

Northeastern  
**IPM**  
Center

# StopBMSB Website Review 2017

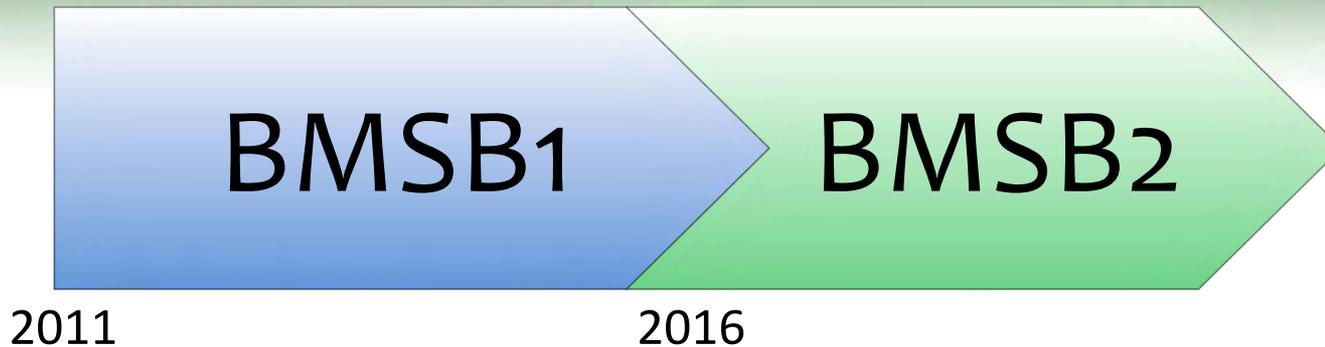
Kevin Judd, Northeastern IPM Center



United States  
Department of  
Agriculture

National Institute  
of Food and  
Agriculture

# Outreach for USDA SCRI Projects



- Launched StopBMSB.org website in 2012
- Establish awareness, share biological and ecological information (host range, monitoring, pheromones, natural enemies)

- Building upon existing resources, adding new ones over time
- Added more partners from Midwest, Southeast, West
- Landscape ecology, biological control, BMPs, economics, outreach

# StopBMSB.org

- Widely used and cited interactive map
- Basic biology & identification
- Host plants info
- Management info
- Repository for videos, management documents
- News & updates
- Spanish resources

**Stop BMSB** Management of brown marmorated stink bug in US specialty crops

Search

**ABOUT US**  
Project, people, research...

**STINK BUG BASICS**  
Origins, life stages, photos...

**WHERE IS BMSB?**  
Maps, crops, sightings...

**MANAGEMENT**  
Monitor, deter, manage...

**MORE RESOURCES**  
News, videos, español...

**Overview**

The brown marmorated stink bug, *Halyomorpha halys* (Stål), is a voracious eater that damages fruit, vegetable, and nut crops in North America. With funding from USDA's Specialty Crop Research Initiative, our team of more than 50 researchers is uncovering the pest's secrets to find management solutions that will protect our food, our environment, and our farms.

**Updates**

**Tracking the Brown Marmorated Stink Bug** This video series shows growers and others how to identify BMSB, why this pest is important in agriculture, and what's at stake if we don't stop it. **Updates:** We created [four new videos](#) to address recent developments in monitoring, trapping, management, and biological control.

**Keeping Stink Bugs Out of Your House, and Your Island Nation** Officials from New Zealand requested, in April, about twenty egg dead insect specimens preserved in bottles of hand sanitizer.

**Parasitoids of the Brown Marmorated Stink Bug Workshop** Register now for a specialized training workshop covering parasitoids of the BMSB. The workshop will be offered January 17 and 18, 2016, at the University of Florida.

**Who Are the Native Natural Enemies of BMSB?** The list of native natural enemies that attack brown marmorated stink bug includes other species of insects, spiders, and even some birds and mammals.

**Trissolcus japonicus – the samurai wasp** A key natural enemy of brown marmorated stink bug is the egg parasitoid *Trissolcus japonicus*, also known as the "samurai wasp". These stingerless warriors search for and destroy 60-90% of BMSB eggs in Asia.

**Stakeholder Advisory Panel Meeting, November 2016** Download presentations from the Stakeholder Advisory Panel Meeting, held November 2, 2016, in Raleigh, North Carolina.

**Available Positions** Learn about currently open positions on the Brown Marmorated Stink Bug project.

**Grapes** This new guidance document for grape growers provides a synopsis of what researchers have learned so far and management recommendations using an integrated approach. Available in English and Spanish.

**Small Fruit** This new guidance document for small fruit growers provides a synopsis of what researchers have learned so far and management recommendations using an integrated approach. Available in English and Spanish.

**Funding**

USDA United States Department of Agriculture National Institute of Food and Agriculture Specialty Crop Research Initiative

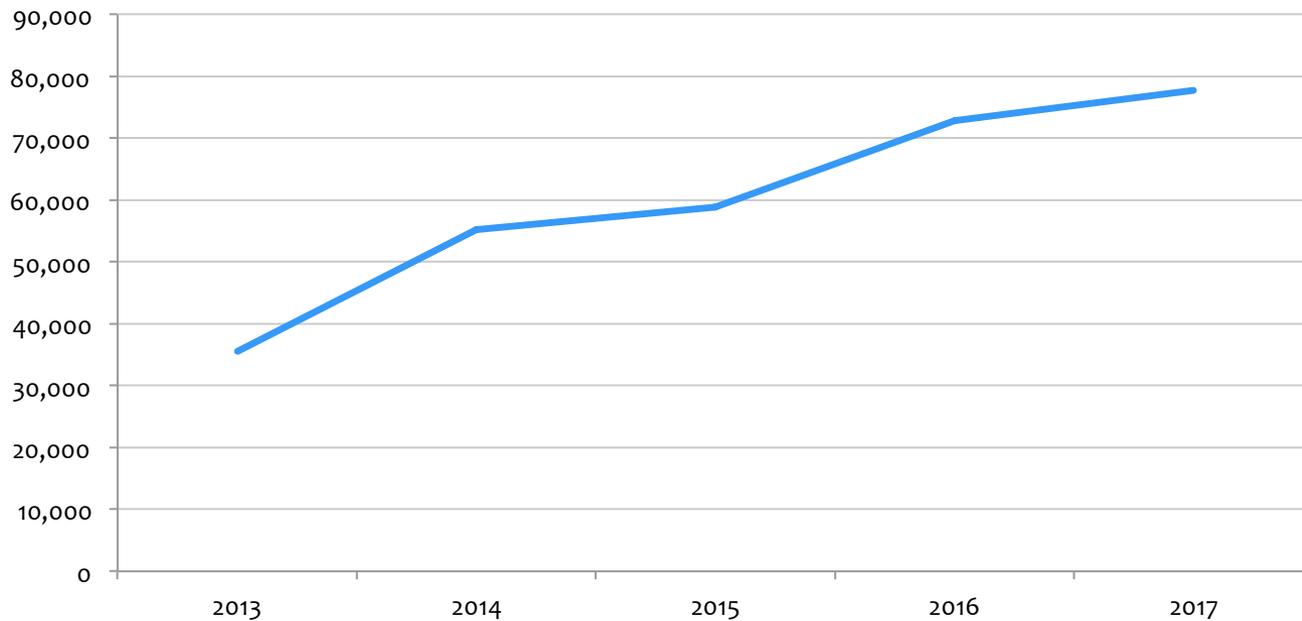
**Collaborators**

OSU Oregon State University NC STATE UNIVERSITY UNIVERSITY OF MARYLAND Washington State University Washington State University Northeastern IPM Center Cornell University RUTGERS The Ohio State University UNIVERSITY OF MINNESOTA MICHIGAN STATE UNIVERSITY PennState University of Kentucky UNIVERSITY OF GEORGIA UC DAVIS UC Berkeley UC RIVERSIDE

This material is based upon work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, Specialty Crop Research Initiative under award numbers 2016-61181-25409 and 2011-61181-20507. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture. Website maintained by the Northeastern IPM Center.

# StopBMSB.org – Unique Visitors

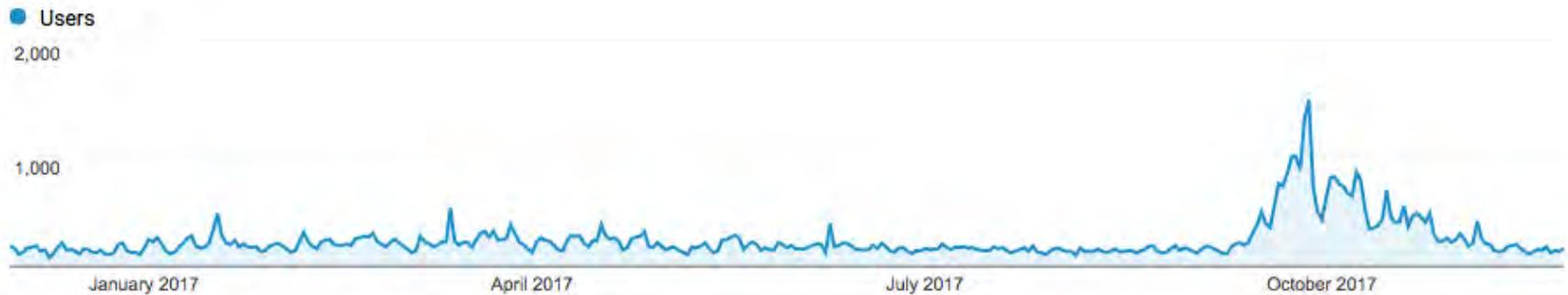
StopBMSB.org – Unique Visitors



Compared to five years ago, yearly traffic has doubled

# StopBMSB.org – Unique Visitors

77,857 unique visitors in past year



Noticeable bump in traffic starting late September

# Management Documents

Four sets of management documents completed August 2016.

Total downloads: 1,673

## Download Totals

	English	Spanish
Orchard Crops	533	18
Vegetables	530	20
Grapes	276	14
Small Fruit	268	14

## Integrated Pest Management for Brown Marmorated Stink Bug in Orchard Crops

A synopsis of what researchers have learned so far and management recommendations using an integrated approach

Authored by the BMSB SCRI CAP Orchard Crop Commodity Team:

Chris Bergh and Angel Acebes-Doria (Virginia Tech), Tracy Leskey, Rob Morrison and Brent Short (USDA ARS Kearneysville, WV), Greg Krawczyk (Pennsylvania State University), Jim Walgenbach (North Carolina State University), Arthur Agnello and Peter Jensch (Cornell University), George Hamilton, Anne Nielsen and Brett Blaauw (Rutgers University), Vaughn Walton, Nik Wiman, Chris Hedstrom and Peter Shearer (Oregon State University), and Betsy Beers (Washington State University)

### Basic Biology and Life Cycle of BMSB

- References herein to specific points in the growing season are based on information from the mid-Atlantic region, where the seasonal biology of BMSB is currently understood best, and may vary in other regions.
- BMSB is a serious agricultural pest of numerous crops during the late spring and summer.
- After emerging from overwintering sites in May and June, BMSB adults begin mating and laying eggs on various host plants (Fig. 1).
- In most of its range in North America, BMSB completes one to two generations per year, progressing from the egg stage through five nymphal stages (instars) before molting into a winged adult (Fig. 2).

### Orchard Crops at Risk / Crops Not at Risk

- BMSB may move frequently among different wild and cultivated host plant species, feeding alternately among them.
- BMSB nymphs and adults feed by inserting their piercing-sucking mouthparts into fruit, nuts, seed pods, buds, leaves, and stems and appear to prefer plants bearing reproductive structures. Their mouthparts can penetrate very hard and thick tissue, such as the hazelnut hull.
- Older nymphs and adults cause more injury to apples and peaches than young nymphs.
- Peach is considered a preferred and highly vulnerable host. The survival of BMSB nymphs has been studied on only a few hosts, but peach was the only host on which they completed development without feeding on another plant.
- Nectarines show BMSB injury and may be as vulnerable as peach, but the relative susceptibility of apricots is less well known.
- Apples and European and Asian pears are also very susceptible to BMSB feeding injury.
- Economic injury from BMSB to hazelnuts has been documented in Oregon, but other nut crops have been less well studied at present.
- Cherries can sustain BMSB feeding injury, but the effects at harvest are usually small.
- Plums and plum hybrids are not considered as vulnerable to BMSB as some other tree fruits.

### Orchard Crop Injury Diagnostics

- BMSB feeding through the skin of tree fruits can cause injury to the fruit surface and flesh. These injuries are not immediately apparent, but develop gradually after feeding has occurred.
- Feeding on young peaches, nectarines, and apricots causes gummosis at the feeding site (Fig. 3), deformations on the fruit surface (Fig. 4), and brownish-red internal necrosis (Fig. 5).
- Feeding on more mature peaches and nectarines may or may not result in apparent surface injury at harvest but can cause areas of whitish necrosis in the flesh (Fig. 6), which has been an important marketing issue.
- The mouthpart insertion point on apples and pears leaves a tiny hole in the skin (Fig. 7) and a "stylet sheath" that runs into the flesh (Fig. 8), both of which are best

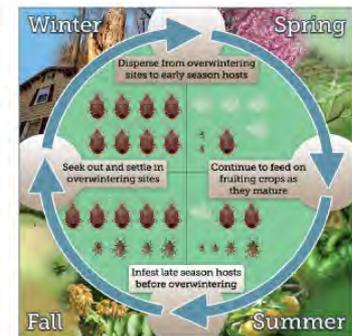


Fig. 1. Typical seasonal biology of brown marmorated stink bug.

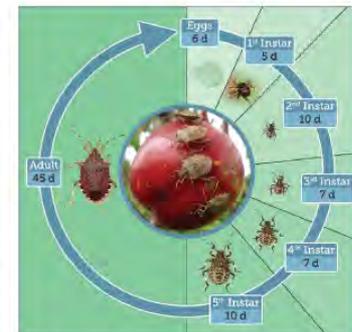


Fig. 2. Life cycle of brown marmorated stink bug.

# Videos

“Tracking the Brown  
 Marmorated Stink Bug”

10-part video series, plus  
 4 Research Update videos



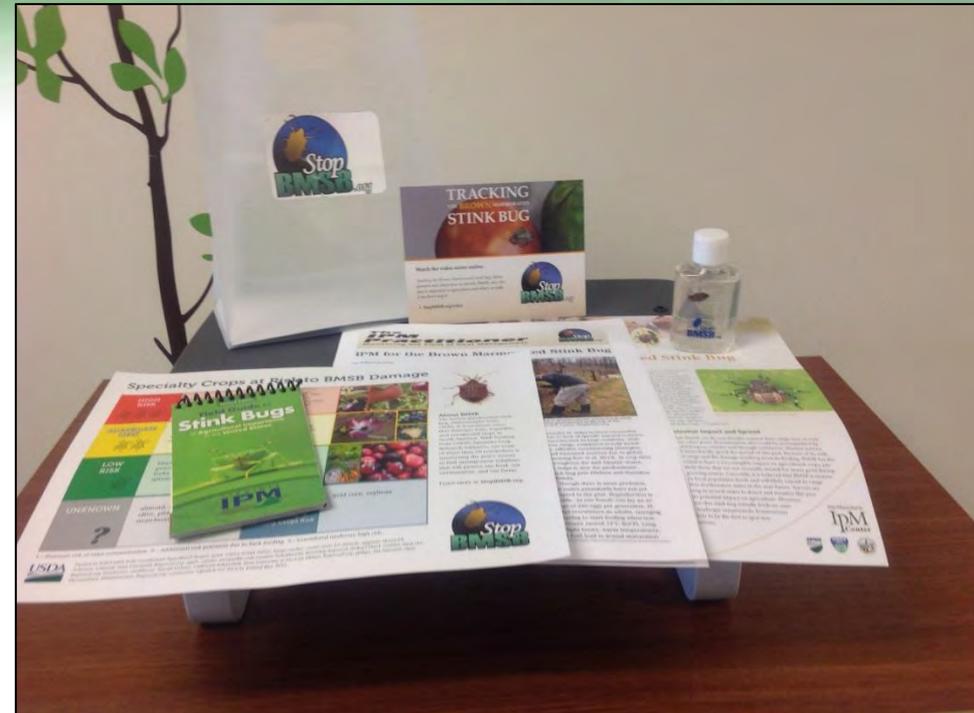
Lifetime Views	
<b>Total (all videos combined)</b>	<b>58,213</b>
Part 1: History and Identification	23,154
Part 10: Biological Control	8,457
Part 6: Host Plants and Damage in Vegetables	6,513
Part 2: Overwintering and Spread	3,798
Part 3: Monitoring and Mapping	3,317
Part 9: Management	2,557
Research Update: Pyramid Traps	1,672
...	

# Stink Bug Kits

*Includes: stink bug guide, specimen in bottle, video postcard, article, factsheet, “Crops at Risk” flier*



**“Low stock”** — *Can you help us put bugs into bottles?*

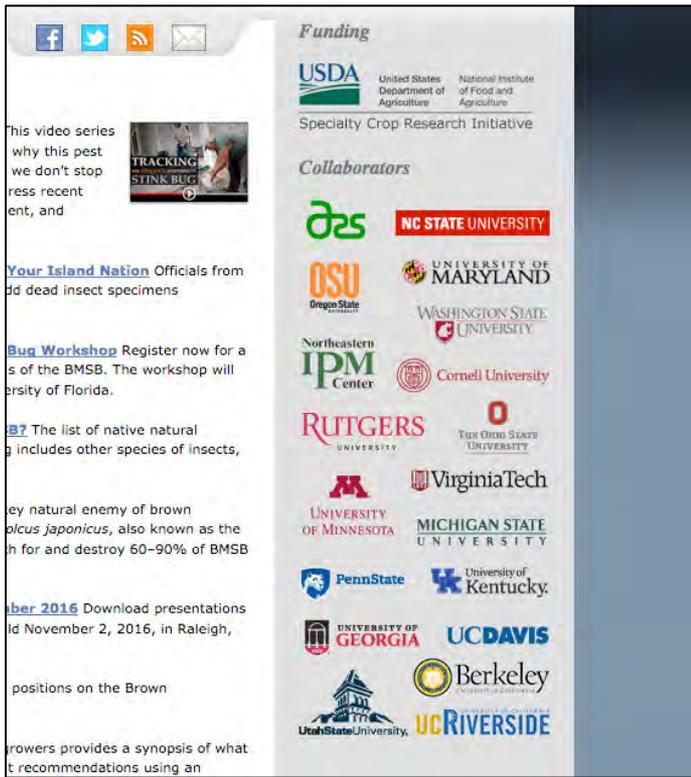


**Kits distributed in 2017:**

610 kits sent to 35 states,  
plus 4 Canadian provinces

# 2017 Website Updates

- Updated collaborator logos on home page.
- Updated project team page with current list of participants and a map showing locations of participants by state.





# 2017 Website Updates

Added new articles to the website:

- “Who Are the Native Natural Enemies of BMSB?”
- “*Trissolcus japonicus* – the Samurai Wasp”
- “Keeping Stink Bugs Out of Your House, and Your Island Nation”

## Who Are the Native Natural Enemies of BMSB?



By Christopher Sorstnes, Jim Waagenbach, Arthur H. Aguiar, Diane G. Allen, Nix Wilcox  
May 2017

The list of native natural enemies that attack brown marmorated stink bug (BMSB) includes other species of insects, spiders, and even some birds and mammals. For instance, birds to a certain extent, feed on BMSB adults (1), and small mammals such as rats may feed on BMSB eggs (2). However, insects and spiders are largely recognized as the most important group of natural enemies of BMSB. These natural enemies can play an important role in reducing BMSB populations, and understanding how these different species behave in nature is key to developing successful biological control programs.

Antropogous natural enemies (insects, spiders and relatives) can be grouped into one of two general categories: parasite or predator. A parasite lives on or in another animal at the expense of the host. A parasitoid is an organism that lives on or in a host organism for a portion of its life and ultimately kills the host (3). A predator is an animal that kills and consumes multiple prey during its lifetime. It's debatable which group of insects—parasitoids or predators—have a greater impact on BMSB populations, so it depends on the habitat, but both are significant players. Learning to identify and protect these beneficial natural enemies can help them prosper around your farm, garden, or home.

Some of the most common insect parasitoids are small wasps that lay eggs in insect hosts, often in the eggs of other insects. The wasp larva feeds inside the host egg, halting its development. The parasitoid emerges from the nonviable host egg as an adult wasp. Egg-attacking parasitoids are the most common type of natural enemy of BMSB.

Much of what we know about parasitoids of BMSB comes from studies that use sentinel eggs. These are stink bug eggs, often obtained from laboratory-reared colonies, which are attached to a piece of index card or other material so that they can be placed in the field and retrieved at a later date to determine their fate.

These studies can tell us, for example, who are the important natural enemies of BMSB and how often parasitoids are successful in attacking BMSB. Success for the parasitoid might be defined as a live young insect emerging from an egg, from a human perspective, i.e., in terms of pest regulation, success is defined as a reduction in the BMSB reproductive potential.

In a two-year study in agricultural crops in the eastern U.S., predation, mainly by chewing predators, accounted for the majority of BMSB egg mortality (4). Parasitism of BMSB eggs by native parasitoids was very low, ranging from 1% to 4% of eggs. Predators, both those with chewing and sucking mouthparts, accounted for about 8% to 22%. However, rates of parasitism and predation vary among habitats. For instance, parasitism rates as high as 15% have been observed in soybean fields, and in wooded habitats it can exceed 30%. Parasitism levels differ by habitat, in part, due to variation in parasitoid species occupying habitat niches.



## Keeping Stink Bugs Out of Your House, and Your Island Nation

Ports of entry in New Zealand are working hard to keep out brown marmorated stink bug (BMSB), relying in part on information and resources provided by the Northeastern IPM Center for identification and control.



Officials from the island nation requested, in April, about twenty odd dead insect specimens preserved in bottles of hand sanitizer. Part of the “BMSB identification kit,” these specimens are available for free through the StopBMSB.org website. See <http://stopbmsb.org/guides>

The Northeastern IPM Center provides information to visitors every day about excluding stink bugs from ordinary houses. Now we are defending the landing grounds, beaches, and farms of distant countries. In this article, we'll discuss keeping stink bugs out of your house, and your island nation.

**Home Invasion**

“Brown marmorated stink bugs are rude guests, as they eat your garden and then move in with you,” said William Quarles, an IPM specialist and managing editor of the *IPM Practitioner*.

If your house is invaded by 25,000 *Halyomorpha halys*, as has happened<sup>1</sup>, this group of bugs could produce a summer population of almost three million in the immediate vicinity of your home<sup>2,4</sup>.

“The best approach is exclusion,” Quarles said. “Pay special attention to the side of the house facing the sunset. Caulk up all holes, and make sure that window screens fit tightly. Pay attention to sealing around window air conditioners. Cover attic and foundation vents with screens. Make sure the chimney is protected with a screen. Weather-strip doors, and make sure each one has a functional door sweep.”



## Trissolcus japonicus – the samurai wasp

During the 1990s, the brown marmorated stink bug (BMSB) invaded the United States. In the years since, scientists have learned that many native enemies of other stink bugs in the United States will also attack BMSB. Unfortunately, those native enemies are not well adapted to BMSB and, as a result, they are not effective in keeping BMSB from damaging crops. To fill in that gap, ARS scientists in Newark, Delaware, began a worldwide search for a solution. Those explorations turned up a key natural BMSB enemy—the egg parasitoid *Trissolcus japonicus*. Also known as the “samurai wasp,” these stingerless warriors search for and destroy 60–90% of BMSB eggs in Asia.

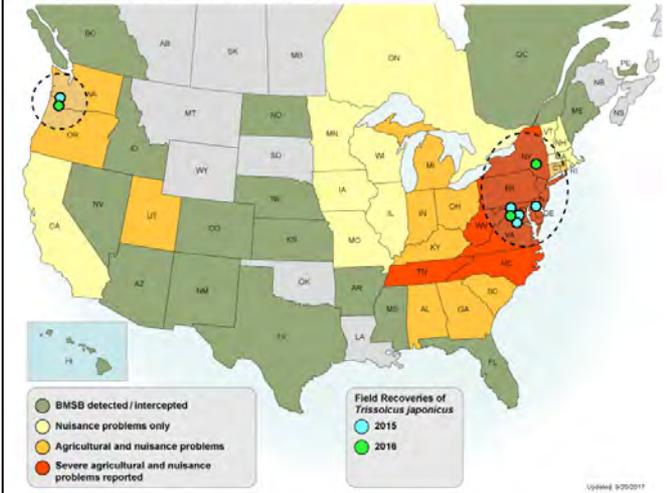


The samurai wasp (*Trissolcus japonicus*) is a natural enemy of the brown marmorated stink bug. Photo by E. Takahasi.

Research underway at quarantine laboratories in Newark and elsewhere is determining how suitable the wasp is for release in the United States. These studies show that the wasp specializes in attacking only certain kinds of stink bugs, like BMSB. Before regulatory permission could be obtained for their release in the United States, surveys conducted during 2014–2015 detected the wasp's presence in several U.S. locations. Genetic matching studies showed that these wasps were different from the ones under ARS quarantine. Although we don't know how it arrived, the “samurai wasp” made its way to the United States naturally and has continued to spread to new locations. As of 2016, the wasp was found in nine U.S. States. Plans are underway in some of these States to rear large numbers of these warrior wasps in laboratories in order to release them and protect key U.S. agricultural crops from BMSB damage.

— Text from USDA ARS factsheet “Samurai wasp (*Trissolcus japonicus*)”, April 2017.

## U.S. Map of Field Recoveries of Trissolcus japonicus



## Publications



# Going Forward – 2018 Revisions

- We are reviewing and prioritizing recommendations from the extension committee (areas where updates or additional content is needed)
- Planning for some reorganization of content to highlight new information, particularly on biological control
- More emphasis on visual information instead of text-heavy pages

