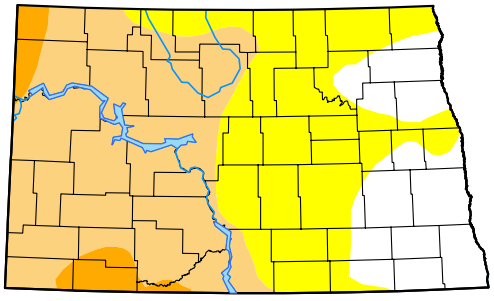
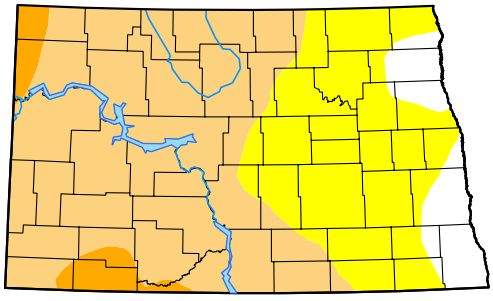


December 26



Weather and Abiotic Issues

Herbicide Injury

Herbicide injury in community and conservation tree plantings was behind more than half of all requests for tree health management assistance.

Improper Planting Practices

Tree health assessments throughout the state revealed that well-intentioned but improper planting and mulching practices are reducing the useful life of community and conservation trees. Trees often are planted too deeply and lack organic mulch to assist with moisture retention and soil cooling.

Fabric mulch applied in conservation tree plantings enhances early survival but fails to decompose. The fabric, forgotten under several years' accumulation of organic matter, girdles the trees it once protected.

Figure 13: A trowel reveals that the black fabric mulch, buried under a 20-year accumulation of organic matter, girdled and killed this ponderosa pine in a Grand Forks County windbreak. (Lezlee Johnson, NDFS)

Insects and Diseases

The most commonly encountered disease agents are spruce needlecasts (*Stigmina lautii* and *Rhizosphaera kalkhoffii*) in the east, and valsa canker (*Valsa kunzei*) of spruce, ash heart rot (*Perenniporia fraxinophila*), Dutch elm disease (*Ophiostoma ulmi* and *O. novo-ulmi*), diplodia needlecast (*Diplodia sapinea*) on ponderosa pine, and hardwood anthracnoses statewide.

The most commonly encountered insect agents are: forest tent caterpillar (*Malacosoma disstria*), cottony ash psyllid (*Psyllopsis discrepans*) on black and mancana ashes (*Fraxinus nigra* and *F. mandschurica*), yellow-headed spruce sawfly (*Pikonema alaskensis*), scales, aphids, galls and bark beetles.

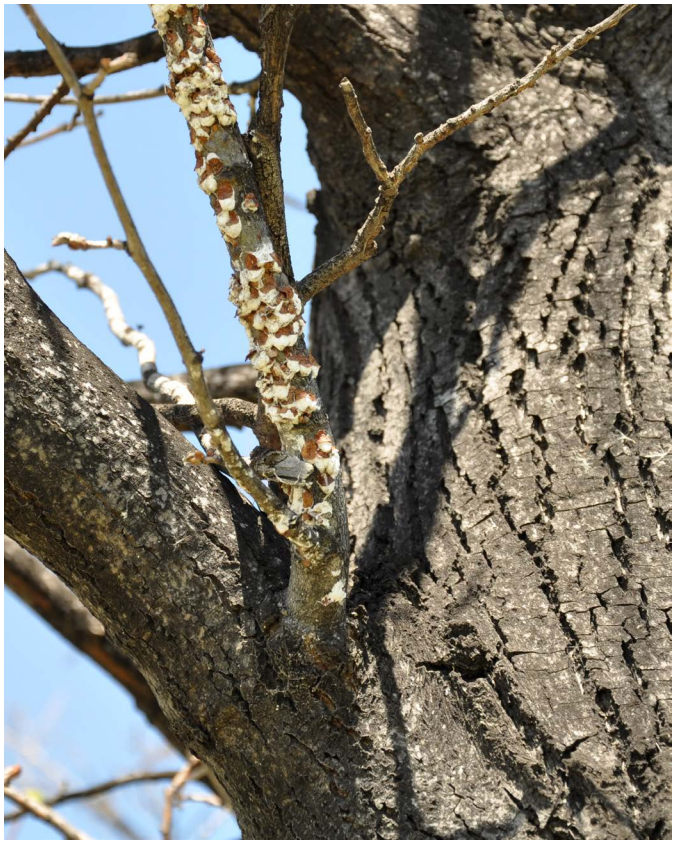


Figure 14: Cottony maple scale (*Pulvinaria innumerabilis*) on a littleleaf linden (*Tilia cordata*) in Bismarck. (Lezlee Johnson, NDFS)

Forest Health Issues of Concern

- An overabundance of green ash in light of potential introduction of EAB threatens the sustainability of riparian forest areas, conservation tree plantings and municipal forests.
- Regeneration is not occurring in the Mouse/Souris River Basin and elsewhere where extensive flooding during the 2011 growing season killed vast areas of forest.
- The overmaturity of aspen stands, accompanied by increasingly severe forest health issues, threatens the sustainability of aspen forests in the absence of stand-replacing disturbance.

Figure 15: Valsa canker symptoms in a blue spruce windbreak in Benson County. (Lezlee Johnson, NDFS)

Figure 16: Diplodia tip blight on a ponderosa pine in a Burleigh County windbreak. (Lezlee Johnson, NDFS)

Collaborative Project to Regenerate Aspen

To address the threat to aspen stand sustainability, the NDFS is collaborating with the North Dakota Game and Fish Department on an aspen regeneration project the U.S. Fish and Wildlife Service is funding under the Wildlife Restoration Act. The project recognizes that some wildlife species, such as the ruffed grouse (*Bonasa umbellus*), require the young and vigorous aspen growth that is missing. The project is regenerating 10 to 20 acres of aspen each year to improve forest health and provide critical habitat for ruffed grouse, deer, elk and moose in the Turtle Mountains.

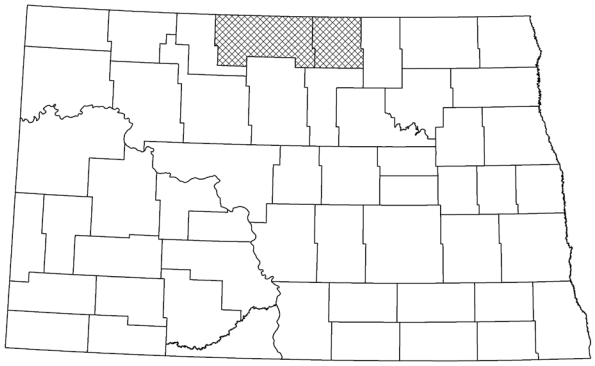


Figure 17: Aspen forest health and wildlife habitat improvements have begun in the Turtle Mountains. (Lezlee Johnson, NDFS)

Figure 18: On the left, hazelnut chokes out all aspen regeneration. On the right, a skid steer loader with a grinding attachment converts the understory and most of the declining overstory into mulch. Hand crews will fell the few remaining trees too large for the loader. This prepares the site for vigorous aspen regeneration critical for habitat and aspen sustainability. (Cody Clemenson, NDFS)

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