Progress report 1 – August 31, 2023 MSRPC Project: 10-15-44-23151

2023 Western Minnesota Soybean IPM Survey & Ag Student Training Program

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Project Summary: The western Minnesota soybean IPM survey expands our ability to obtain field reports on crop conditions and pest activity to tailor educational outreach to crop managers through radio, digital newsletters and through print in the ag press. Should something for which additional information is needed in-person, the primary investigators will partner with company-sponsored plot tour events to provide education regarding new or emerging pest and disease issues. The goal is to provide information regarding pest and disease pressure to producers to assist them in making economical pest management decisions.

Minnesota soybean farmers continue to face new and emerging pests. This survey expands our ability to obtain field reports on crop conditions and pest activity to tailor outreach to crop managers. With the invasive soybean gall midge confirmed in 25 Minnesota counties since 2020 and a native leafmining moth (*Macrosaccus morrisella)* that was found colonizing soybeans for the first time in the US in Minnesota in 2021, understanding the range of these devastating (or *potentially* so, in the case of the leafminer) pests is critical. Without having "boots in the field" trained to look for both current and invasive pests Minnesota soybean producers would not be alerted to potential current or emerging management challenges, such as when pyrethroid insecticide-resistant soybean aphids were first observed.

PROPOSAL OBJECTIVES:

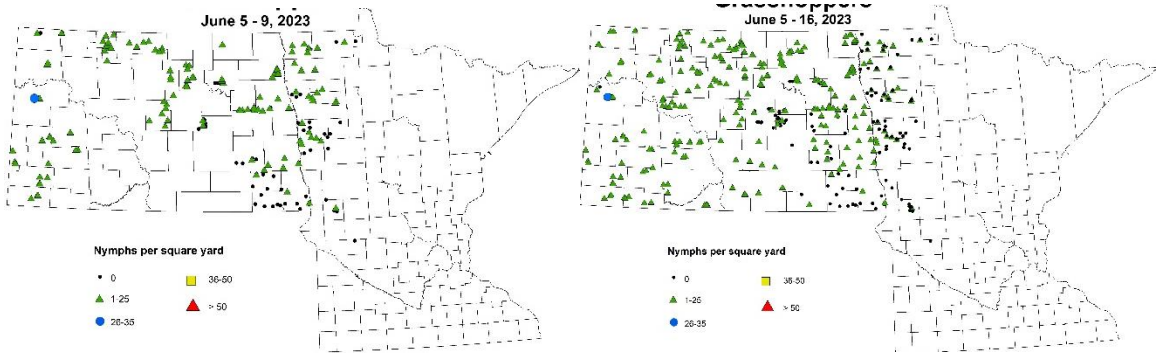
1) **2023 Western Minnesota Soybean IPM Survey & Ag Student Training Program.** *(PI: A. Peltier & A. Hanson)*
   a) Conduct field surveys to report soybean crop stage and pest conditions in NW and WC MN.
      i) Partner with the NDSU IPM program in conducting and reporting field and pest conditions across a region that includes NW and WC MN and eastern ND.
      ii) Deliver timely crop updates based on field observations with an emphasis on soybean aphid, two-spotted spider mite and other crop pest conditions as they develop.

Leveraged funding: To provide a more diverse summer experience for this program's interns and to share costs, we also sought and obtained funding from the Minnesota Wheat Research and Promotion Council for a similar small grains-version of the soybean survey.

Project Methodology. The MSRPC-sponsored IPM Survey was funded and conducted for the first time in 2015. UMN Extension continued this project in 2023 in coordination with similar efforts in North Dakota. As soon as MSRPC funding decisions were finalized, UMN Extension personnel began to advertise these positions to potential student interns to work out of regional Extension offices in Crookston, Moorhead and Morris, MN. Following the lead of NDSU Extension IPM, which has had success recruiting (and retaining, year after year) rural high school biology and agriculture teachers seeking summer employment, we contacted teachers in public high schools and community colleges in northwest and west-central Minnesota. We also made direct contacts to people and advertised on Handshake, a website that university students looking for jobs frequent. Despite being able to offer $17/hr for people with some experience or a bachelor's of science degree, we were only able to recruit a scout to work out of the Moorhead and Crookston regional Extension offices and so the survey was not able to go counties further south than Big Stone, Stevens Pop and Stearns Counties. Having a scout working out of the Morris regional Extension office (in Stevens County) would have allowed this.

Project Deliverables:

The IPM scouts began the season scouting small grains fields, switching over to soybeans mid-season. At each field, the scout collected data both inside and outside fields. Outside each field, grass areas that bordered fields were swept for grasshopper nymphs (**Figure 1**) and adults (**Figure 2**). Soybeans were inspected for growth stage (**Figure 3**), soybean aphid incidence (**Figure 4**), soybean aphid severity (**Figure 5**), presence of aphids colonized by parasitic wasps (**Figure 6**), number of bean leaf beetles (**Figure 7**) and the severity of chewing injury they caused (**Figure 8**), two spotted spider mite (TSSM) presence on the field edge (**Figure 9**) and inside the field (**Figure 10**), soybean gall midge presence (**Figure 11**) and soybean tentiform leafminer presence (**Figure 12**). Please find Figures 1 through 12 below.



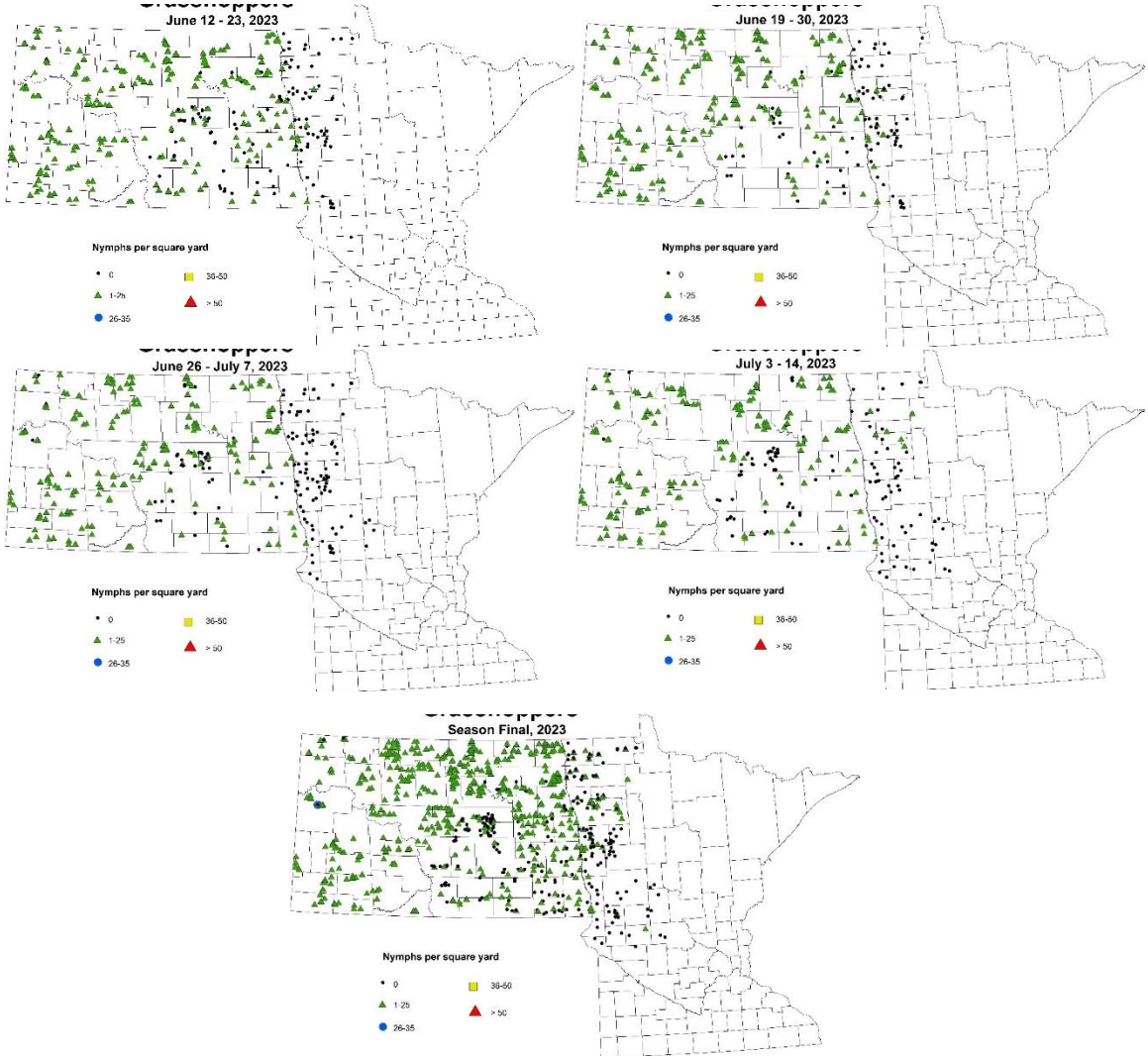
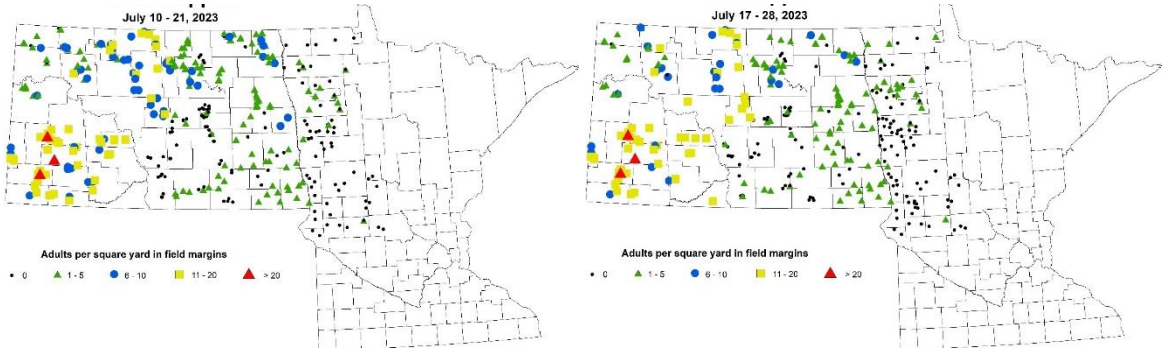


Figure 1. Grasshopper (multiple spp.) nymphs caught on the edge of scouted soybean fields over two-week periods from June 5 through July 14, 2023; Map: NDSU IPM.



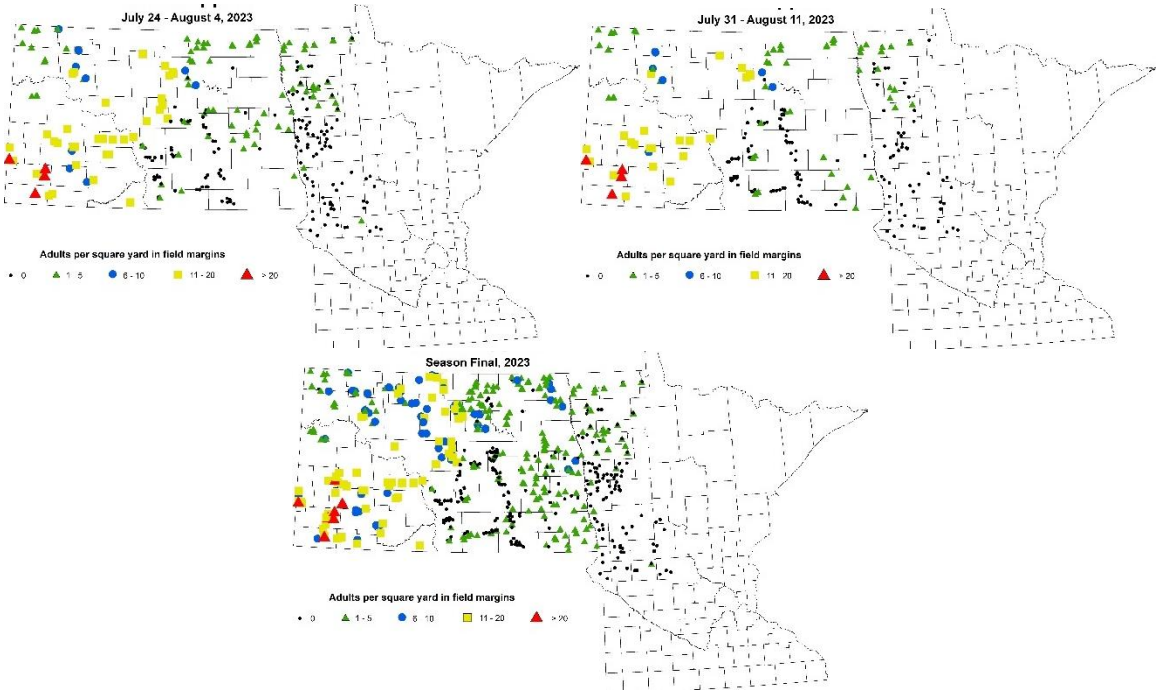
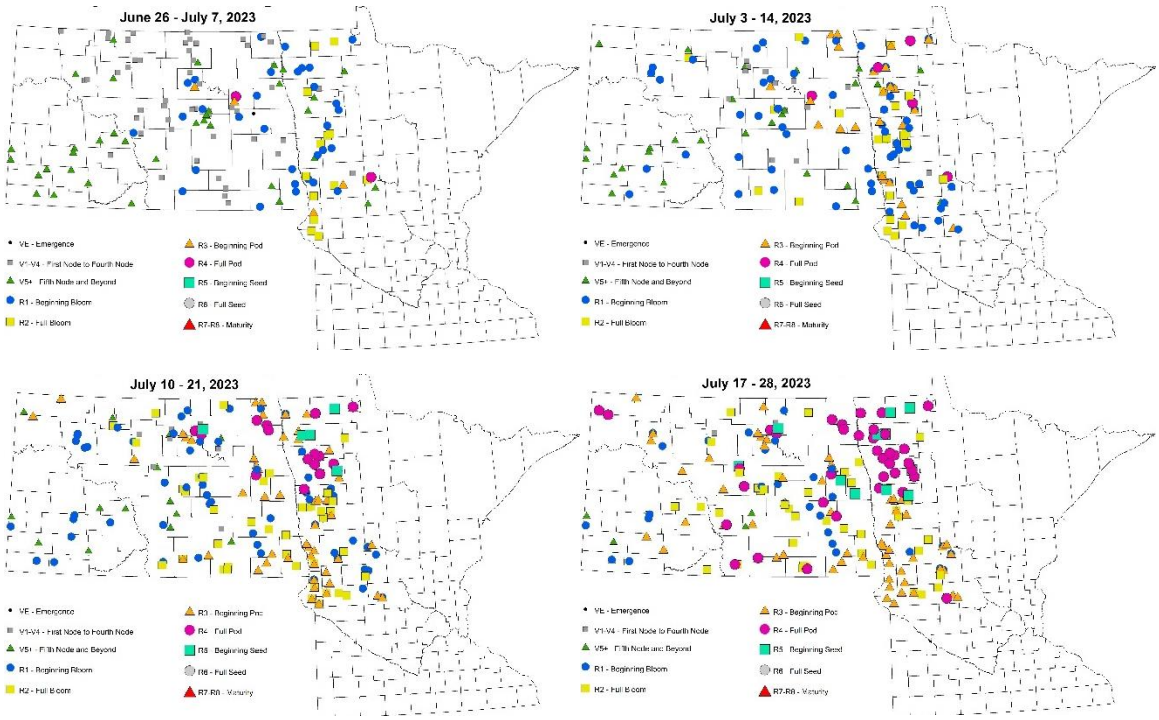


Figure 2. Grasshopper (multiple spp.) adults caught on the edge of scouted soybean fields over two-week periods from July 10 to August 11, 2023; Map: NDSU IPM.



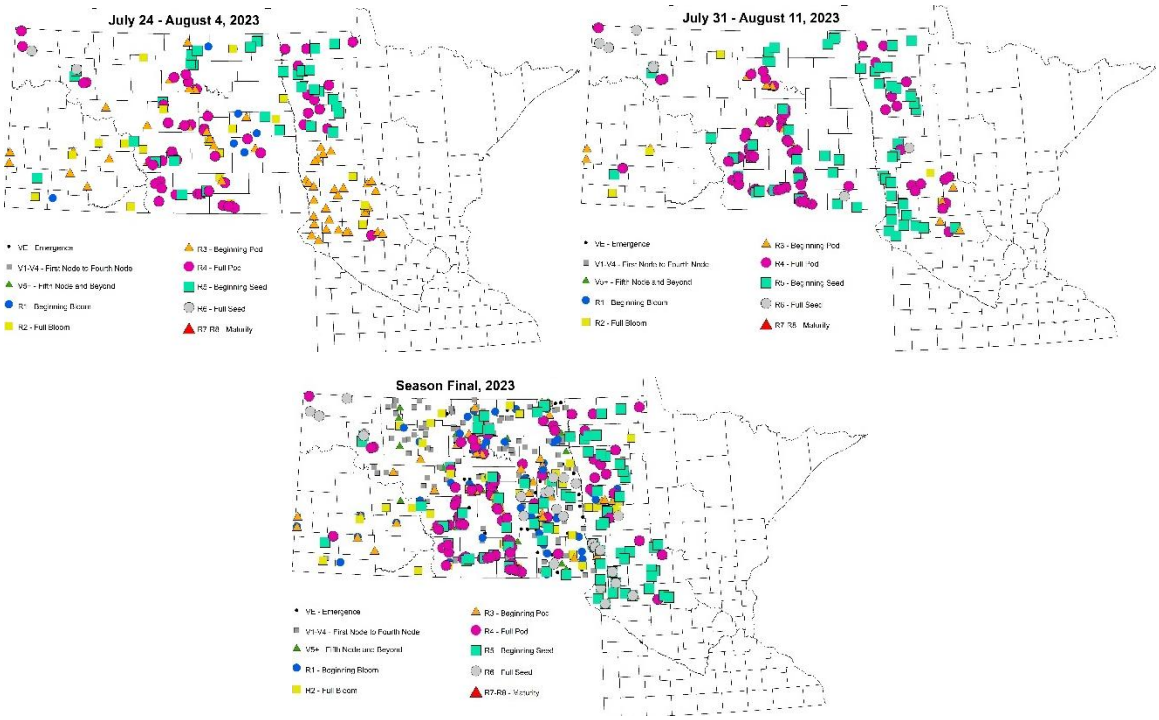
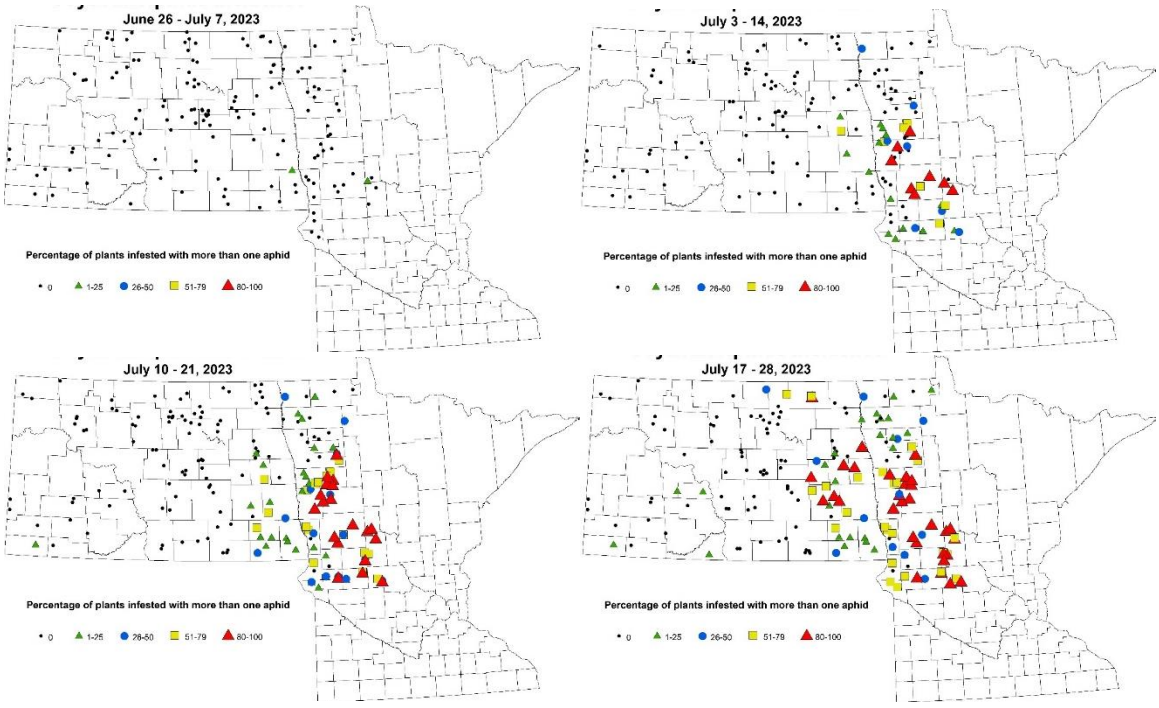


Figure 3. Soybean growth stages over two week periods from June 26 to August 11, 2023; map: NDSU IPM.



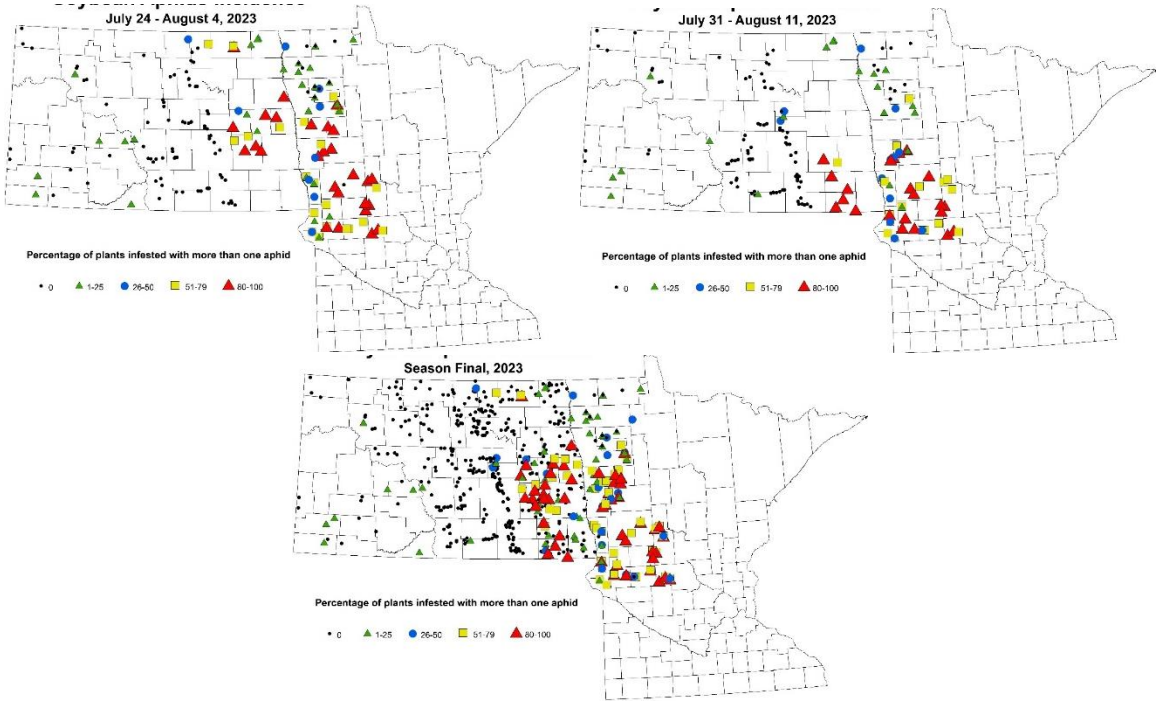
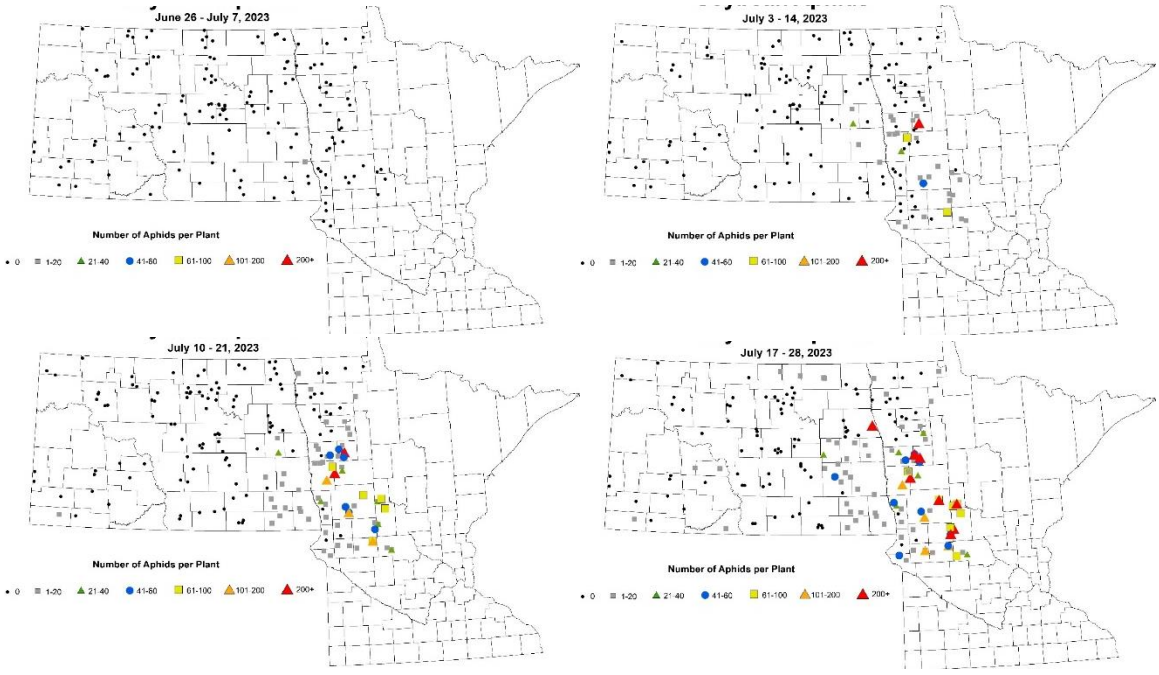


Figure 4. Soybean aphid incidence (percentage of plants infested) over two-week periods from June 26 to August 11, 2023; Map: NDSU IPM.



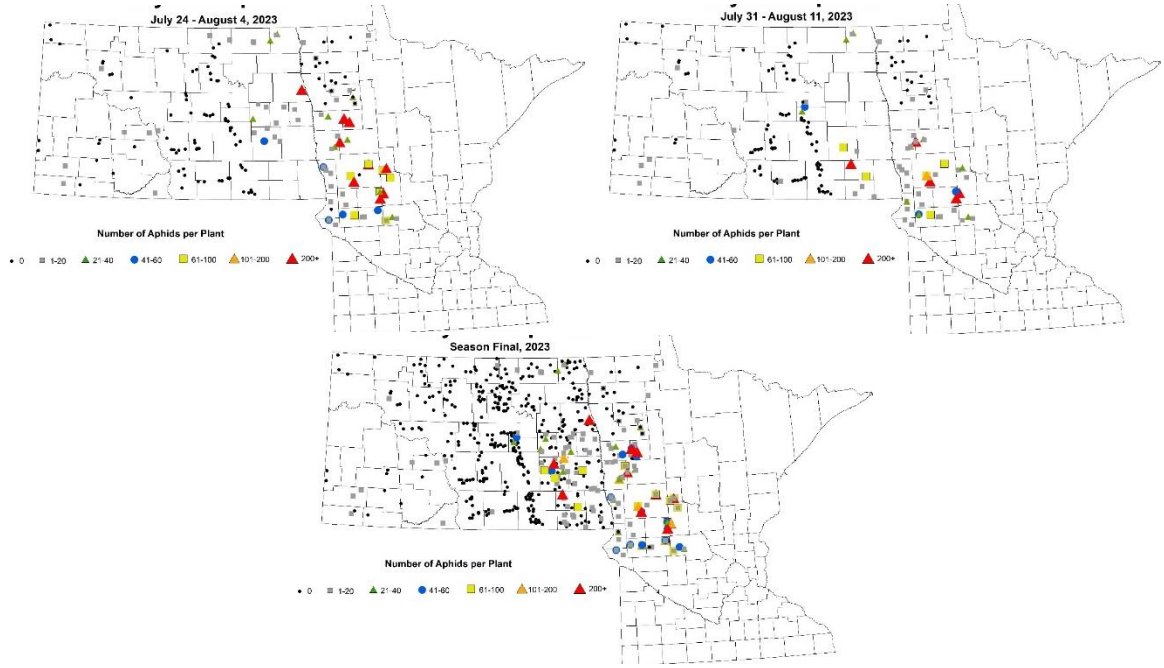
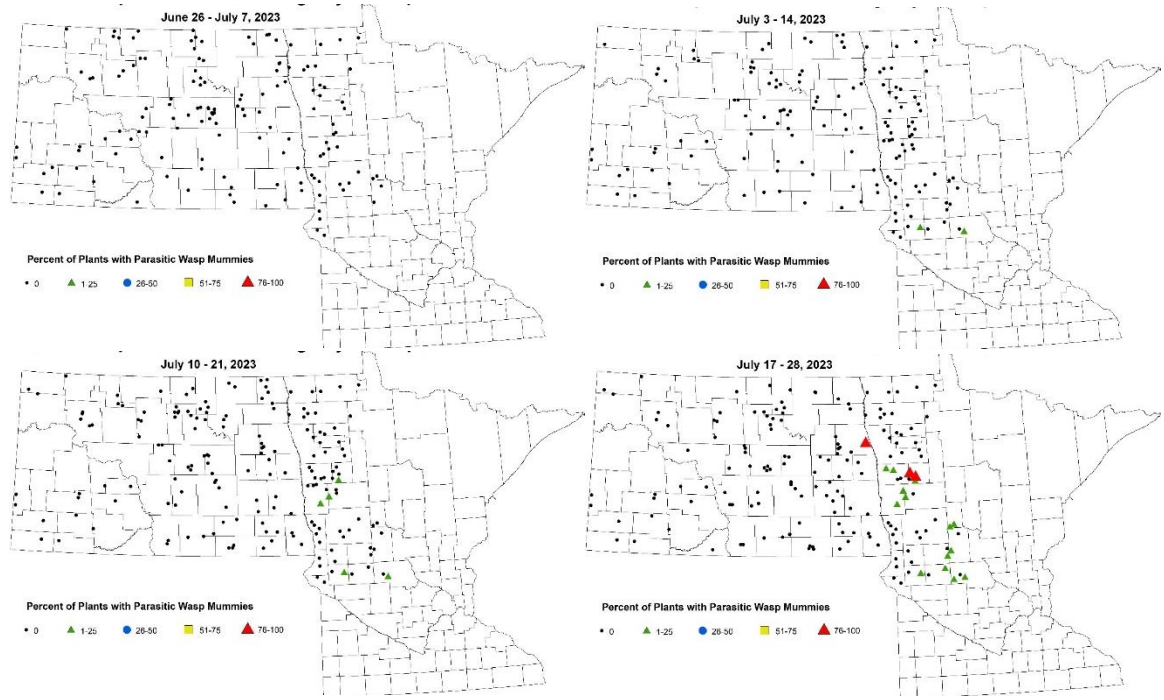


Figure 5. Soybean aphid (*Aphis glycines*) severity (number of aphids per plant) over two-week periods from June 26 to August 11, 2023; Map: NDSU IPM.



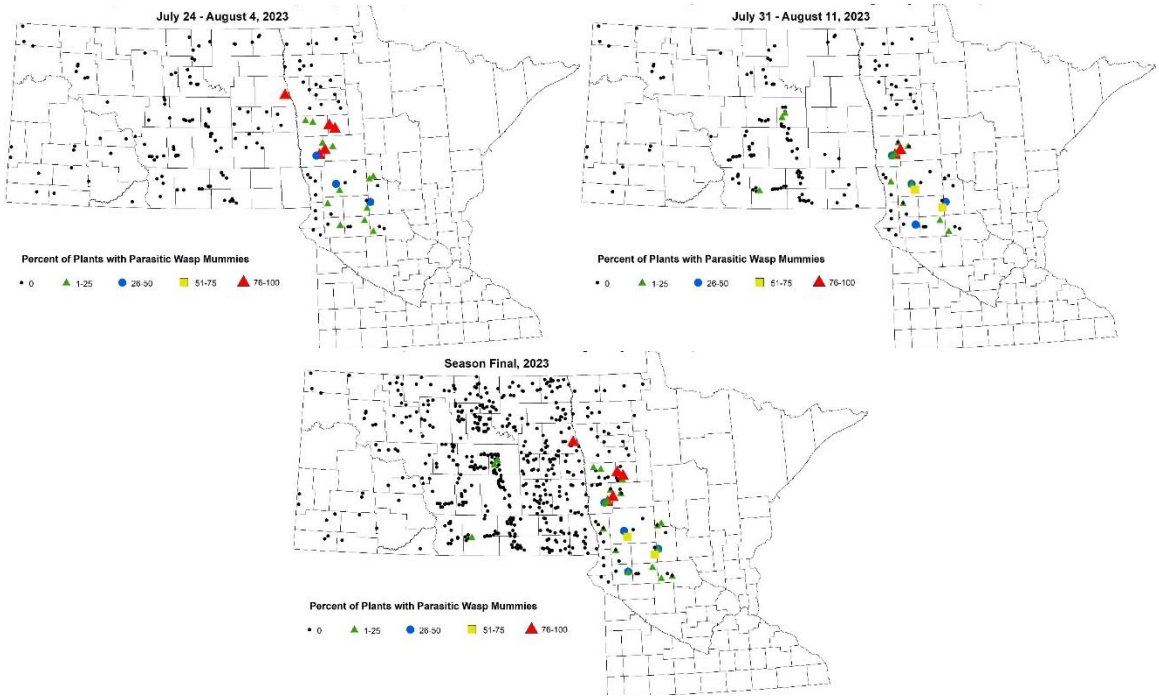
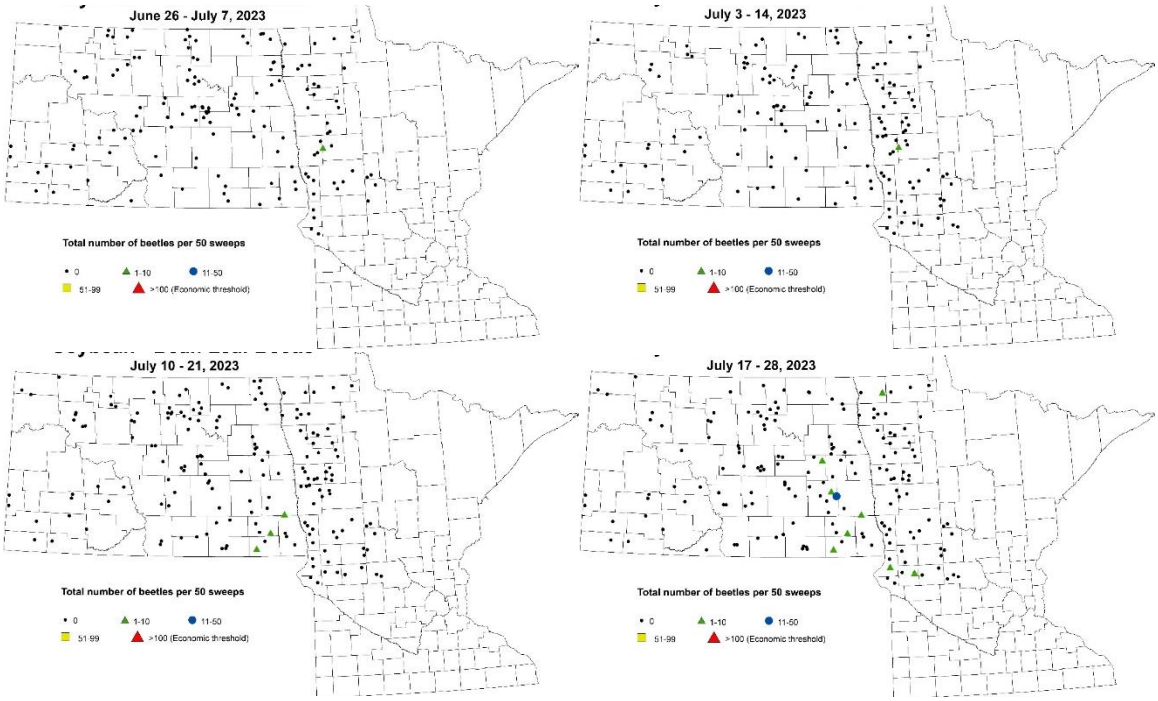


Figure 6. Percentage of plants with soybean aphids (*Aphis glycines*) that were colonized by parasitic wasps over two-week periods from June 26 through August 11, 2023; Maps: NDSU IPM.



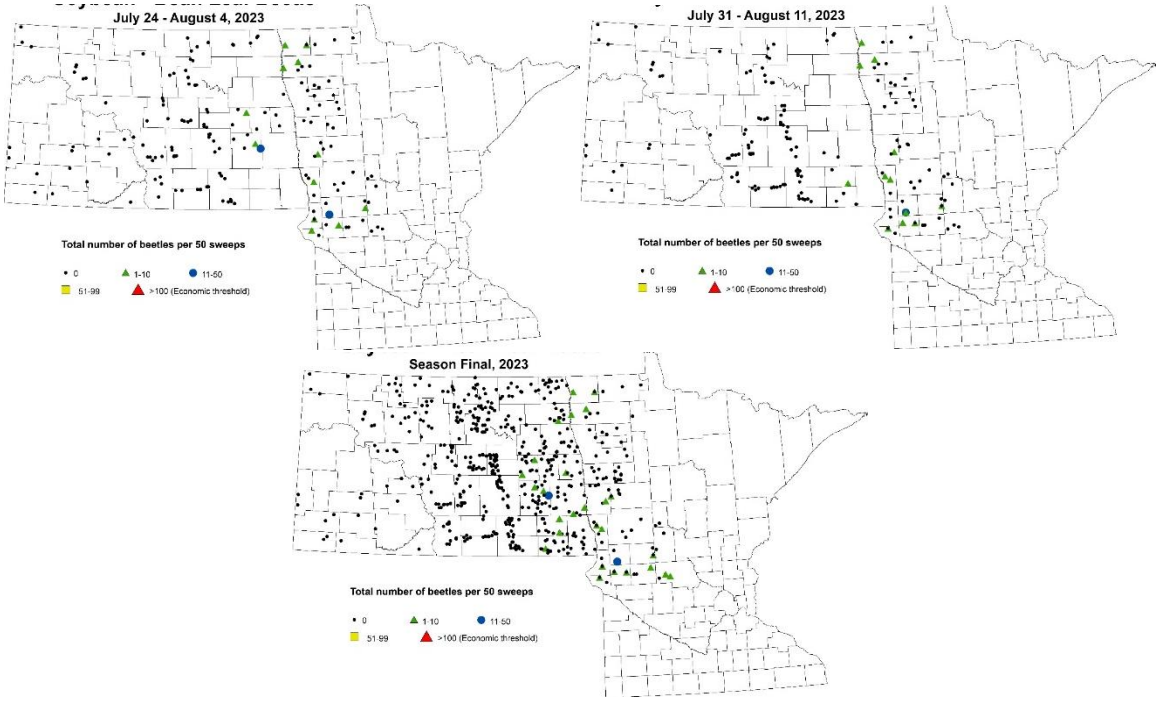
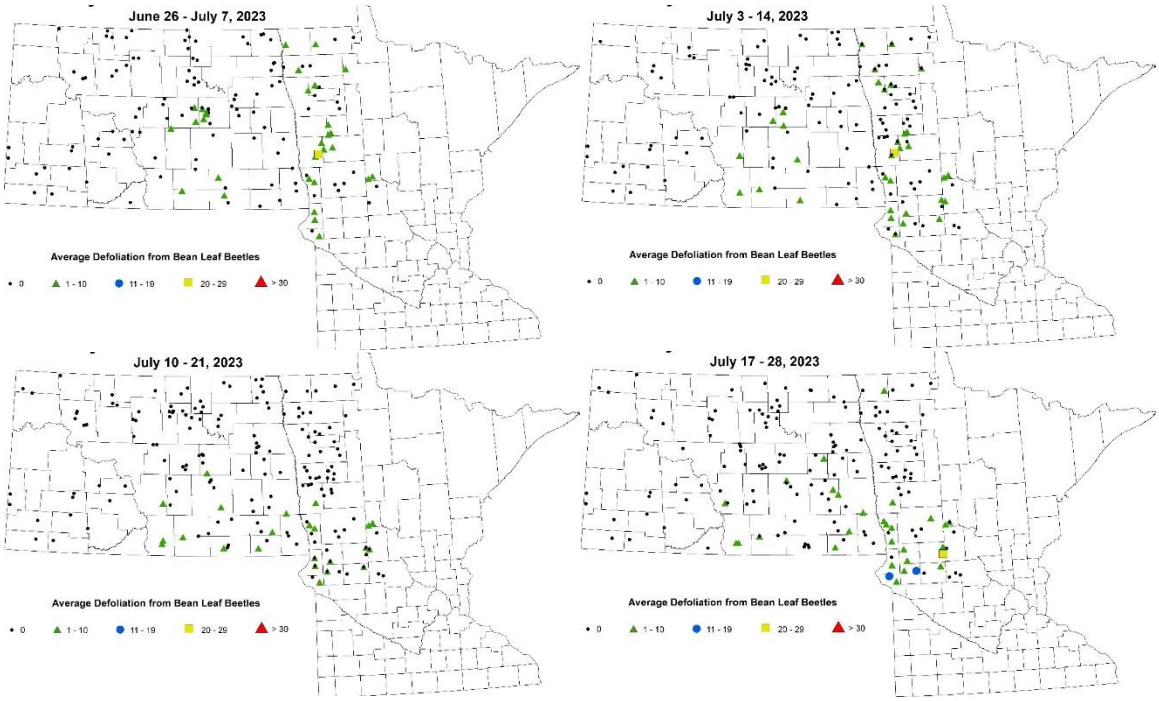


Figure 7. Number of bean leaf beetles (*Cerotoma trifurcate)* per 50 sweeps over two-week periods from June 26 to August 11, 2023; Map: NDSU IPM.



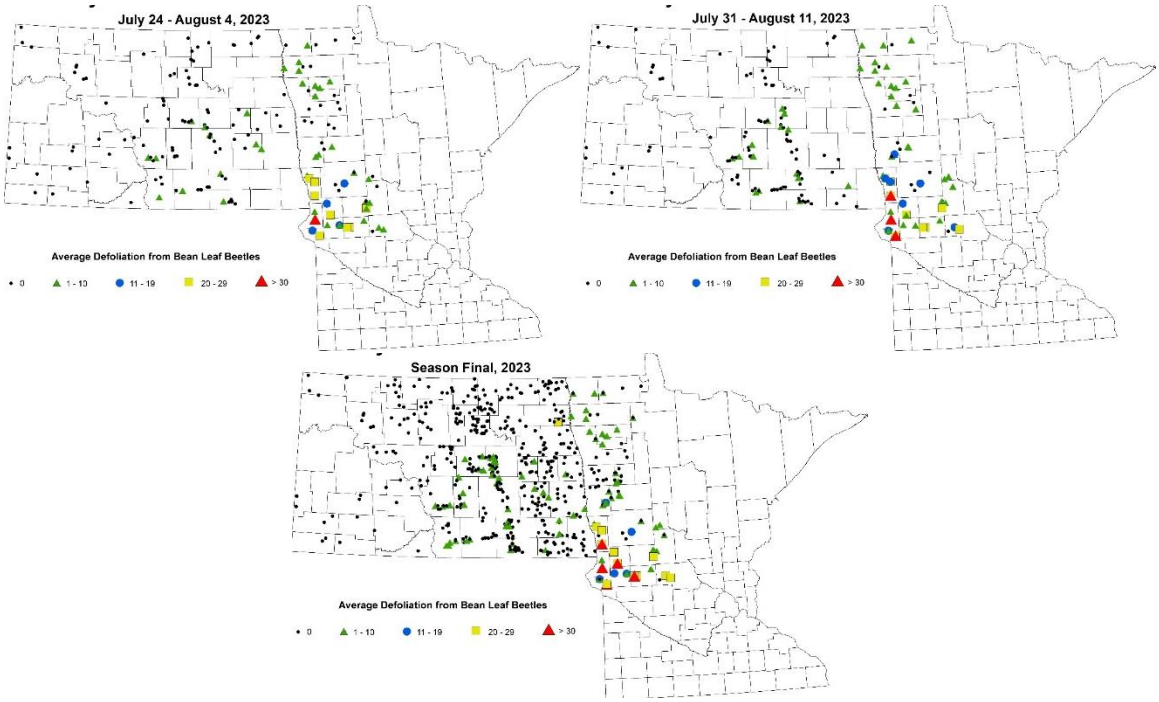
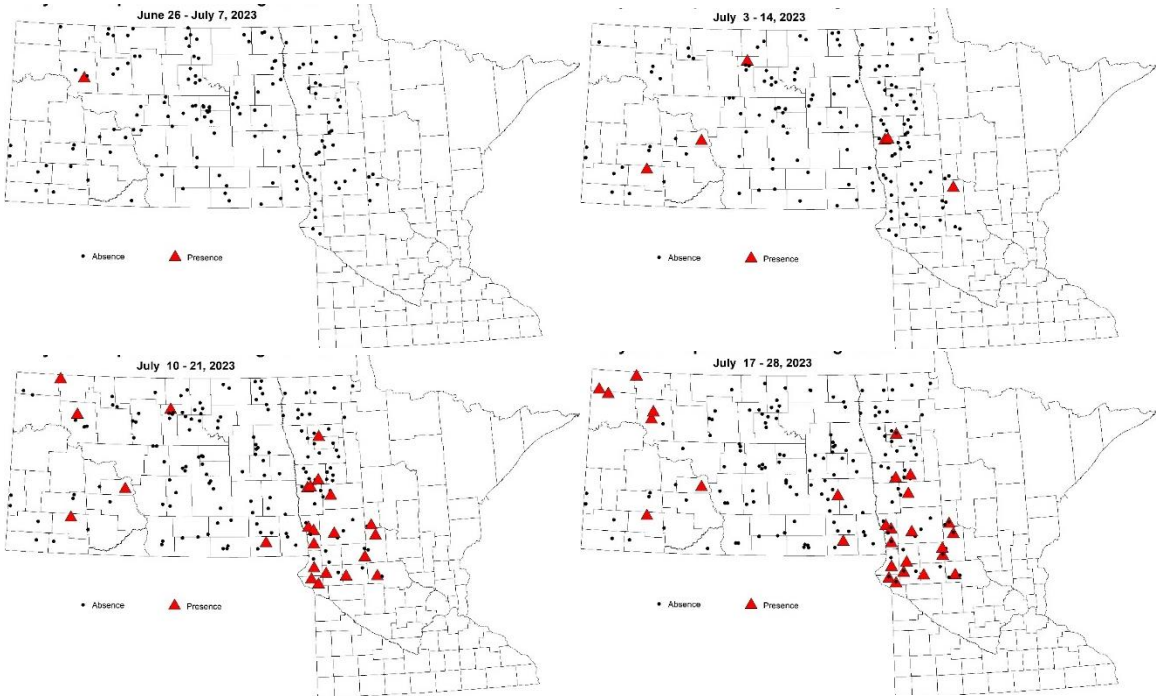


Figure 8. Average bean leaf beetle (*Cerotoma trifurcate)* defoliation injury over two-week periods from June 26 to August 11, 2023; Map: NDSU IPM.



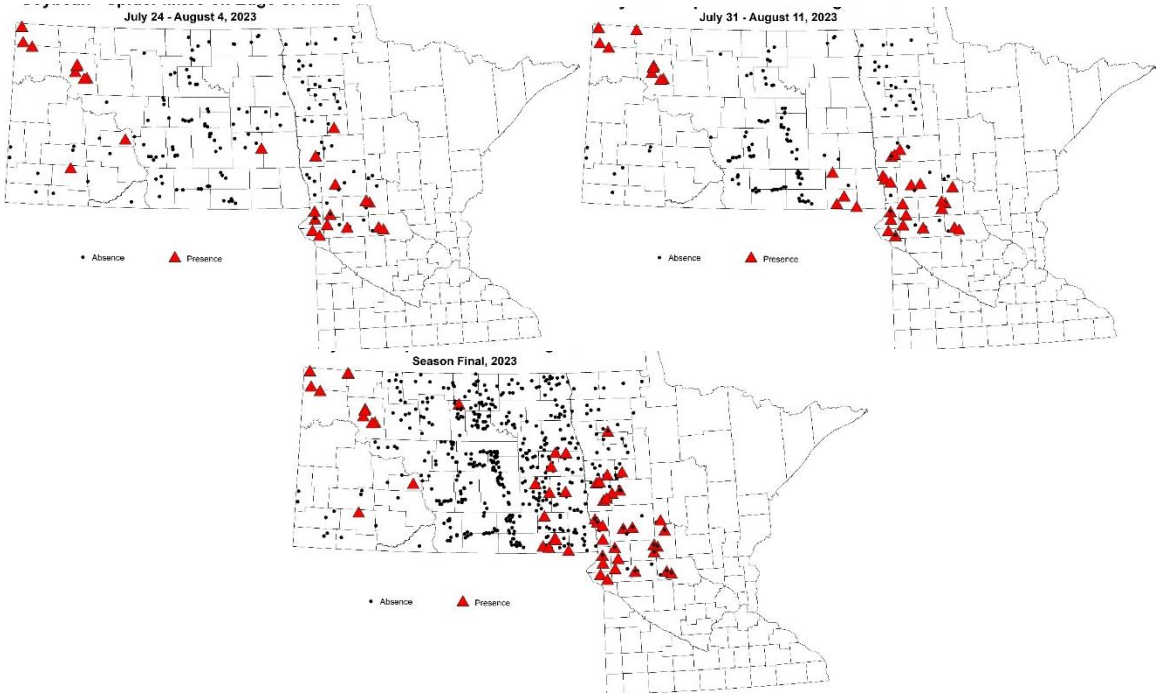
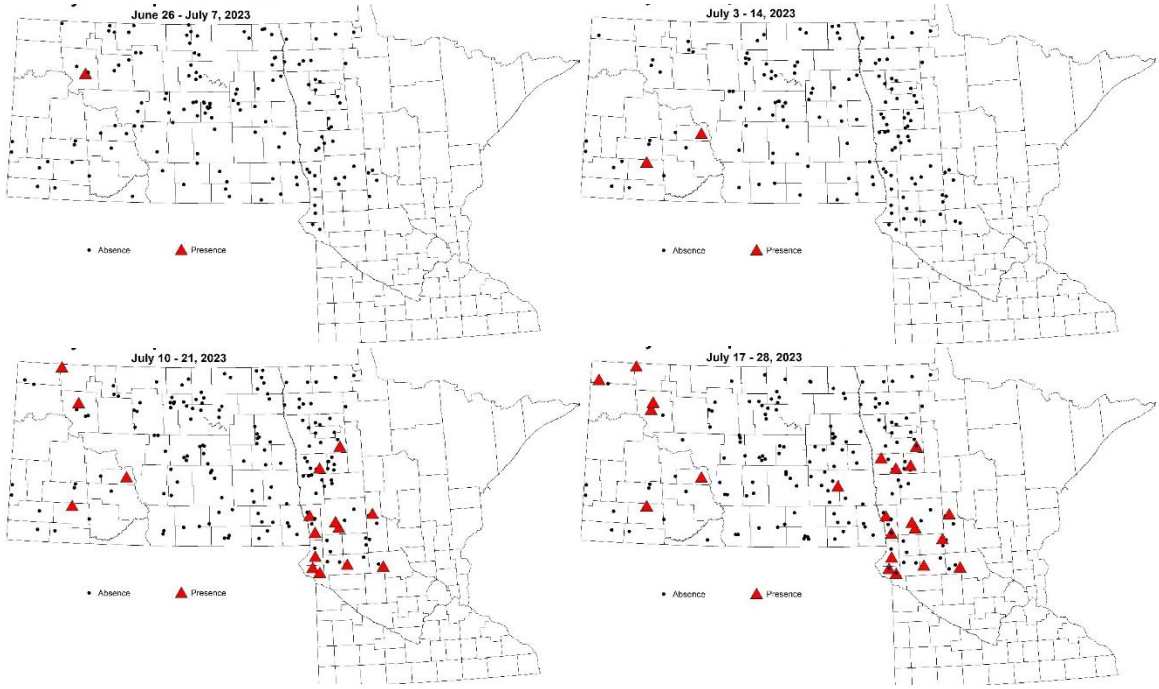


Figure 9. Presence of two-spotted spider mites (*Tetranychus urticae*) on edge of field (red triangle) over two-week periods from June 26 to August 11, 2023; Map: NDSU IPM.



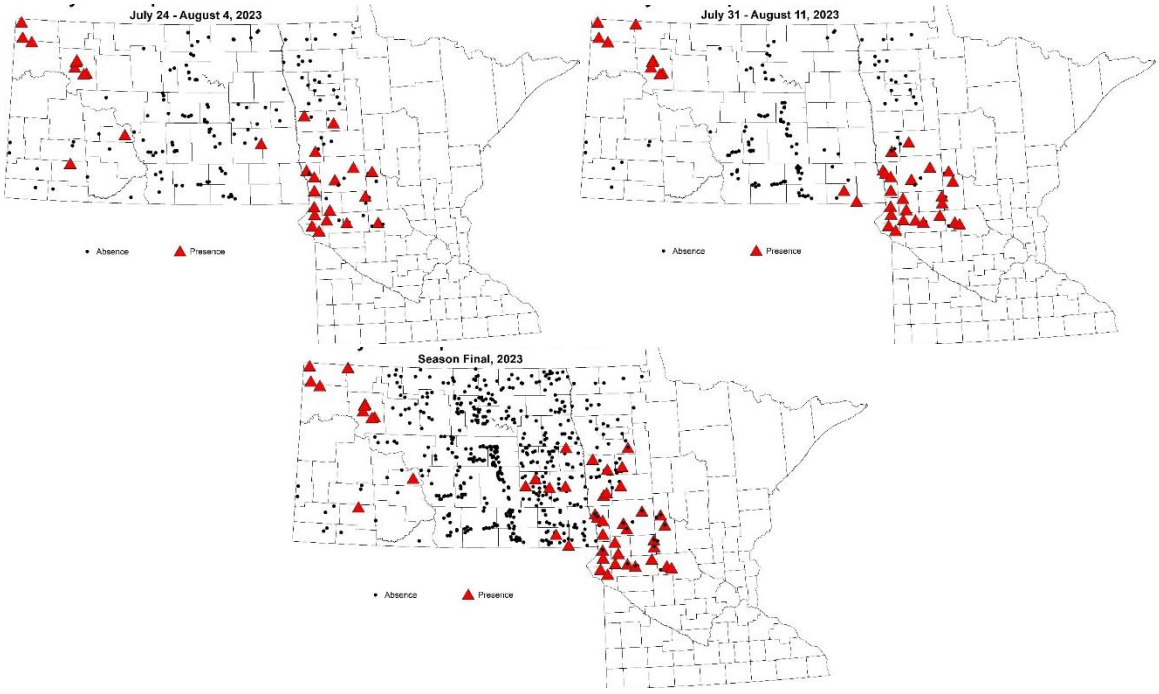
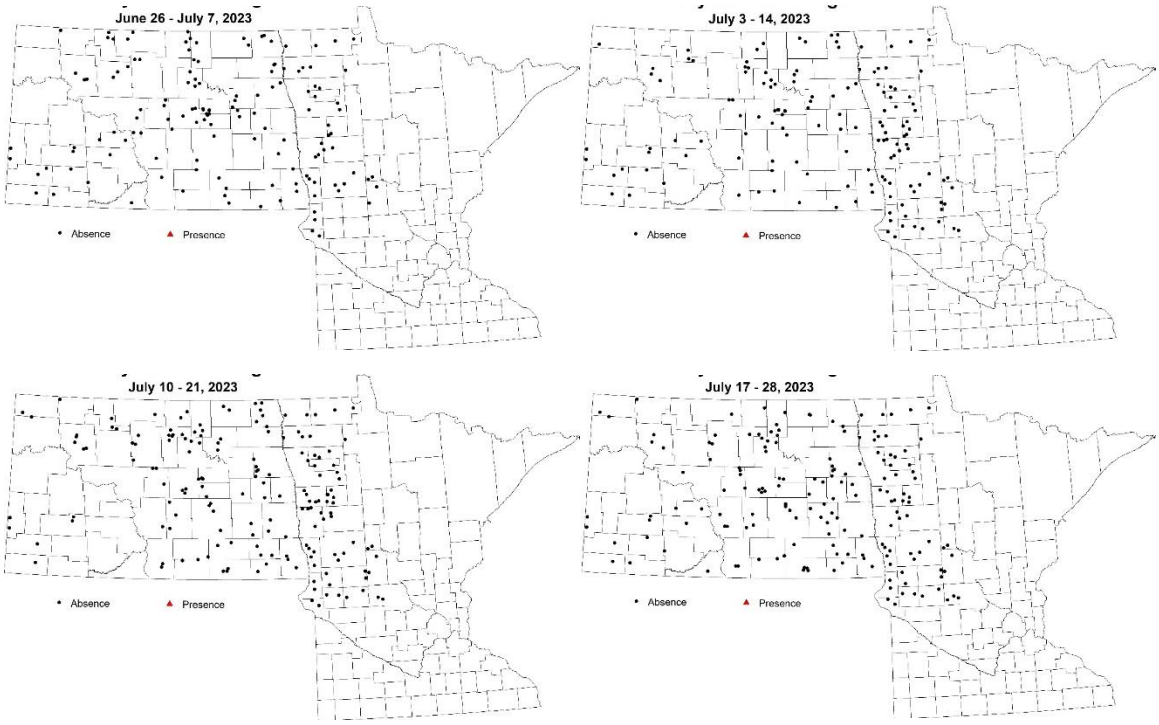


Figure 10. Presence of two-spotted spider mites (*Tetranychus urticae*) inside field (red triangle) over two-week periods from June 26 to August 11, 2023; Map: NDSU IPM.



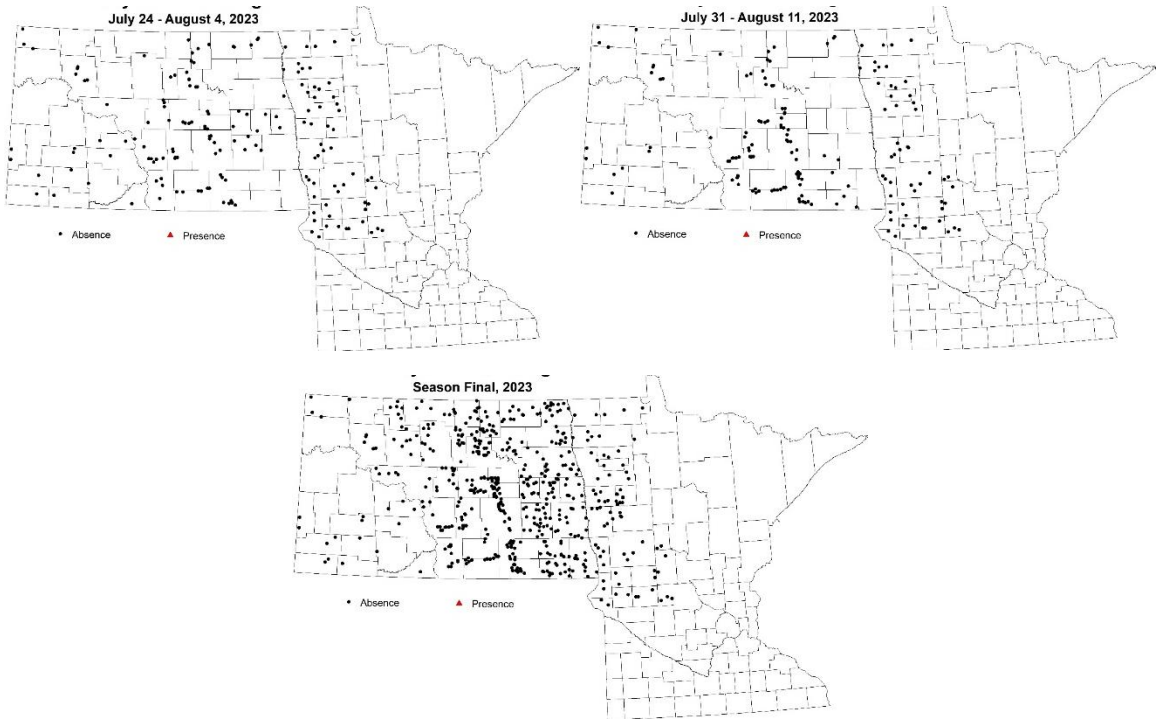
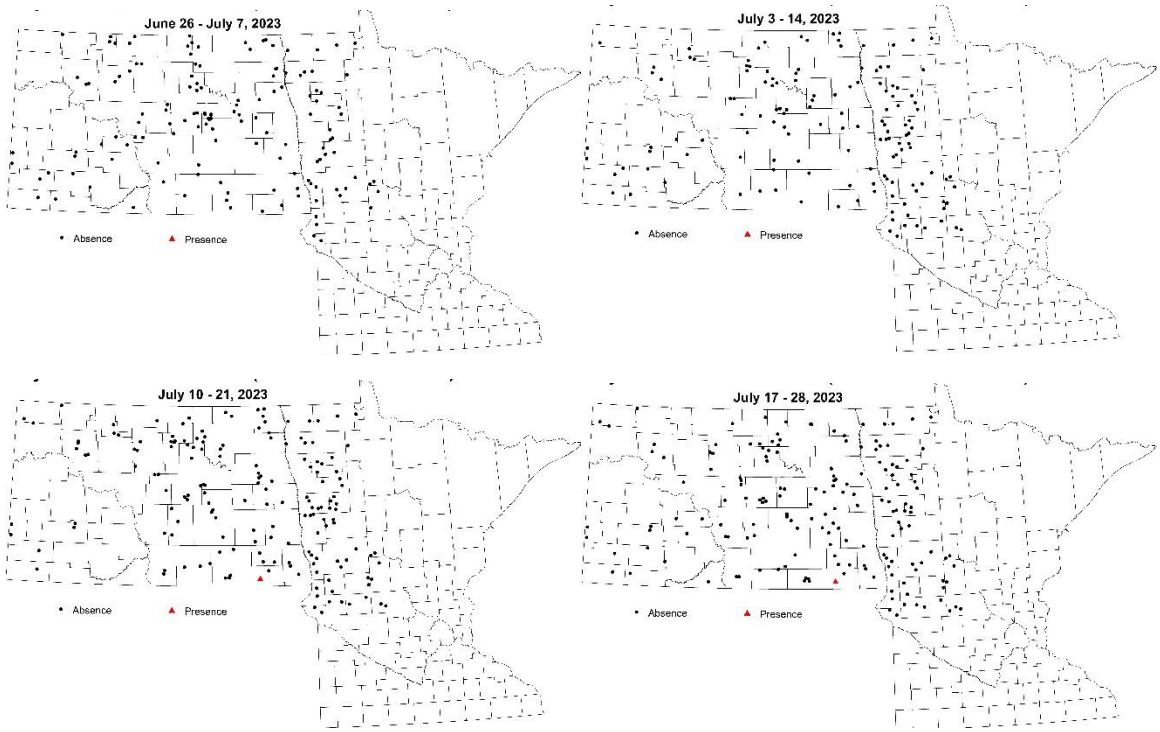


Figure 11. Soybean gall midge (*Resseliella maxima*) presence (red triangle) and absence (black dots) in scouted soybean fields from June 26-August 11, 2023; Map: NDSU IPM.



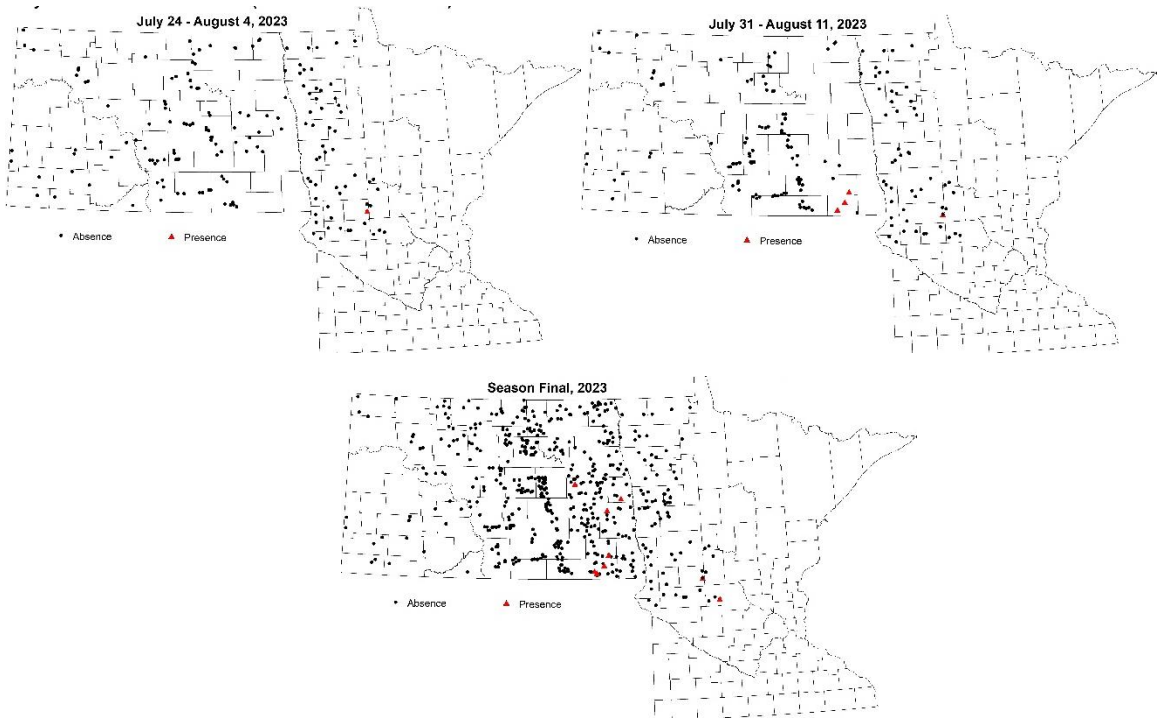


Figure 11. Soybean tentiform leafminer (*Macrosaccus morrisella*) presence (red triangle) and absence (black dots) in scouted soybean fields from June 26-August 11, 2023; Map: NDSU IPM.

Single day scouting trips taken after the conclusion of the formal survey ended on August 11, 2023, revealed soybean tentiform leafminer infestations in Crookston (Polk County) and in both eastern and western Marshall County. Additional scouting trips and details regarding extending knowledge gained during this survey will follow in the next quarterly report.