DEPARTMENT OF AGRICULTURE

Status of Invasive Fruit and Vegetable Pests in Minnesota

2022 Annual Report

2/1/2023

Contents

Minnesota Department of Agriculture
625 Robert Street North
Saint Paul, MN 55155-2538

reportapest@state.mn.us
www.mda.state.mn.us/reportapest

Pathways Survey for Invasive Pests of Fruit and Vegetables

The Pathways Survey, funded by the United States Department of Agriculture (USDA) Plant Protection Act 7721 (formerly The Farm Bill), focused on agricultural systems near urban areas, such as community gardens, fresh market produce farms, apple orchards, and vineyards. In addition, high tunnels were surveyed for diseases of tomatoes, peppers, and cucumbers. These sites were chosen because high tunnels can be sheltered areas were invasive diseases have the potential to overwinter and become established. Some of the high priority invasive species that are currently impacting Minnesota urban agricultural include brown marmorated stink bug and Swede midge. These invasive species were first found in urban areas before spreading into more rural areas of the state. Thus, agricultural systems in and around urban areas can be a pathway by which invasive species become established and spread.

Urban agricultural systems made good survey sites due to the high diversity of crops. This provided opportunities to monitor for a broad range of invasive insects and plant pathogens. The Minnesota Department of Agriculture (MDA) worked with partners including the USDA Animal and Plant Health Inspection Service (APHIS) Plant Pest Quarantine (PPQ) and the University of Minnesota (U of M) to determine which insects and diseases to include in the survey. Some key criteria for including an invasive pest in the survey were:

- The likelihood of an organism reaching Minnesota soon (due to proximity to existing infestations or ease of movement)
- The prevalence and importance of potential hosts in Minnesota
- Climatic suitability, particularly likelihood of overwintering survival

Figure 1. A community garden site for the Agricultural Pathways Survey.

Survey Procedure

The 2022 Agricultural Pathways Survey was conducted from early June through mid-September, with sites visited approximately every two weeks. Sites were in the Twin Cities and surrounding suburbs, Duluth, St. Cloud, Alexandria, and Rochester. Primary sampling techniques included pest-specific traps and visual inspection of plants for symptoms of disease or insect injury. Insect traps were checked at each site visit, and samples were collected and submitted to the MDA Laboratory Services. Insects were then screened, and if found, those with national implications were submitted to the USDA for final identification.

On each site visit, a visual inspection was conducted on a portion of the plants. Plant samples were collected and submitted to the MDA Laboratory Services for further analysis when disease symptoms not identifiable as common garden diseases were found.

Table 1 shows the insect pests in the Agricultural Pathways Survey. Table 2 shows the plant disease pests in the Agricultural Pathways Survey. Table 3 shows the site numbers by types.

Table 1. Insect pests in the Agricultural Pathways Survey.

Scientific Name	Common Name	Survey Site
Halyomorpha halys	Brown marmorated stink bug	Blueberry farms, vegetable gardens, orchards, vineyards
Adoxophyes orana	Summer fruit tortirx moth	Orchards
Epiphyas postvittana	Light brown apple moth	Orchards
Lycorma delicatula	Spotted lanternfly	Orchards
Trichoferus campestris	Velvet longhorned beetle	Orchards
Acrolepiopsis assectella	Leek moth	Vegetable gardens
Contarinia nasturtii	Swede midge	Vegetable gardens
Neoleucinodes elegantalis	Tomato fruit borer	Vegetable gardens
Tuta absoluta	Tomato leafminer	Vegetable gardens
Rhagoletis mendax	Blueberry maggot	Blueberry farms
Lobesia botrana	European grapevine moth	Vineyards

Table 2. Plant disease pests in the Agricultural Pathways Survey.

Scientific Name	Common Name	Survey Site
Candidatus Phytoplasma mali 16SrX-A	Apple proliferation	Orchards
Gymnosporangium yamadae	Red star rust	Orchards
Monilinia fructigena	Apple brown rot	Orchards
Clavibacter michiganensis subsp. *michiganensis*	Bacterial wilt and canker of tomato	Vegetable gardens and high tunnels
Cucumber Green Mottle Mosaic Virus	CGMMV	Vegetable gardens and high tunnels
Pseudoperonospora cubensis	Cucurbit downy mildew	Vegetable gardens and high tunnels
Ralstonia solanacearum race 3 biovar 2	Bacterial wilt	Vegetable gardens and high tunnels
Tomato Brown Rugose Fruit Virus	ToBRFV	High tunnels
Candidatus Phytoplasma australiense 16SrXII-B	Australian grapevine yellows	Vineyards
Candidatus Phytoplasma solani 16SrXII-A	Stolbur disease	Vineyards
Candidatus Phytoplasma vitis 16SrV-C	Flavescence dorée	Vineyards
Pseudopezicula tetraspora	Angular leaf spot	Vineyards
Pseudopezicula tracheiphila	Rotbrenner disease	Vineyards
Xylella fastidiosa	Pierce's disease	Vineyards

Table 3. Agricultural Pathways Survey site numbers by type.

Site Type	Counties	Sites With Visuals and Traps	Sites With Visuals Only	Sites With Traps Only
Orchards	18	31		4
Vegetable gardens	10	18		
Vineyards	8	11		
Blueberry farms	6			6
High tunnels	6		6	

Insect Finds

Brown Marmorated Stink Bug

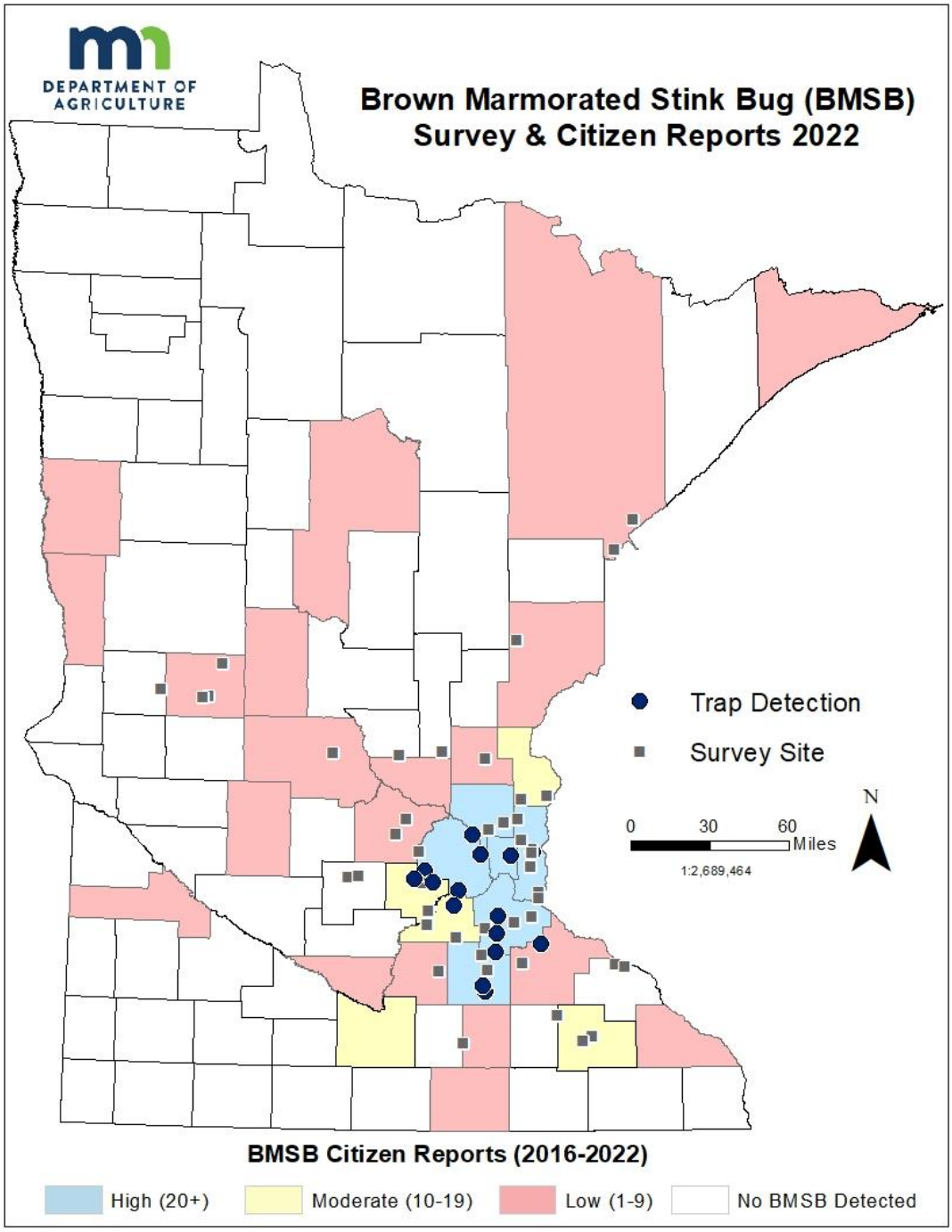
Brown marmorated stink bug (BMSB) (*Halyomorpha halys*) was first introduced to the United States in the mid-1990s from eastern Asia (Figure 2). It became a serious problem for fruit growers in the mid-Atlantic states in 2009. At present, BMSB is known to occur in most states as well as Canada. It is a generalist pest that will feed on many plants, including some economically important to Minnesota. BMSB is currently considered an agricultural and nuisance problem pest in Minnesota www.stopbmsb.org/where-is-bmsb/state-by-state/

BMSB was first identified in Minnesota in 2010 and continues to be detected throughout the state. To date, it has been detected in 29 counties. Most BMSB finds have been in the greater Twin Cities metropolitan area. The insect is now considered established in the seven-county metropolitan area. The MDA tracks the distribution and abundance of BMSB across Minnesota in multiple ways, including citizen reports and multiple state and federally funded field surveys.

Figure 2. Adult BMSBs are approximately 1/2 inch long.

Figure 3. A brown marmorated stink bug sticky trap in a Minnesota apple orchard.

Figure 4. 2022 BMSB survey locations and results.



Survey

The BMSB survey ran from May through October at 80 sites covering 24 different counties (Figure 4). There were 26 survey sites with BMSB detections in nine counties (Table 5). The amount of BMSB captured at most of these locations was very small, and there is little evidence that they are causing any widespread damage in these settings. Populations are building quickly in urban settings and may require implementation of integrated pest management strategies soon.

Table 5. BMSB positive counties by survey site types.

County	Blueberry Farm	Orchard	Residential	Vegetable Garden	Vineyard
Carver					2
Chisago			1		
Dakota	1	2			
Goodhue					1
Hennepin			2	4	
Ramsey		1	4	2	
Rice		2			
Scott		1			
Washington		2			
Total	**1**	**8**	**7**	**6**	**3**

BMSB Monitoring

The MDA continues to partner with the U of M through data sharing and research. The U of M evaluates and understands the community of natural enemies that are present in agricultural settings that may have an impact on BMSB population dynamics. The MDA organizes a monitoring network for BMSB to better track its distribution and abundance. An interactive map of current BMSB detections in Minnesota is available on the MDA's BMSB webpage: www.mda.state.mn.us/bmsb

A large increase in reports and trap catches of BMSB in 2022, including trapped nymphs, has indicated growing activity and establishment in the Twin Cities metropolitan area. It is also becoming more common for sites to have detections across multiple years. The increase has been well documented with seven years of monitoring data (Figure 5 and 6). This information provides an opportunity to closely monitor the build-up of BMSB populations in urban and residential settings and its transition to agricultural settings. Detailed monitoring can provide information that could possibly help avoid reactive use of insecticides by agricultural producers.

In addition to monitoring BMSB, the MDA placed yellow sticky cards from mid-June through mid-September for *Trissolcus japonicus,* a non-native wasp species that parasitizes BMSB eggs that has been captured in other states that have BMSB. The MDA placed 95 cards at 11 locations where BMSB nymphs had been detected in previous years. Cards were screened throughout December and January and suspected *T. japonicus* were removed for further identification. Twenty-six *Trissolcus* specimens were sent off to be identified by Elijah Talamas at the Florida Department of Agriculture. Results included four wasps that were the BMSB egg parasitoid *Trissolcus japonicus*, the first find in Minnesota. These came from residential sites in St. Paul and Roseville where reproducing populations of BMSB are well documented. The other specimens identified were *T. euschisi* and *T. thyantae*.

Figure 5. Percent of Minnesota counties with BMSB detections and number of agricultural production sites with BMSB detections since 2014.

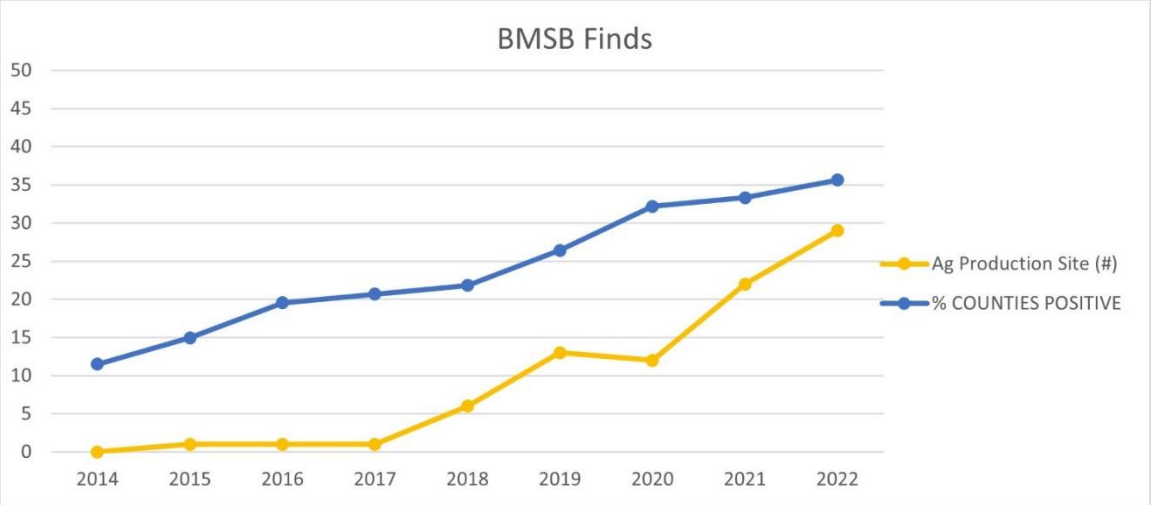
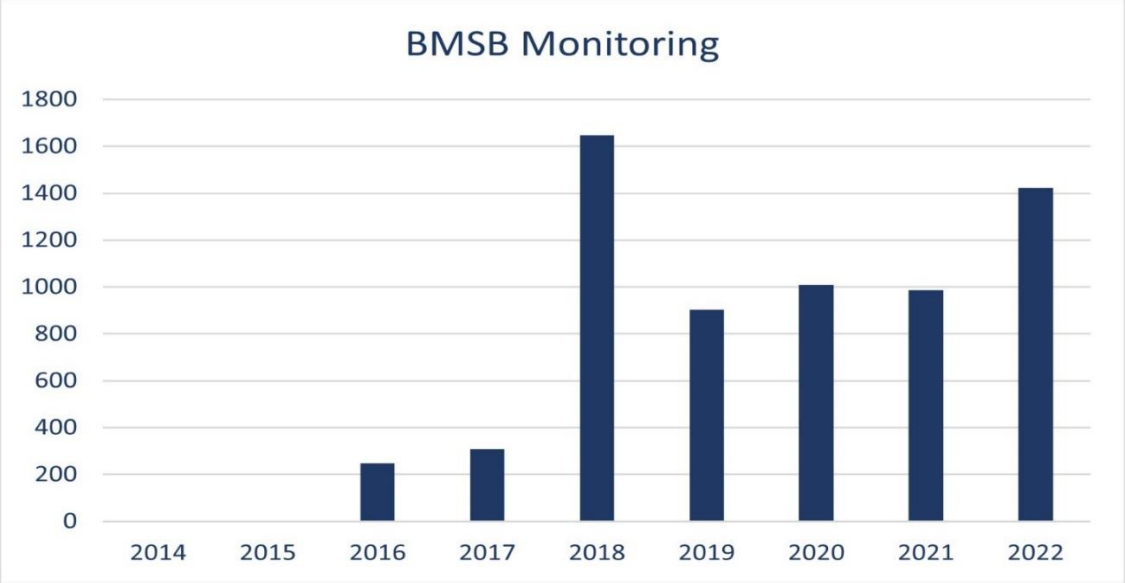


Figure 6. Number of BMSB adults and nymphs captured in survey traps each year.



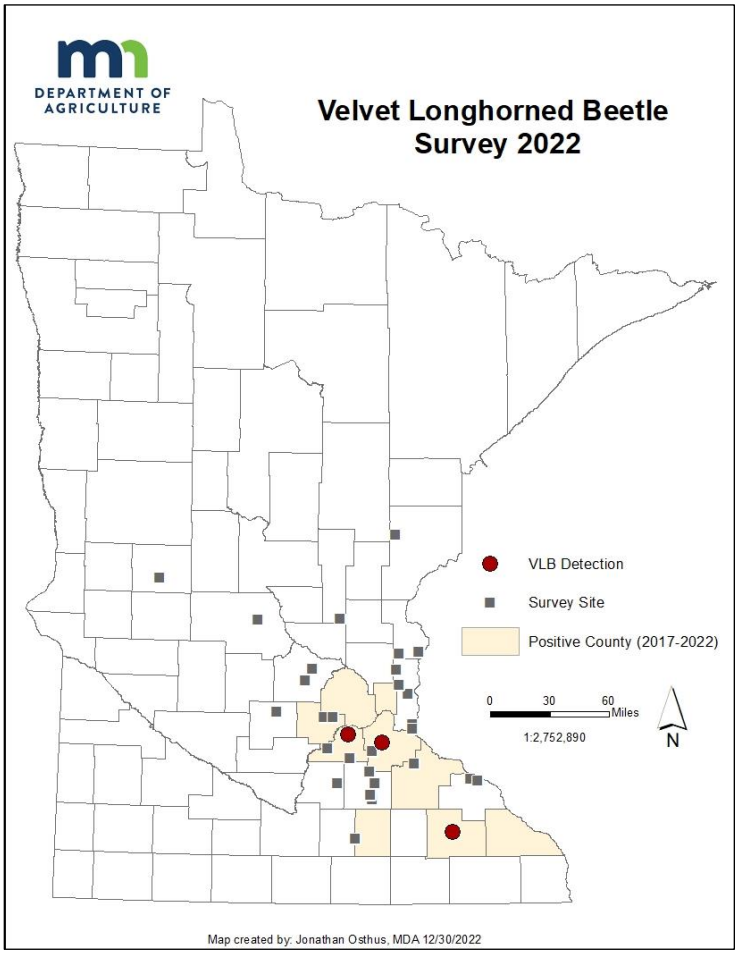
Velvet Longhorned Beetle

Velvet longhorned beetle (VLB) (*Trichoferus campestris*) is an exotic beetle native to Asia and eastern Europe with the potential to become a pest in Minnesota (Figure 7). Preferred hosts include apple and mulberry, but it has also been recovered from maple in Canada and has been found attacking and causing damage in live cherry and peach trees in Utah. Velvet longhorned beetle biology is like other woodboring beetles, such as the Asian longhorned beetle, but it differs in that it 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.

Figure 7. Adult velvet longhorned beetle. Boris Loboda, http://ukrbin.com/show_image.php?imageid=28517

In 2022, VLB traps were set in 17 counties at 31 orchards. Adult beetles were captured in three counties: Dakota, Olmsted, and Scott. Recent finds indicate that VLB is likely widely established in parts of central and southern Minnesota. No evidence of damage caused by VLB has been observed. The MDA will continue monitoring for VLB in orchards in 2023.

Figure 8. VLB trapping locations and positive detections.



Disease Finds

Red Star Rust

Red star rust, caused by the fungus *Gymnosporangium yamadae*, is native to Japan, China, and Korea. This disease was first identified in the United States in 2009 in several northeastern states and was reported in Wisconsin in 2021. In 2022, the MDA identified red star rust in Anoka, Carver, Dakota, Hennepin, Le Sueur, Ramsey, Rice, and Scott counties. Infected apple and crabapple trees were present in commercial apple orchards, nurseries, and landscape plantings.

The red star rust fungus infects apple, crabapple, and juniper at different stages of its life cycle. The most common symptom on apple and crabapple are bright red, orange, or yellow leaf spots. Some susceptible varieties of apple will drop infected leaves, resulting in yield loss. Small (<0.4 inches in diameter) woody galls form on juniper twigs. These produce a bright orange gelatinous mass full of fungal spores in wet spring

weather. Spores produced on infected junipers are carried by wind and rain to infect apple and crabapple leaves in spring. In fall, chestnut brown powdery spores produced on infected apple and crabapple leaves are carried by wind to infect nearby junipers.

Figure 9. Red and orange leaf spots caused by red star rust in a Zestar apple.

Figure 10. Bright red leaf spot with long finger like spore producing structures emerging from the lower leaf surface on a crabapple tree infected with red star rust.

Bacterial Canker of Tomato

Bacterial canker of tomato, caused by *Clavibacter michiganensis* subsp. *michiganensis* (CMM), can cause spots on fruit (Figure 11), leaf wilt, stem cankers, and plant death. In 2022, tomatoes grown in community gardens, commercial vegetable fields, and high tunnels were surveyed for symptoms of bacterial canker. Samples of suspect plants were analyzed at the MDA Laboratory Services to determine if CMM was present.

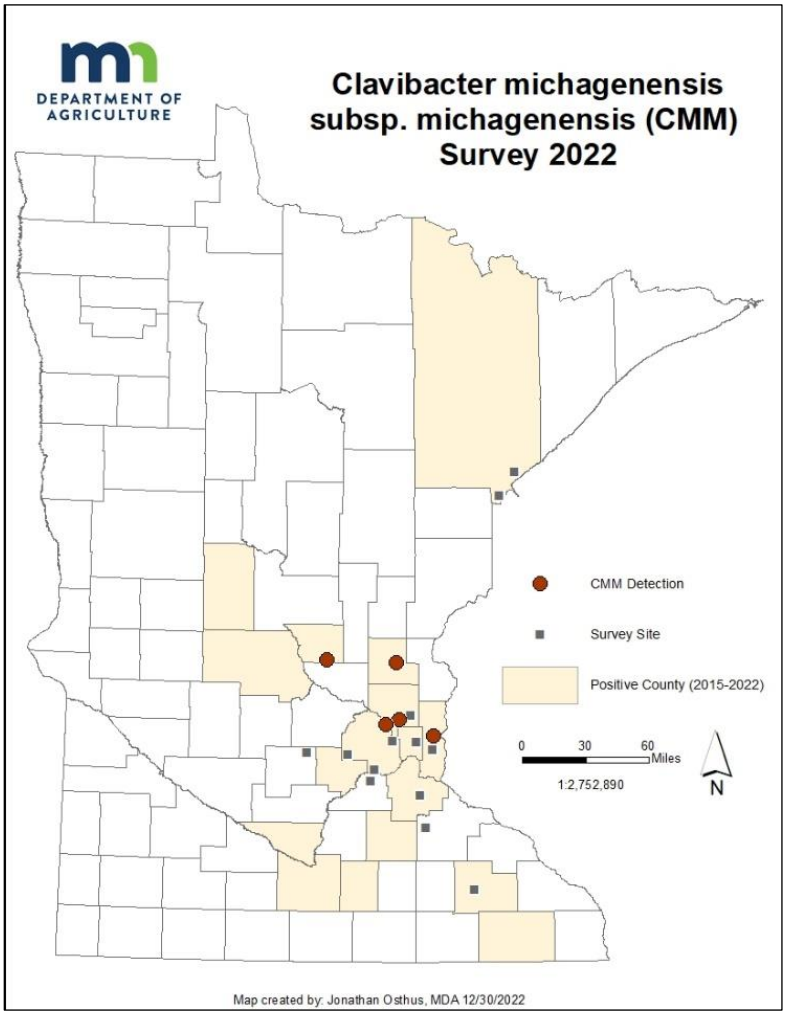
As in previous years, infected plants found inside high tunnels had different symptoms than infected plants identified outdoors. In a field or garden, the CMM bacteria splash with rain and irrigation resulting in spots on fruit and discoloration of the leaf edges. Plants in a high tunnel are sheltered from rain and do not have fruit spots. CMM is more likely to spread on workers' hands and tools in a high tunnel or greenhouse where plants are frequently handled for pruning, staking, and tying. The bacteria infect minor wounds caused by handling, then move into the plant's vascular system. This results in wilt, cankers, and death of the plant.

Figure 11. Tomato fruit infected with bacterial canker.

Prior to 2015, the occurrence and distribution of bacterial canker of tomato in Minnesota was unknown. CMM has now been identified in 17 counties across Minnesota. The 2022 survey found CMM infected plants at five sites in Anoka, Benton, Hennepin, Isanti, and Washington counties. This pathogen had been previously identified in all five counties in earlier surveys. It is possible for CMM to survive in plant debris from one season to the next after it is initially introduced. Introduction of CMM commonly occurs on infected tomato seed or tomato transplants.

For more information on bacterial canker of tomato visit: www.mda.state.mn.us/plants/plantdiseases/cmm

Figure 12. Counties where bacterial canker of tomato has been identified (2015 – 2022).



For More Information

Angie Ambourn

Entomologist/Supervisor, Pest Detection and Export Certification Unit
angie.ambourn@state.mn.us
651-201-6073