DEPARTMENT OF AGRICULTURE

Status of Invasive Forest and Landscape Pests in Minnesota

Plant Protection Division

Prepared January 2020

Emerald Ash Borer

Emerald ash borer (EAB) was discovered in four new counties (Brown, Nobles, Stearns and Steele) in Minnesota in 2019. While any new county becoming infested is disappointing, the rate of spread in Minnesota continues to be much slower than the national average (Figure 1). During 2019, the Minnesota Department of Agriculture (MDA) worked on a variety of projects related to EAB. They are described below.

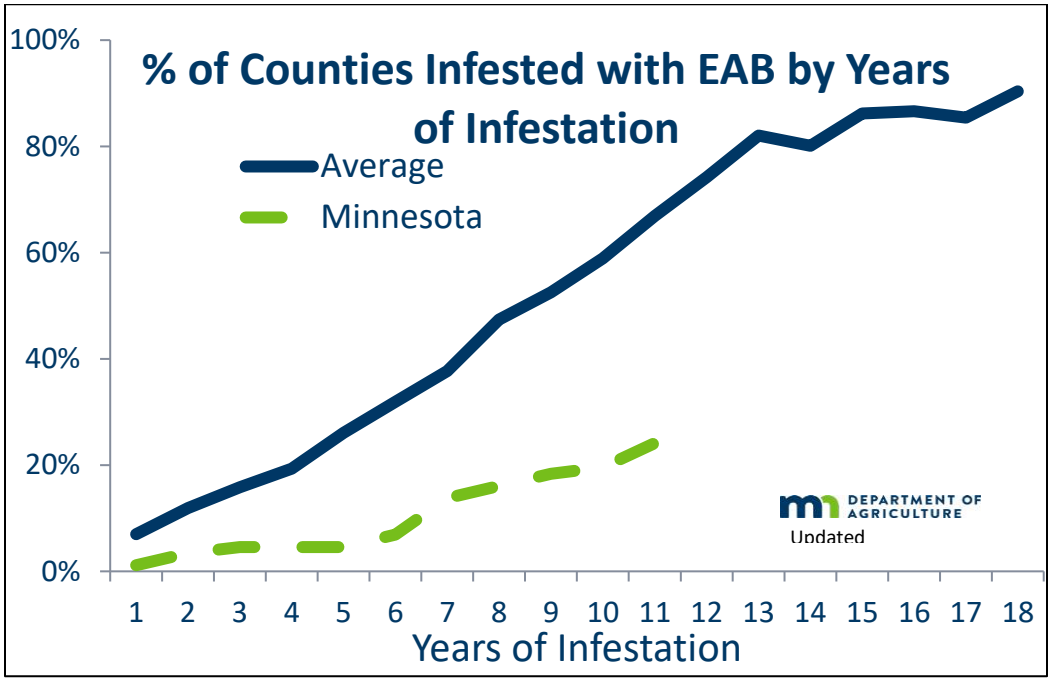

Figure 1. Rate of EAB spread to new counties in Minnesota vs the U.S.

Survey

In follow-up on citizen reports to the MDA Arrest the Pest hotline, EAB infestations were discovered in a number of new locations within regulated areas as well as four new county level detections (Figure 2). New county detections all received a delimit visual survey by MDA staff to understand the extent and severity of the infestations. All known EAB-infested areas can be viewed online: www.mda.state.mn.us/eabstatus.

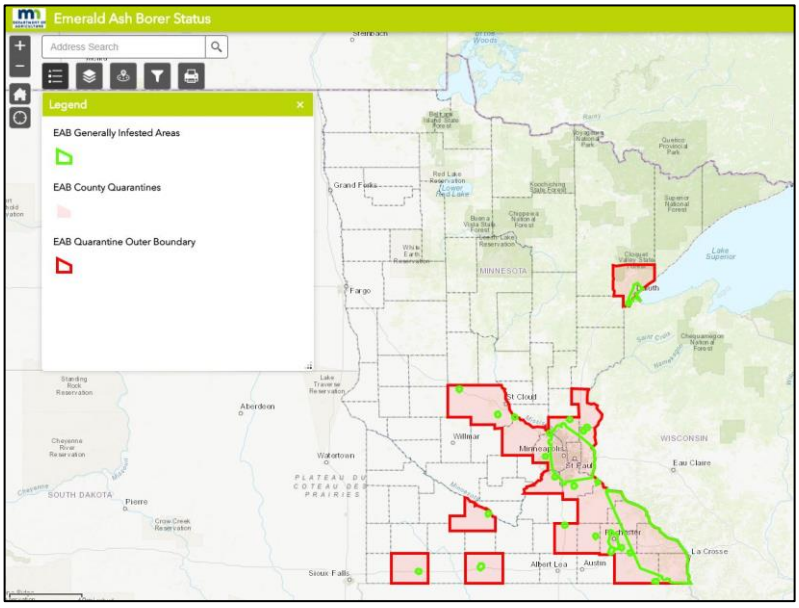

Figure 2. EAB-infested counties in Minnesota as of January 1, 2020.

Outreach

With support from the United States Forest Service (USFS), 30 EAB field workshops were held during 2019 in Rockville, Clearwater, Duluth, and the Historic Fort Snelling site in St. Paul. Over 150 individuals from local governments, tree care services, and the public attended. Additional workshops are planned for March 2020 in Steele, Anoka, and Nobles counties. To register for the free hour-long workshops, please visit www.mda.state.mn.us/eab.

Two EAB regional management meetings were held in February in Detroit Lakes, and a webinar was hosted in March for municipalities and forest managers. Over 100 managers attended the meetings to learn EAB management strategies that are being used throughout the state and what the University of Minnesota (U of M) has learned through their research. An EAB regional management meeting is scheduled for March 2020 in Brainerd.

Through a grant from the USDA Plant Protection Act 7721 (formerly known as the USDA Farm Bill), the MDA also conducted an advertising campaign in 2019 to highlight the risk of moving invasive species via firewood (Figure 3). Advertising occurred during the summer through a variety of media, including online, television, radio, and print.

Figure 3. A billboard near Stacy, MN used in the 2019 advertising campaign.

Biological Control

With support from the Environment and Natural Resources Trust Fund and the USDA EAB Parasitoid Rearing Facility, the MDA released 47,616 parasitic wasps at eight EAB-infested sites in southeast Minnesota, the Twin Cities, and Duluth during 2019. Since this project began in 2010, over 609,000 wasps have been released at 47 EAB-infested sites in Minnesota. Two species have been in use since 2010, and an additional species, *Spathius galinae*, was made available in 2016.

Intensive sampling at two locations of known establishment was completed for the second year. Whole tree sampling, bark sampling, and yellow pan traps were utilized to gain information on the ability of the wasps to

reproduce and reduce the EAB populations in EAB-infested locations. The University of Minnesota will analyze data collected by the MDA to determine the percentage of parasitism by each parasitic wasp species as well as develop efficacy curves for each sampling technique.

Sampling for parasitoid establisment at former release sites was conducted throughout the year. Winter bark sampling resulted in the recovery of the egg parasitoid *Oobius agrili* from three new locations: West River Parkway in Minneapolis, Farmers Community Park in Lewiston, and Whitewater Wildlife Management Area near Elba. Yellow pan traps were deployed during the summer and recovered *Tetrastichus planipennisi* from Farmers Communty Park in Lewiston.

Figure 4. Yellow pan trap used for recovering parasitoid wasps at EAB biological control sites.

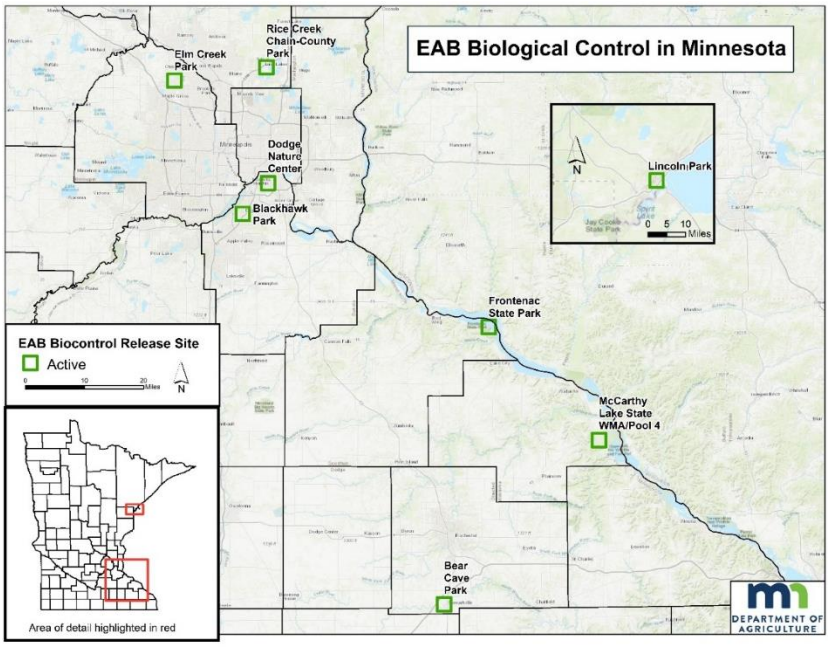

Figure 5. Map of EAB biocontrol sites that received wasp releases in 2019.

Regulatory

During 2019, four new counties (Brown, Nobles, Stearns and Steele) were formally quarantined. Once an emergency quarantine is put in place, public meetings are held and a 45-day opportunity for comment follows before the quarantine is formalized. The most current quarantine information can be found at www.mda.state.mn.us/pestregs.

The MDA now has 11 USDA or MDA certified firewood producers in the state (Figure 6).

Figure 6. Example of the MDA certified firewood logo.

Gypsy Moth

This is a shortened summary of the MDA's work with gypsy moth in 2019. A more thorough report can be accessed online at www.mda.state.mn.us/gypsymoth.

Survey

In 2019, a total of 21,794 pheromone baited gypsy moth detection traps were set in Minnesota by the MDA and other cooperators (Figure 7). A west central area was added to include municipalities and high-risk sites. The results map (Figure 7) shows the locations of the 21,523 traps set with the MDA's project area, positive trap locations, and the total number of moths trapped per county.

The survey season ran May through October, and the final statewide gypsy moth count was 544 moths in 435 positive traps. More detailed viewing of survey results can be found at www.mda.state.mn.us/gmresults2019.

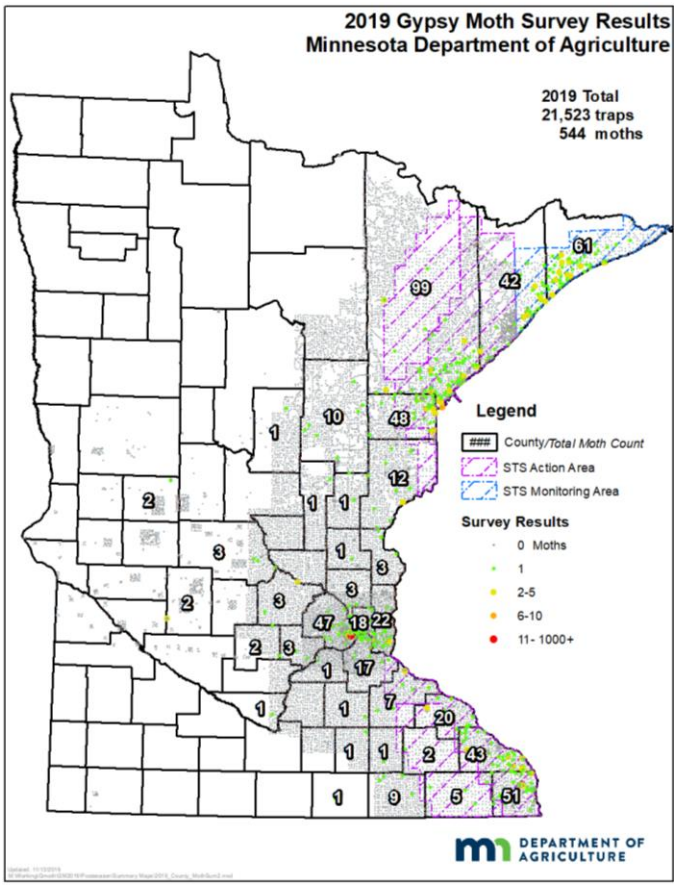

Figure 7. Locations of gypsy moth traps and male moth catches in 2019.

2020 Survey Plans

The MDA trapping survey will continue to focus on the eastern half of Minnesota, with special attention paid to both the Slow The Spread (STS) area and high-risk sites, such as nursery, mills, parks, and urban communities. There will likely be a western rotation (focusing on select municipalities and high-risk sites) again if funding is available. The goal is to maintain 20,000 early detection survey traps across the state in 2020 with approximately 60% of the placements focused in the eradication zone.

Treatments

The MDA's 2019 gypsy moth treatment areas were in both the uninfested area of the state and the STS action area. The MDA determined areas for gypsy moth treatments based on alternate life stage surveys conducted in the fall of 2018 and through the analysis of trapping survey results with the STS Program Decision Algorithm.

The MDA had treatment blocks in portions of Stillwater, Lakeville, and Chisholm. All three treatment blocks were treated with the product Foray 48B, which is a biological insecticide containing the active ingredient *Bacillus thuringiensis* var. kurstaki (Btk). The Stillwater and Lakeville treatment blocks were located in the uninfested zone and had the management goal of eradication. The Chisholm treatment block was located in the STS action area and also had the goal of eradication because of the isolated population. The three treatment blocks each had two aerial applications of Btk spaced 7-12 days apart. Treatment timing was very difficult due to a cold and extended spring season.

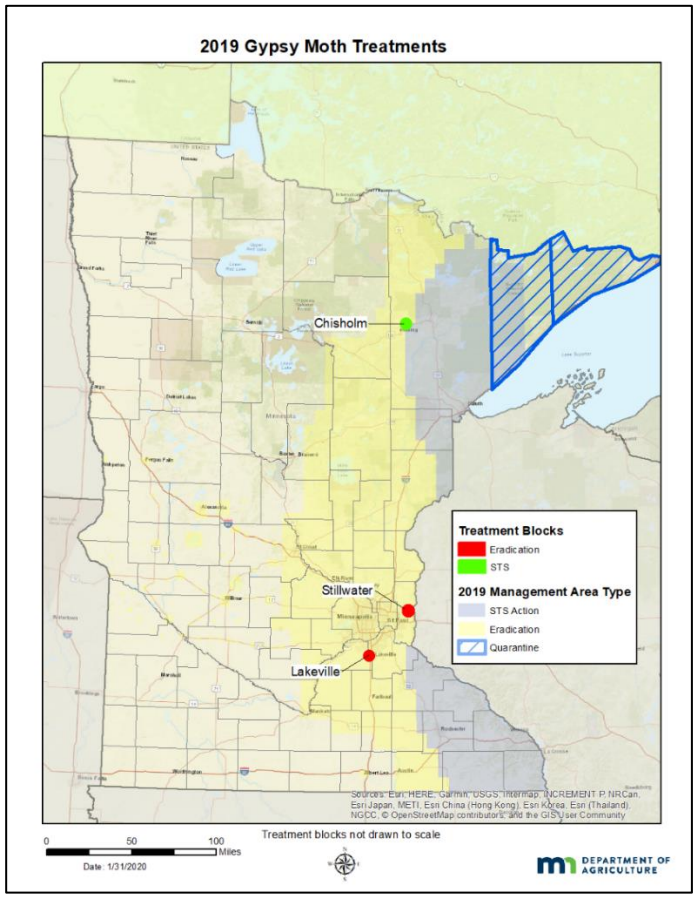

Figure 8. Locations of 2019 gypsy moth treatments.

2020 Treatment Plans

Even with the low moth numbers in 2019, three areas have been identified for proposed treatments in 2020 (Figure 9). For more detailed descriptions of the 2020 proposed gypsy moth treatments, please visit the MDA's gypsy moth treatment webpage at www.mda.state.mn.us/gmtreatments.

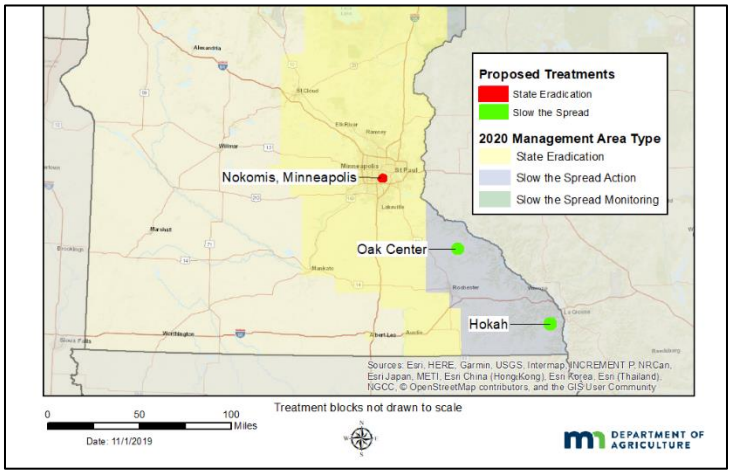

Figure 9. Proposed 2020 gypsy moth treatments.

Regulatory

Quarantine Compliance

The MDA establishes compliance agreements with entities that wish to move regulated articles out of gypsy moth quarantine areas (Figure 10). The majority of regulatory activities occur in Cook and Lake counties, which were quarantined in July 2014. Cook and Lake counties are also under a parallel federal quarantine for gypsy moth.

Limited permits are required for the transport of pulpwood to approved receiving facilities, and they expire annually. Gypsy moth receiving facility and holiday greenery compliance agreements are also renewed annually.

The Gypsy Moth Regulatory Program at the MDA is a multi-faceted program that relies on strong cooperative relationships with other state agencies and units within the MDA. The MDA cooperates with the Minnesota Department of Natural Resources to provide outreach at high-risk sites such as state parks, state forests, and public campgrounds. Outreach materials are also provided to privately owned campgrounds across Minnesota. The MDA cooperates with the Minnesota State Patrol to conduct commercial vehicle saturations. During these commercial vehicle saturations, log trucks are pulled over and their documentation is inspected to ensure quarantine compliance. The Plant Pest Regulatory Coordinator works closely with the Nursery Unit to ensure that nurseries and Christmas tree growers adhere to the federal gypsy moth quarantine.

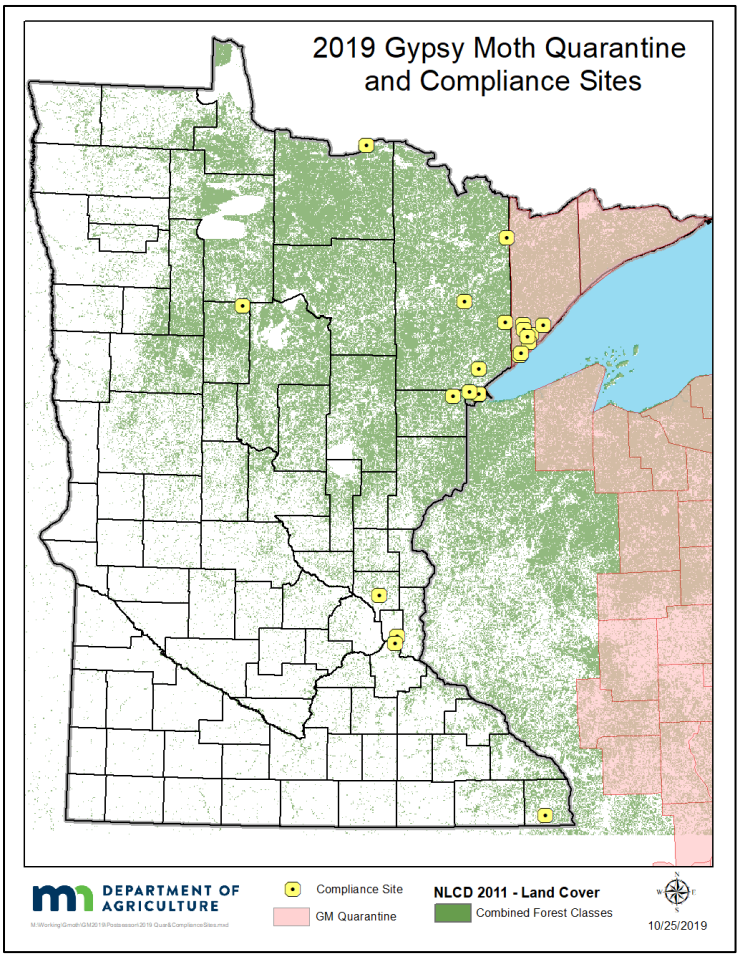

Figure 10. Locations of gypsy moth compliance sites and quarantined counties.

Velvet Longhorned Beetle

Velvet longhorned beetle (VLB), *Trichoferus campestris*, is an exotic beetle native to Asia and Eastern Europe and has the potential to become a pest in Minnesota. Preferred hosts include apple and mulberry, but it has also been recovered from maple in Canada and been found attacking and causing damage in live cherry and peach trees in Utah. Velvet longhorned beetle biology is similar to other woodboring beetles, such as the Asian longhorned beetle, but it differs in that is has the potential to infest and complete its lifecycle under dry wood conditions. Thus, the range of potential hosts could include dry, cut wood with bark, as well as recently cut logs.

This insect has been detected in Minnesota, previously in 2010 and again in 2014-2016 by USDA APHIS Plant Protection and Quarantine's (PPQ) exotic bark and woodboring beetle surveys near the Minneapolis/St. Paul International Airport.

Figure 11. A cross-vane trap is used for VLB detection surveys.

In 2018, the MDA received ten new species-specific lures from the USDA's Center for Plant Health Science and Technology and set cross-vane traps in close proximity to where the USDA historically captured VLB (Figure 11). The MDA captured a total of 93 adult VLB at 20 trapping locations located near the Minneapolis/ St. Paul International Airport in 2018.

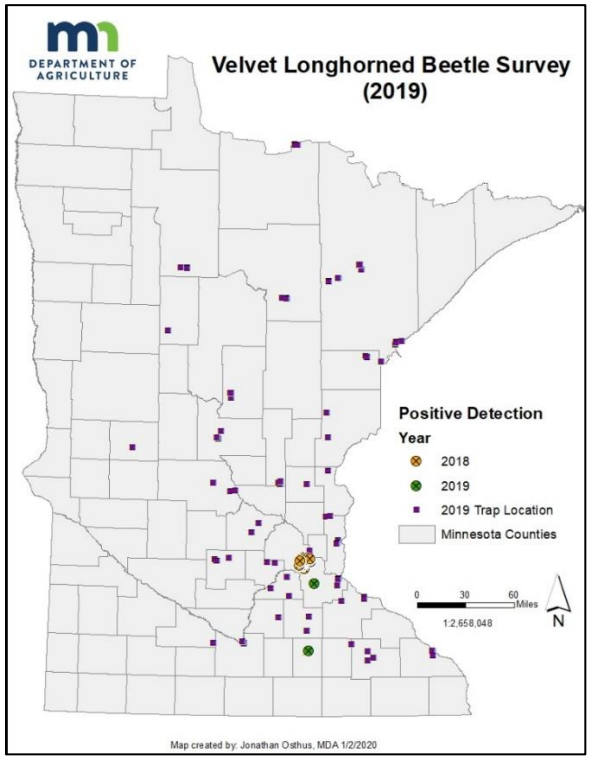

Figure 12. Velvet longhorned beetle trap detections in Minnesota.

In 2019, VLB traps baited with the new lure (Trichopherone) were set at parks and orchards in 30 counties throughout the state (Figure 12). A total of 67 sites (43 parks, 24 orchards) had traps placed at them from May through September. The survey resulted in new detections at an orchard in Farmington (Dakota County) and a city park in Owatonna (Steele County). These finds are new county detections and are the first ones located a substantial distance from the Minneapolis/St. Paul International Airport.

After receiving the species-specific Trichopherone lure and the increased trap detections in 2018, these new detections of VLB outside of the Minneapolis/St. Paul area don't come as a big surprise. It is important to note that no tree mortality associated with VLB has been documented and overall impacts to forest health are still unknown at this time.

Exotic Bark and Woodboring Beetles

Introduction of wood boring insects in solid wood packing material is a continuous threat to the United States. Some of our most serious invasive pests (e.g., emerald ash borer, Asian longhorned beetle) have been introduced via this pathway. Rustic log furniture has also been identified as another pathway through which exotic insects may enter the United States. Since 2016, there have been multiple incidents where Minnesota retailers have been found to be selling log furniture infested with wood boring insects such as *Callidiellium villosulum* and the velvet longhorned beetle, *Trichoferus campestris* (Figure 13). The MDA continues to get reports of insects emerging from these products 3-5 years after initial purchase.

Figure 13. Adult velvet longhorned beetle. Steven Valley, Bugwood.net

The purpose of this project is to survey for the presence of exotic woodborers that could affect a wide variety of forests in Minnesota as well as pathogens affecting ash trees. This is the third year of this USDA Farm Bill funded survey.

Survey

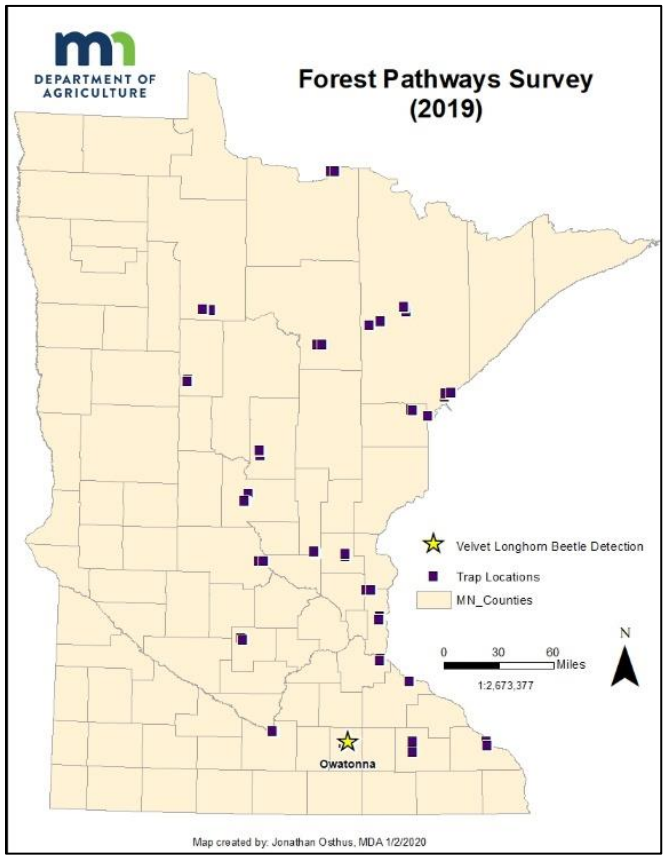

Figure 14. Map of 2019 Forest Pathways survey site locations and positive detections.

Field work for the Forest Pathways survey began the week of May 6, 2019. Survey staff set funnel traps and cross-vane panel traps (Figure 11) at 47 sites, mostly city parks, in 19 counties in Minnesota (Figure 14). Sites were evaluated for the presence of host trees, and 1-6 USDA approved traps were set (a total of 156 traps). Traps were placed in different areas of the sites to avoid any intermingling of pheromones that might inhibit attraction to the traps. Each trap was checked biweekly by survey staff, and baits were changed as needed. A total of eight trap checks were conducted throughout the field season with a total of 1,220 samples taken. The MDA surveyed for 15 exotic bark and woodboring insects (12 were surveyed with traps and three were surveyed visually).

All trap catches have been screened. A positive detection of velvet longhorned beetle (VLB) was confirmed from a trap that was part of this survey and set in the city of Owatonna. This is the first detection of VLB in Steele County. No other target pests were found in 2019.

Ash Disease Survey

Because of the growing concern that disease could be proliferating in ash trees under the cover of impacts from EAB, the MDA surveyed in 2019 for ash yellows caused by '*Candidatus* Phytoplasma fraxini' and ash dieback caused by the invasive fungus *Hymenoscyphus fraxineus*. The 2019 survey is the third and final year of the ash yellows survey and the second year of the ash dieback survey.

Figure 15. Ash yellows infected ash tree; EAB present in area. Ramsey County, MN

Symptoms of ash yellows include yellow, small leaves, epicormic branching, witches brooms (proliferation of shoots from the same place), reduced growth rate, branch dieback, and tree decline (Figure 15 and 16). Prior to the 2017 survey, there were only two reports of ash yellows in Minnesota (1989, 1999). Ash yellows is known to occur in Iowa, North and South Dakota, and in 31 counties in Wisconsin.

Ash dieback from Hymenoscyphus fraxineus is causing widespread ash mortality in several European countries; however, it has not yet been detected in the United States. This fungus spreads short distances by windborne spores and long distances on diseased ash plants, including nursery stock. Symptoms include brown, black, or wilted leaves hanging from branches, blackened leaf stems, diamond shape lesions on stems or branches that are centered on a branch or leaf entry point, and small fruiting bodies on blackened leaf stalks on the ground.

Field scouts surveyed 47 park properties in 19 counties for ash trees with symptoms of decline. An ash tree was considered positive for canopy decline if it displayed wilting leaves, thin canopy, dead branches, stunting, or chlorotic foliage. Trees with witches' brooms on the trunk or at the base of the tree were sampled and tested in the laboratory for the ash yellows phytoplasma.

Figure 16. Ash yellows infected tree; EAB not present in the area.. Polk County, MN

For ash dieback, only trees with diamond shaped cankers at the base of a dead branch, brown or necrotic leaves with black veins, or fruiting bodies growing from blackened stalks of leaves that had fallen were sampled.

No trees with symptoms of ash dieback were identified in the 2019 survey. Trees with symptoms of ash yellows were found at seven sites in Hennepin, Ramsey, Steele, Carver, and Blue Earth counties. Cuttings from witches' broom were collected and submitted to the University of Minnesota Plant Disease Clinic for molecular testing. Samples from five of the seven trees that were collected in 2019 were positive for the ash yellows phytoplasma.

Looking at the collective results of the 2017, 2018, and 2019 surveys gives us a broader idea of the occurrence of ash yellows in the state (Figure 17). Of the 30 ash trees that were sampled, 27 were green ash (*F. pennsylvanica*), two were black ash (*F. nigra*) and one was a white ash (*F. americana*). Samples from 13 of the 30 tested positive for ash yellows.

Ash yellows and EAB can result in similar symptoms of canopy decline, epicormic shoots, and witches' brooms. Although treatments exist for EAB-infested trees, there are no treatment options for trees infected with the ash yellows phytoplasma. Infected trees will progressively decline over time. The results from the 2017-2019 Ash Health Surveys demonstrate that ash yellows occurs in many areas of the state, and its presence and potential impact should be considered when making management decisions for EAB.

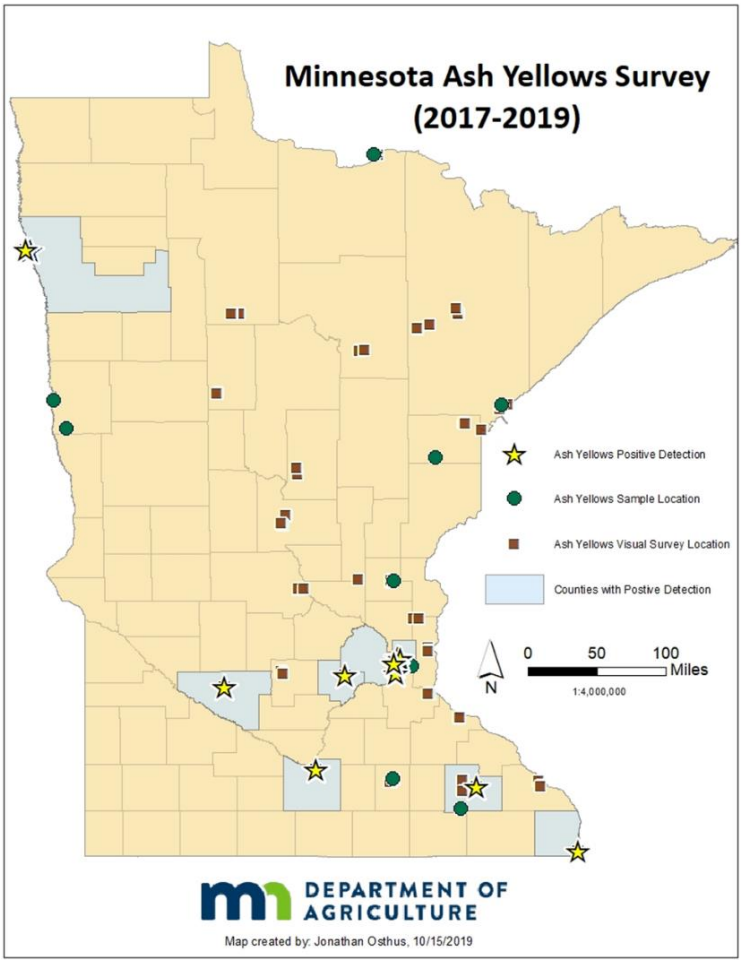

Figure 17. Locations surveyed for ash disease, ash yellows sample locations, and ash yellows positive detection sites.

Viburnum Leaf Beetle

Viburnum leaf beetle (*Pyrrhalta viburni* Paykull) was discovered for the first time in Minnesota in June 2019. The first report was in the southern Twin Cities metro area. Once the public was alerted to the presence of viburnum leaf beetle, several other citizen reports were confirmed positive in close proximity to the initial find. This insect has most likely been present in the Twin Cities metro area for some time.

Figure 18. Adult viburnum leaf beetle. Photo by: Whitney Cranshaw

Viburnum leaf beetle is native to Eurasia but appears to have become established in North America (Ottawa and Quebec, Canada) during the 1970s. Viburnum leaf beetle was first discovered in the United States in Maine in 1994; and as of 2007, it was considered to be established west to Ohio as well as in British Columbia and Washington State.

Viburnum leaf beetle feed only on *Viburnum* species. There are four species of *Viburnum* native to Minnesota (*V. edule* - squashberry*, V. lentago* - nannyberry*, V. rafinesquianum* – downy arrow-wood*, V. trilobum* – American high-bush cranberry), and one considered naturalized (*V. opulus* – European high-bush cranberry). Severe infestations can lead to complete defoliation which can weaken the plant and eventually lead to death.

The viburnum leaf beetle has one generation per year. It overwinters as an egg and must experience cold temperatures to complete their development. First instar caterpillar emergence occurs about the same time as the leafing out of arrowwood viburnum (*Viburnum dentatum*).

Larval feeding damage is generally between the leaf veins and results in a skeletonized appearance (Figure 19). When late instar larvae are ready to pupate, they crawl down the stem of the plant and pupate about 2-3 cm deep in the soil. Adults emerge in June and July to feed on the same foliage they fed on as immature insects. Adult feeding damage is diagnostic and looks like an oblong hole (Figure 20). Females lay their eggs on the underside of twigs in linear clusters; depositing eggs after chewing small pits and then covering them with a mixture of chewed bark and insect droppings.

Figure 19. Viburnum leaf beetle larvae. Photo by: Bruce Watt

Figure 20. Viburnum leaf beetle adult feeding damage. Photo by: Paul Weston

Elongate Hemlock Scale

The Elongate hemlock scale (EHS), *Fiorina externa* Ferris, was found for the second year in a row in Christmas trees and holiday greenery in Minnesota. The trees and greenery were imported into Minnesota from the Southeastern U.S. where this insect is established.

This pest is believed to have been introduced from Japan and was first found in New York in 1908. It is currently established in the Eastern United States but not in Minnesota. This insect is potentially a threat to our native conifer species such as spruces and firs. Elongate hemlock scale is reported to develop and reproduce on 43 species of native and exotic conifers. Primary hosts include hemlocks (Tsuga sp.), firs (Abies sp.), and spruce (Picea sp.), which several species are native to the United States.

The elongate hemlock scale is a small insect that secrete a waxy coating for defense and feed on the sap of plants. They have piercing/sucking mouthparts they insert into the host plant for feeding. Once they begin feeding, most species of scales remain stationary on the plant (Figure 21). This insect typically overwinters as an egg or a female carrying eggs. The life cycle consists of immobile adults and mobile immatures called “crawlers.” Crawlers are capable of dispersing and establishing new populations via birds or the wind. The life stages broadly overlap, so crawlers may be found throughout spring and summer. Males and females look quite different because the males have wings.

Detection of EHS is very difficult, but the female, which would normally be seen if an infestation is present, is dark brown and longer than wide. Adult females are typically found on the underside of the needles (Figure 22). Signs of elongate hemlock scale include a yellow banding on the top of infested needles which can lead to premature needle drop. The crowns of infested trees may have a thin appearance.

Figure 21. Adult and immature elongate hemlock scale on the underside of a fir needle.

Figure 22. Fir needles heavily infested with elongate hemlock scale.

For More Information

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