

Midwest Suction Trap Network

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Introduction

The Midwest Suction Trap Network was described in some detail in an earlier report from the Iowa State University Northeast Research and Demonstration Farm. This report is available online at: <http://www.ag.iastate.edu/farms/10reports/Northeast/SuctionTrapNetwork.pdf>. The Network has continued through the 2014 growing season with support from the North Central Soybean Research Program and soybean research programs from most of the Midwestern states. Currently, there is no funding to continue operating this network of suction traps, although a proposal to keep it operating for another three years has been submitted.

The suction trap network started in 2001 with seven traps set up in Illinois with the primary purpose of monitoring the seasonal distribution of the soybean aphid. The traps were built following the design used in the western states to monitor the movement of the Russian wheat aphid. The network later was expanded to an additional nine states (42 traps) but currently has 34 fully operational traps in 8 states (<http://www.ncipmc.org/traps/>). On this page there is a photograph of what a trap looks like as well as the distribution of the traps in the network. However not all traps have been in operation all 10 years, except the ones from Iowa. Collaborators there have been very consistent in collecting the suction trap samples from middle of May to October.

Soybean aphids become pests when they develop large populations that consume so much of the nutrients the plants produce, that the yield is reduced. Since its introduction in 2000, every year there have been areas of the Midwest where fields needed to be sprayed to limit damage by the soybean aphid. In the early years, the number of acres sprayed numbered in the millions for the Midwest, however, the number of acres sprayed annually over the last few years is relatively low. The soybean aphid is considerably less of a problem now than it was the first few years after its introduction. For example, for the past five years the number of soybean aphids collected in four suction traps located in Iowa has ranged from less than 100 to slightly over 1,000, and the highest peak of summer migrants for most of the years were in the first week of August (Figure 1).

The numbers of soybean aphids collected in the traps reflect these lowered field populations. This decline in field populations is likely due to a combination of factors such as natural biological control (predation by ladybeetles, syrphids, minute pirate bug, and fungus infestation) and potential IPM programs such as soybean plant resistance. Annual observations of the soybean aphid showed that in spite of the lower field counts, rarely reaching the economic threshold in recent years, the aphid still manages to spread across the majority of the Midwest every year. For example, aphids are routinely found on crops to the southern tip of Illinois. The soybean aphid is much like a number of other pest aphid species in that it seems to be genetically driven to disperse. The intake for the suction traps is located about 20 ft above ground level and any small insects that fly close are sucked in. These are collected into a fluid that preserves them and the weekly catches are shipped to Illinois Natural History

Survey where the aphids are removed, identified, and counted.

In addition to the soybean aphid, the catches include many aphids of agricultural interest. In total, 17 pest aphid species are recorded as observed. These aphids are both direct pests as well as vectors of both persistent and non-persistent viruses. The “cereal aphids” are a large part of the trap catch and often are more abundant than the soybean aphid. In this group are the Corn Leaf Aphid, *Rhopalosiphum maidis*, the Oat-Bird Cherry Aphid, *Rhopalosiphum padi*, the English Grain Aphid, *Sitobion avenae*, and the Rice Root Aphid, *Rhopalosiphum rufiabdominale* (Figure 2). These species are found throughout the Midwest with primary impact on winter wheat and corn, and have been implicated in the transmission of viruses to other crops.

Rhopalosiphum padi and *R. maidis* have been two of the most abundant species in the trap catches with numbers rivaling the abundance of the soybean aphid. Both of these species are quite different from the soybean aphid in that they are predominantly asexual. They survive the winter in the southern regions of North America and migrate north as the season progresses.

The traps also collect many natural enemies of aphids and other insects such as ladybeetles, lacewings, minute pirate bugs, and syrphids.

Stink bugs also are collected and if the Network continues to operate we will watch for the Brown Marmorated Stink Bug and other stink bugs that have been introduced into North America and can be pests of our crops.

Over the past two years, the insects that remain after the aphids have been removed are shipped to Punya Nachappa at Indiana-Purdue University in Fort Wayne, Indiana. She studies the thrips that transmit Soybean Vein Necrosis Virus. The thrips she identified from the suction trap network are potential species that transmit this virus. Therefore, there is a great interest to keep this survey ongoing.

We have recorded 99 species of aphids within 58 genera in the four suction traps located in Iowa (Ames, Chariton, Nashua, and Sutherland). Slide mounting and detail collection of these records have been deposited and entered in the database of the Illinois Natural History Insect Collection (<http://www.inhs.illinois.edu/collections/insect>). The most abundant genera are *Aphis* with 20 spp. and *Rhopalosiphum* with 6 spp. All the suction trap data collected between 2005 and 2014 has been compiled by Christie Bahlai at Michigan State University and incorporated as part of the data set of the Kellogg Biological Station, a Long-term Ecological Research site (<http://lter.kbs.msu.edu/datatables/122>).

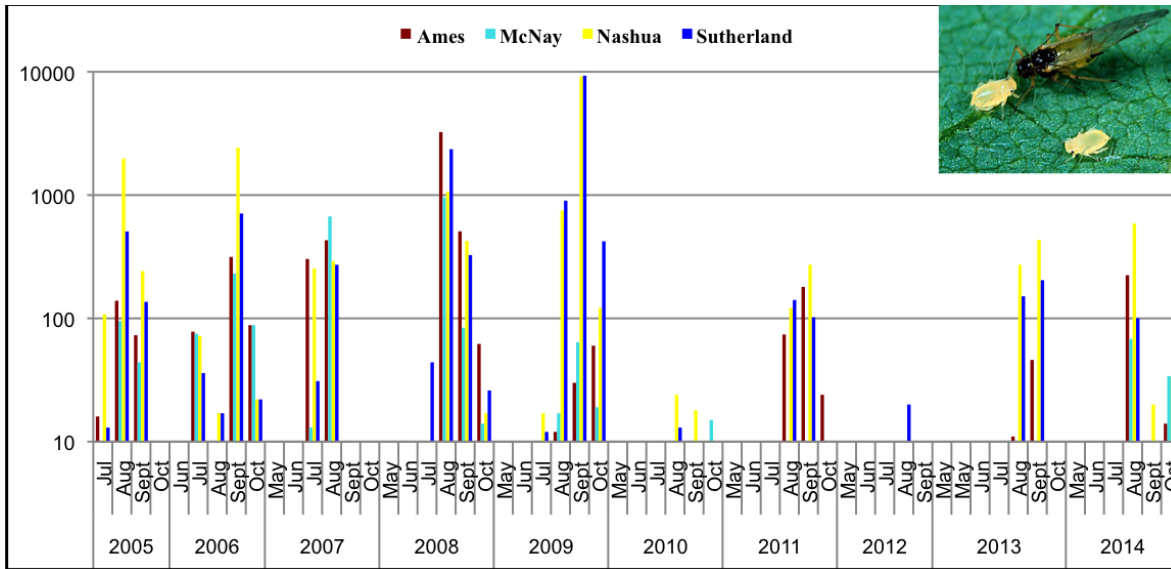


Figure 1. Population dynamics of the soybean aphids in Iowa collected between 2005 and 2014. The X axis corresponds to the period when the suction traps were in operation, and the Y axis corresponds to the counts in logarithmic scale.

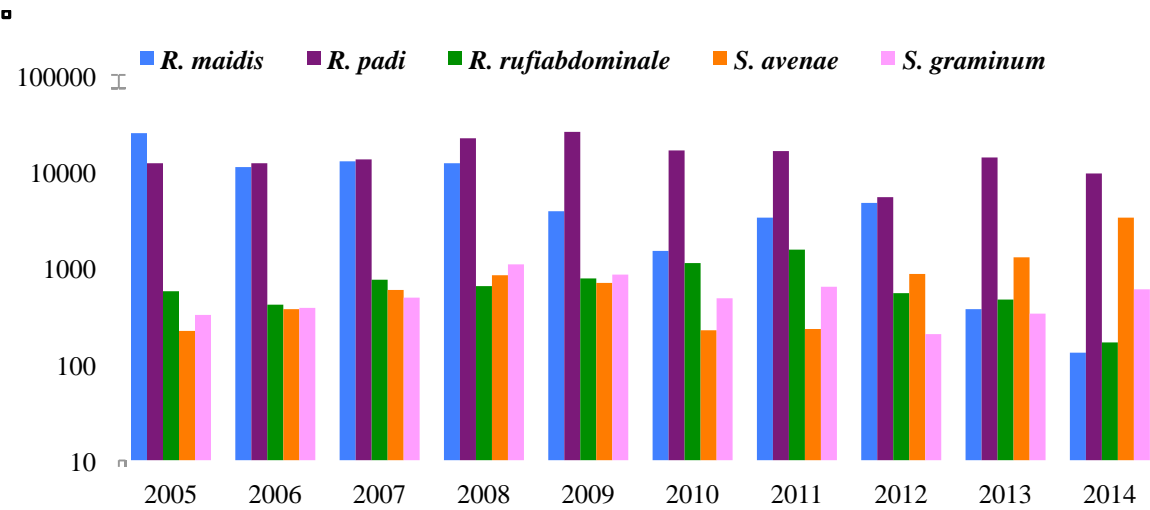


Figure 2. Total number in logarithmic scale of cereal aphids from some states of the Midwest Suction Trap Network (IA, IL, IN, MI, MN and WI) collected between 2005 and 2014.