

# Wasp warriors—entomologists on samurai mission to slay stink bugs

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Hillary Peterson is every brown marmorated stink bug's worst nightmare.

The Penn State doctoral degree student does not intend to rest professionally until she and other entomologists devise a way to reduce burgeoning populations of the invasive insect, originally from Asia, which are damaging crops and aggravating people. The goal of their research is to develop biological controls to interfere with the pest's reproduction.

Peterson's discovery of the tiny samurai wasp in Pennsylvania last year has led to an aggressive research project aimed at determining population levels of the parasitoid that inserts its eggs into stink bug egg masses and ultimately destroys them. Co-evolved with the brown [marmorated stink bug](#) in China, Japan, the Koreas and Taiwan, the parasitoid wasp seems to offer the best chance to get invasive stink bug numbers under control.

Only about the size of a sesame seed, the samurai wasp has been found in 10 states. Peterson found specimens in southeastern Pennsylvania by putting out yellow sticky cards baited with the stink bug aggregation pheromone in orchards and bordering woods. In the future, entomologists may decide to culture and release samurai [wasps](#) where populations of the Asian stink bug are especially high and menacing crops. However, they need to conduct research to learn about the wasp's potential effect on native stink bugs and other ecological risks and rewards to culturing and releasing them.

Finding the samurai wasp was important, noted Peterson, who hails from Brunswick, Maine, and learned she was intrigued by parasitoid wasps as an undergraduate at the University of Maine. That fascination brought her to Penn State's College of Agricultural Sciences to join the research group of Greg Krawczyk, extension tree fruit entomologist and research professor, who is on the front lines of the battle against brown

marmorated stink bugs at Penn State's Fruit Research and Extension Center in Adams County.



Apple and peach growers in recent years have seen their crops spoiled by brown, marmorated stink bugs to the level that some stone fruit orchards had to be left unharvested due to severe injuries caused by this pest. The economic loss for apple growers was estimated last year to be approximately \$35 million because of unmarketability of fruit on the fresh market. Credit: Penn State

"Once the beneficial samurai wasp is found in a wild, natural ecosystem, we can apply to the Pennsylvania Department of Agriculture and the U.S. Department of Agriculture's Animal and Plant Health Inspection

Service for it to not be considered as a quarantined organism," Krawczyk said. "Then, if we want to do research on it or release it to control stink bugs, it is not regarded by USDA as an invasive species. We are not allowed to release an insect—even a beneficial one—that is not here already."

Finding a way to control populations of the brown marmorated stink bug is critical in Pennsylvania, where agriculture is economically vital. The pest first was found in North America near Allentown in the late 1990s but has spread across much of the United States. Its heaviest populations are found in the mid-Atlantic region, centering on southern Pennsylvania, New Jersey, Maryland, Delaware, Virginia and West Virginia.

In this region, they first gained attention as a nuisance pest due to their tendency to overwinter in homes, but it soon became clear the invasive insect is a serious threat to fruits, vegetables and ornamental plants. Beginning in 2009 and 2010, invasive stink bug populations ramped up in corn and soybean fields, and farmers experienced yield losses.

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Brown marmorated stink bugs are about three-quarters of an inch long and have a characteristic shield-like shape. They are, of course, brown, but both nymphs and adults can be distinguished from other brown stink bugs by whitish bands on the antennae and legs.





Penn State doctoral student Hillary Peterson crunches numbers in the field, assembling data that indicates whether samurai wasps invaded brown marmorated stink bug egg masses, such as the one shown in the inset, and laid their eggs among the stink bug eggs. She is also searching for signs that native parasitoid wasps found the invasive stink bug eggs and successfully laid their eggs. Ultimately, the wasps could rein in stink bug populations. Credit: Penn State

Adults produce an odor when they are disturbed, accounting for the

"stink" in stink bug. This defensive odor is meant to repel predators. Some people find the smell bothersome; others claim it is somewhat pleasant, smelling something like cilantro.

The relationship—based on chemical ecology—between stink bugs and parasitoid wasps is fascinating, according to Peterson, who pointed out that there are plenty of native parasitic wasps that long have parasitized native stink bugs. However, whether they will ever be able to adapt fully to finding and parasitizing invasive brown marmorated stink bugs still remains a mystery.

To resolve this question, Peterson will deploy brown marmorated stink bug eggs this summer on index cards and on leaves in southeastern Pennsylvania orchards, and she also will put out some cages with [stink bugs](#) in them. "I am trying to do more realistic deployments of eggs to increase the chemical cues that wasps will pick up on because we are interested to see how these native wasps react," she said.

"We found native parasitoids in low numbers on the egg masses that we put out last summer, so they are able to find the brown marmorated stink bug eggs, and they are able to lay their eggs in those eggs," Peterson said. "But sometimes their development is not successful because they have not evolved with these bugs. I hope that native parasitoids will adapt to utilize brown marmorated [stink bug](#) eggs, but it could take decades."

Provided by Pennsylvania State University

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