

Biology, Ecology, and Management of Brown Marmorated Stink Bug in Orchard Crops, Small Fruit, Grapes, Vegetables and Ornamentals



Our long-term goals for this project are to develop economically and environmentally sustainable pest management practices for the brown marmorated stink bug (BMSB), *Halyomorpha halys* (Stål), in specialty crops and to implement a coordinated, rapid delivery system to disseminate critical information generated from this project to specialty crop end-users. USDA-NIFA SCRI # 2011-51181-30937

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Objective 1. Establish biology and phenology of BMSB in specialty crops.

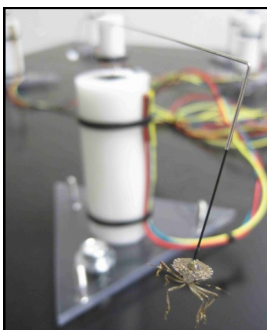
Objective 2. Develop monitoring and management tools for BMSB.

Objective 3. Establish effective management programs for BMSB in specialty crops.

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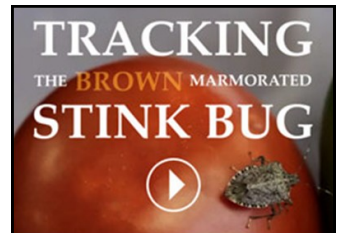
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Scientists Publish on Stink Bug’s Favorite Plants by Chris Gonzales

On July 16, 2013, researchers published a list of 170 plants that the brown marmorated stink bug (BMSB) uses for food and reproduction, called *Host Plants of the Brown Marmorated Stink Bug in the U.S.* Thomas Kuhar of Virginia Tech led the effort, and a group of 23 project directors and collaborators contributed. They have made several updates to the document since then. To access the document, visit:

<http://www.stopbmsb.org/where-is-bmsb/host-plants/>

As part of several ongoing research projects, entomologists have been observing which plants this insect typically uses for food and reproduction in its new environment. Since its initial discovery in eastern Pennsylvania in the mid-1990s, the invasive brown marmorated stink bug (BMSB, *Halyomorpha halys*

[Heteroptera: Pentatomidae]) has become a conspicuous insect in residential areas and farms in the mid-

Atlantic U.S. According to the publication, BMSB devours species such as tree of heaven, *Ailanthus altissima*; soybean, *Glycine max*; English Holly, *Ilex aquifolium*; pear, *Pyrus spp.*; eggplant, *Solanum melongena*; and corn, *Zea mays*.

The Northeastern IPM Center designed the document to work well on the web and when printed on standard paper. Several photographs illustrate plant and insect



Mating pair of brown marmorated stink bug adults on mimosa in June, Salem, Virginia.



Brown marmorated stink bug adults feeding through the bark of an elm tree (*Ulmus* sp.) (M. Raupp, UMD).

species mentioned. Scientists gathered observations and collaborated online and in person over a period of five months to assemble the document.

As of this writing, BMSB has been detected in 40 states plus Ontario, posing severe agricultural and nuisance problems in six states. The insect threatens an estimated \$21 billion worth of crops in the United States alone.



Brown marmorated stink bug nymphs on corn in August, Roanoke, Virginia.

This research project supports Objective 1. Establish biology and phenology of BMSB in specialty crops.

Evaluating Flight Behavior of BMSB by Nik Wiman, Noel Hahn, and Doo-Hyung Lee

Improved understanding of flight behavior will be key to improving management of BMSB in crops. Flight behavior represents the critical link between the agricultural, urban and natural environments that BMSB uses throughout the year. Although well-known for human-assisted hitch-hiking (phoresy), BMSB is also a strong flier that moves on a landscape-scale between habitats at different times of the year to find overwintering sites, mates, and host plants. Populations can build in natural and urban reservoirs and serve as sources of immigration into crops. Because BMSB may also fly long distances to disperse and colonize new areas, knowledge of flight behavior is also important for understanding invasion biology of this pest.

Three institutions are engaged in a coordinated effort to study different aspects of BMSB flight behavior and its implications for management. One tool that these researchers have relied upon to study flight behavior is a flight mill, a device that records flight distance and speed of an insect attached by a fixed tether to a central pivot. At Rutgers' Philip E. Marucci Blueberry and Cranberry Research Center in Chatsworth NJ, Noel Hahn and Cesar Rodriguez-Saona are examining how temperature, day length, and humidity affect flight capacity of field-collected BMSB using flight mills. At the USDA-ARS Appalachian Fruit Research Station in Kearneysville WV, Doo-Hyung Lee and Tracy Leskey have integrated methodologies including flight mills and harmonic radar systems to address the question of how far BMSB are moving between overwintering and agricultural sites. Finally, at Oregon State University in Corvallis, OR researchers are using flight mills and life table methods to examine how flight capacity of field-collected BMSB may change throughout the season and what sort of consequences long distance flight may have on life history.

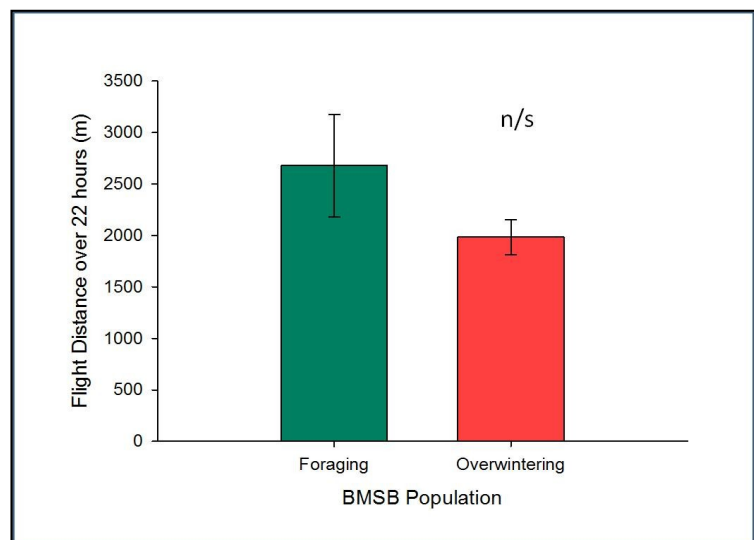


Figure 1. Flight capacity of BMSB measured using a flight mill system in laboratory.

Dispersal from overwintering sites

The Leskey lab has just finished a year-long trial of measuring flight capacity of BMSB using a flight mill system in laboratory. This large data set was acquired by collecting adult BMSB in the morning year-round and testing them over 22 hours. Foraging adults were collected from wild and cultivated host plants. A unique feature of this study is that overwintering adults were retrieved from human-made overwintering sites and immediately tested on the flight mill without further handling. Foraging BMSB populations flew on average 2.5 km over 22 hours with some exceptional individuals flying over 20 km (Figure 1). Somewhat unexpectedly, flight distance of overwintering populations was as high as foraging populations. This result indicates that BMSB have capacity to make long distance dispersal at regional scales and this ability is maintained throughout the overwintering period, which can be readily translated into substantial dispersal capacity of BMSB following spring

emergence.

The Leskey lab also has conducted observations on free flight of BMSB in the field. These observations suggest that BMSB are not likely to initiate their flight when temperatures are below 17°C. When adults were released in an open field surrounded by orchard trees and woodlots, they showed strong, directed flight toward tree lines and most of them landed on or flew above the upper tree canopy (Figure 2). Also, BMSB exhibited a diurnal pattern of prevailing flight directions (Figure 3). Throughout the day, BMSB flew away from the sun although this pattern becomes less apparent close to the sunset.

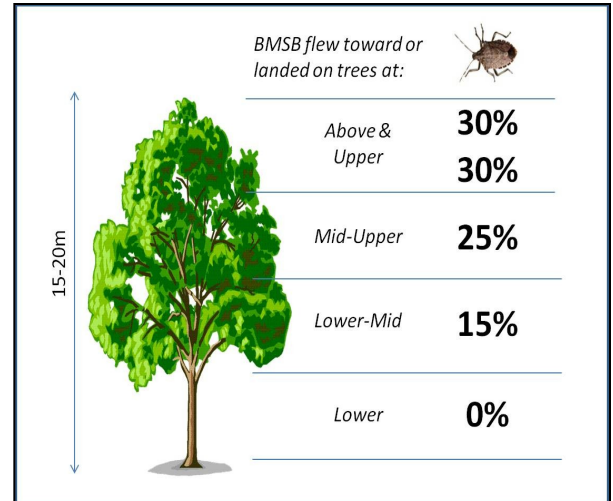


Figure 2. Vertical location of BMSB landing within tree

The Leskey lab is currently using a portable harmonic radar system to track BMSB movement in the field. Over the past year, the lab has

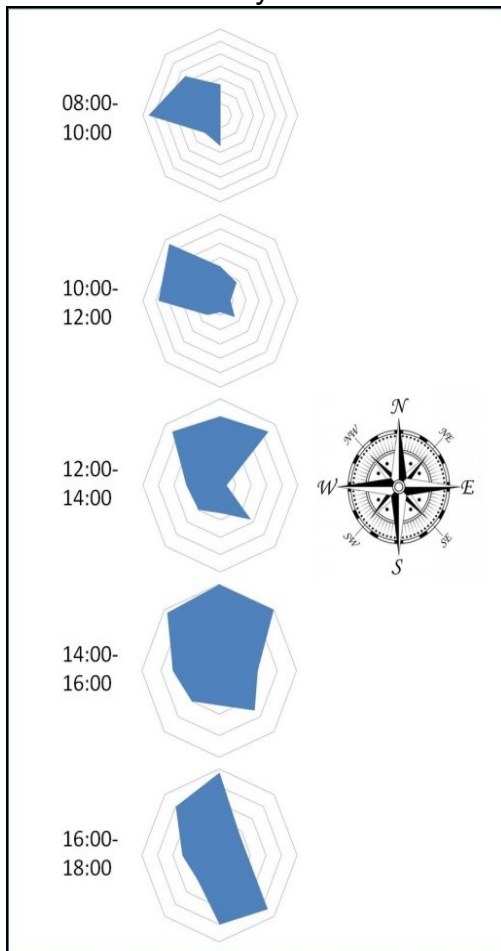


Figure 3. Diurnal pattern of prevailing flight directions of BMSB in the field.

successfully developed a protocol to customize this new technology for stink bug through collaborations with researchers at Agriculture and Agri-Food Canada and University of New Brunswick. In the coming growing season, the lab plans to track BMSB movement immediately after spring emergence, so this critical dispersal period can be better defined and the information can be used toward the development of pre-emptive management programs against BMSB.

Dichotomous flight capacity

In Oregon, BMSB has become common in urban areas interspersed among high-value specialty crops. Although BMSB populations are starting to increase in natural habitats such as forests and wooded borders along farms, proximity of farms to urban areas appears to be the most important landscape risk factor for growers. Oregon State University researchers utilized flight mills to address some basic questions on flight capacity of BMSB in order to better understand its invasive characteristics. Specifically, generational, sexual, and phenological effects on flight distance, frequency, velocity, and diel flight patterns of field-collected BMSB were examined. The second stage (ongoing) of this research is to determine if depletion of energy used for flight has repercussions for future reproduction or survival. Together, these data should help improve understanding of BMSB flight behavior and invasion biology.

One of the most interesting findings from this research was a clear dichotomy in total

This research project supports Objective 1. Establish biology and phenology of BMSB in specialty crops.

flight distance for insects that flew 5 km or less (the majority) and those that flew more than 5 km in 24 h (rare) (Figure 4). These were classified as short distance fliers (SDF) and long distance fliers (LDF), respectively. The LDFs became the focus for our analysis because there was little evidence that SDFs experienced any depletion reproductive capacity or longevity, but there were life history consequences for BMSB classified as LDF. This suggests that BMSB may regularly fly 5 km or less in 24 h with little effect on future reproductive capacity.

In the OSU studies, summer generation females flew farther (Figure 5) and faster than overwintered males and females. Despite the many limitations of extrapolating flight mill data to the field, this research provided evidence that BMSB has the capacity for long distance flight, particularly in the summer generation.

The nutritional status and fat reserves of overwintered versus summer generation adults are one potential explanation for the flight discrepancy between the two generations.

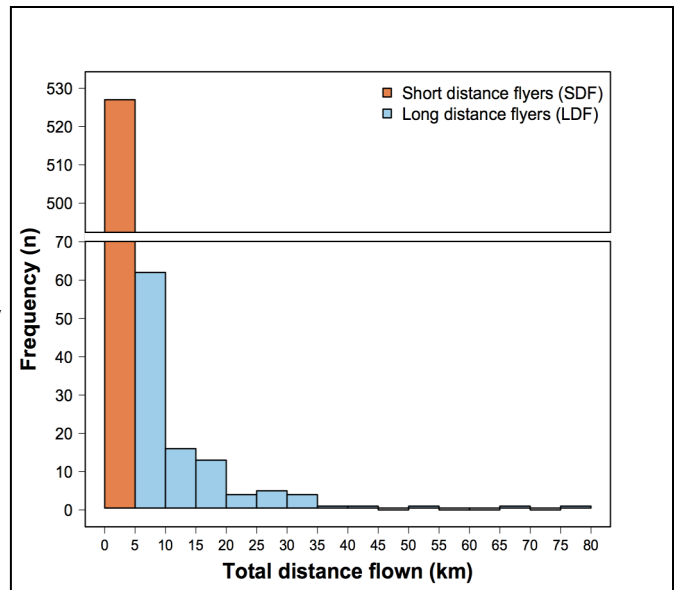


Figure 4. A clear dichotomy was found between BMSB that flew 5 km or less (SDF), and those that flew much farther (LDF).

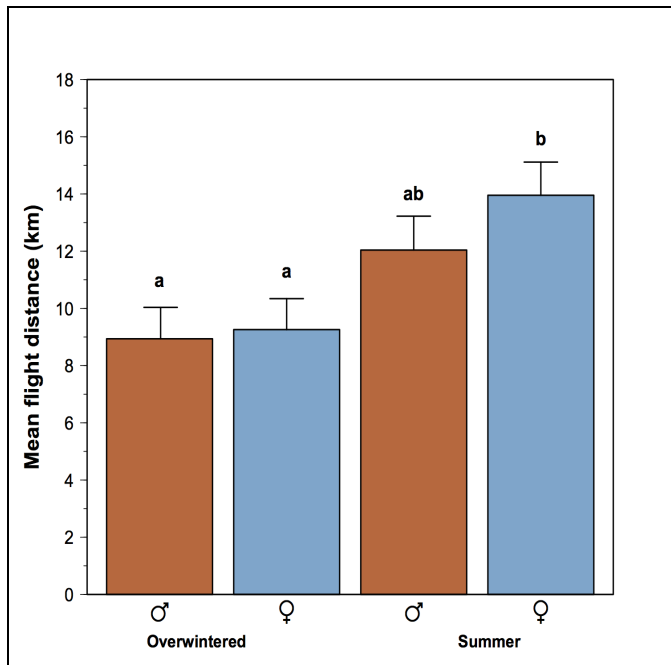


Figure 5. Females from the summer generations flew significantly farther on average compared to overwintered adults.

The nutritional status of these insects will ultimately be determined in a separate bioassay to determine the hypothesis that overwintered adults have depleted energy reserves compared to summer generation adults

Implications for BMSB management

The results of the dispersal and flight mill studies conducted thus far indicate that field-collected BMSB populations have strong flight capacity throughout the growing season. From populations collected from east (WV/MD) and west (OR) coasts, BMSB were found yielding flight distances of >5 km in 24 hours, with a small proportion of the population capable of flights into double digits. These LDFs are likely on the front lines of invading BMSB populations into crops throughout the growing season, and may be responsible for the spread of BMSB

as it invades new areas. Understanding of dispersal patterns for BMSB will help researchers map and predict more precisely invasion routes, and this information would serve as a

Monitoring and Detection Tools for BMSB Rapidly Advance

by Tracy Leskey

The technology to monitor BMSB has improved rapidly. Scientists at the USDA-ARS (IIBBL and AFRS) have identified the BMSB pheromone as a two-component mixture of (3*S*,6*S*,7*R*,10*S*)-10,11-epoxy-1-bisabolen-3-ol and (3*R*,6*S*,7*R*,10*S*)-10,11-epoxy-1-bisabolen-3-ol (Khrimian et al. submitted). In 2012, a large multi-state trial confirmed that the BMSB pheromone was attractive to adults and nymphs season-long. Furthermore, methyl (*E,E,Z*)-2,4,6-decatrienoate (MDT), the pheromone of another Asian stink bug species, *Plautia stali*, that is cross-attractive to BMSB adults late in the season acts as a synergist for the BMSB pheromone (Weber et al. submitted). In combination, these stimuli can be used as a sensitive lure for deployment in monitoring traps.

In 2013, a second multi-state trial was conducted to confirm the use of pheromone in combination with the synergist. Standard black pyramid traps (Fig. 1) were baited with one of

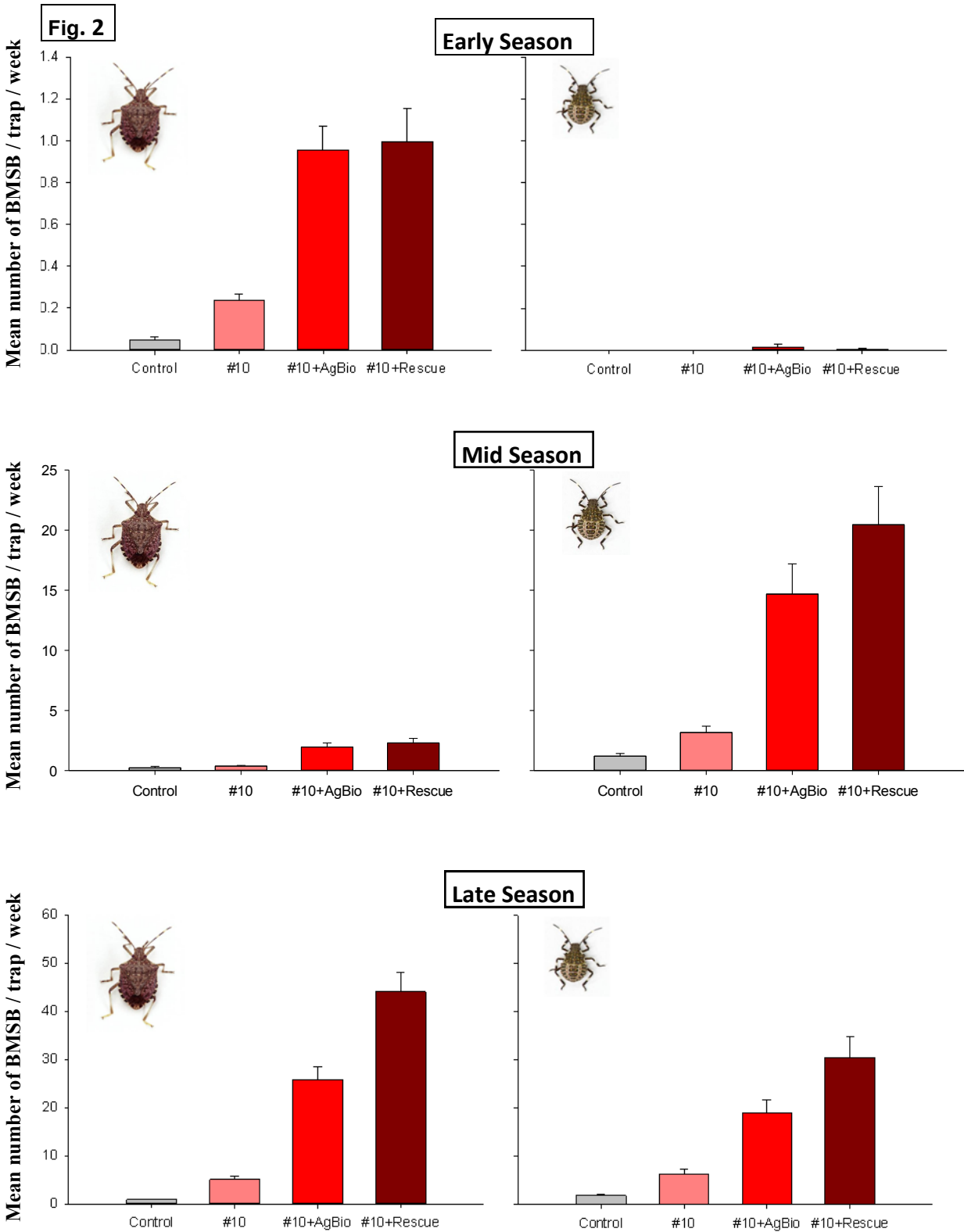


Fig. 1.

four treatments: 1) 10mg lures of the BMSB aggregation pheromone alone (also known as #10); 2) #10 + 120mg MDT (Rescue), 3) #10 + 66mg MDT (AgBio) lures; and 4) unbaited traps. Traps were deployed at the interface between agricultural production and wild, unmanaged habitat in mid to late April and left in place until late October. Trapping sites included tree fruit orchards, small fruit plantings such as blueberries, vineyards, ornamental nurseries, and vegetable planting. In addition, some cooperators used pheromone/synergist stimuli to simply survey for the presence of BMSB. In all, traps were deployed in 19 states across the country and included AL, CA, DE, MD, MI, NC, NY, MA, MO, PA, NJ, OH, OR, RI, UT, VA, VT, WA, and WV. Data from coordinated multi-state trial included sites in DE, MD, NC, NY, PA, NY, OR and VT. Very strong seasonal patterns were observed. During the early, mid and late-season, significantly greater numbers of adults and nymphs were captured in traps when MDT, the synergist, was included with the pheromone compared with those baited with #10

alone or unbaited traps (Fig. 2). Captures were routinely greater in those traps baited with #10 + Rescue MDT lure compared with #10 + AgBio MDT lures, though this was likely a dose response as Rescue lures had 2x the amount of MDT compared with AgBio.

In the early season (mid-April to mid-June), adult activity was detected by traps beginning in mid-April and peaking in late May. Very few nymphs were detected, as reproduction had just begun. During the mid-season (mid-June-mid-August), adult captures were very low but nymphal populations were increasing (mid-June to mid-August), indicative of older overwintered adult populations declining and new generation nymphs developing. During the late-season, largest numbers of adults and nymphs were captured, as this is the



time of year when populations are pheromone lures for BMSB in 2014. As populations of BMSB continue to establish in new regions and threaten specialty crops, the importance of reliable monitoring tools is paramount.

This research project supports Objective 2: Develop monitoring and management tools for BMSB.

Designing Stink Bugs Out of Landscapes by Liane Worthington

The brown marmorated stink bug (BMSB) has an indiscriminate palate and a healthy appetite. The pest thrives on numerous plant species as both food sources and suitable places for laying its egg masses. Ornamental plants face the same risks of BMSB infestation as fruit and vegetable crops.

Researchers recently conducted a study of BMSB in woody ornamentals commonly found in home and public landscapes of the Northeast with the goal of determining whether BMSB can be designed out of landscapes. Principal investigator Erik Bergmann (University of Maryland) led the team that recently reported to the Northeastern IPM Center's BMSB Working Group.

With a robust sampling of nearly 200 cultivars and more than 2,000 individual native and non-native plants, Bergmann and his team observed over 13,000 BMSB and their egg masses for two years.



BMSB adults on the fruit of serviceberry. Photo courtesy of M. Raupp

The research focused on which plants most attract BMSB throughout the insects' annual



BMSB adults on the fruit of *Cryptomeria* (evergreen tree). Photo courtesy of P. Shrewsbury.

cycles. Researchers honed in on specific characteristics that most appealed to BMSB. "BMSB preferred flowering species, or angiosperms, over evergreens, or gymnosperms, at a ratio of 5:1," said Bergmann. "They also preferred hosts that they 'know' evolutionarily, like *cornus* (dogwood), but can favor some native hosts like *acer* (maple) and *ulmus* (elm)."

The team's samples have been grown in commercial nurseries and are the same varieties that consumers purchase for their own homes. Bergmann's team is currently working to compile recommendations for designing

This research project supports Objective 3: Establish effective management programs for BMSB in specialty crops.

Scientists launch video curriculum on stink bugs

A team of 50 scientists, in collaboration with the Northeastern IPM Center, has produced and posted to YouTube ten video clips on how to recognize, trap, and manage the brown marmorated stink bug (BMSB). The videos were produced by James Monahan, a videographer who previously worked on films for public television and university websites with the Rutgers Center for Digital Filmmaking. Chris Gonzales and Carrie Koplinka-Loehr of the Northeastern IPM Center served as co-producers.

The videos cover topics of history and identification, overwintering and spread, monitoring and mapping, host plants and damage, the situation in the Pacific Northwest, and management. The average video length is 7 minutes, and the total length of all of the segments together is 66 minutes.

You can find the videos on YouTube by searching for “brown marmorated stink bug” or by visiting <http://www.stopbmsb.org/video>.

The production team traveled to universities, research stations, and farms in New



Jersey, Pennsylvania, West Virginia, and Maryland to shoot the videos. Chris Hedstrom and Nik Wiman contributed footage shot in Oregon. Monahan did the final editing and production in Ithaca, New York. Shooting and production took place between February and October of 2013.

The purpose of the video series is to educate growers about how to identify, monitor, and manage BMSB. In the videos, scientists and growers discuss why the pest is important in agriculture and what's at stake if we don't stop it. “By using video, we've produced a vivacious curriculum that can be delivered to an Extension meeting or to a grower's home computer,”

commented Koplinka-Loehr, the director of the Northeastern IPM Center.

The videos offer advice to growers, such as:

- If BMSB is present in your orchard, use alternate row middle spray applications to reduce insecticide load and protect natural enemies.
- Some insecticides may cause secondary pest outbreaks of mites, aphids, and scale.
- To protect pollinators, avoid pre-bloom insecticides with long residual activity.
- Peppers, tomatoes, sweet corn, okra, and beans suffer the most damage from BMSB.

This research project supports Objective 4: Integrate stakeholder input and research findings to form and deliver practical outcomes.

Project Outputs

Research Talks

- Acebes, A.L., T.C. Leskey, and J.C. Bergh. Relative suitability of select fruit trees and wild hosts for development of brown marmorated stink bug. Entomological Society of America annual meeting, November 11-14 Knoxville, TN.
- Acebes, A.L., T.C. Leskey, and J.C. Bergh. 2012. Host plant effects on brown marmorated stink bug, *Halyomorpha halys* (Hemiptera: Pentatomidae), behavior and ecology in eastern orchard systems. Cumberland-Shenandoah Fruit Worker's Conference, November 29-30, Winchester, VA.
- Aigner J.D., T.P. Kuhar, and K.L. Kamminga. 2013. Do soil applied neonicotinoids provide control of brown marmorated stink bug (*Halyomorpha halys*) in vegetables? 2013. Entomological Society of America, Eastern Branch Annual Meeting 2013, March 16-19; Lancaster, PA.
- Aigner, J.D. and T.P. Kuhar. 2013. The potential of systemic neonicotinoids in controlling BMSB in vegetables. Oral Presentation: Georgia Entomological Society Annual Meeting 2013, April 10-12; Dawsonville, GA.
- Basnet, S., D. Pfeiffer, T. P. Kuhar, and C. Laub. 2012. Seasonal abundance and biology of brown marmorated stink bug, *Halyomorpha halys* (Stål) (Hemiptera: Pentatomidae), in Virginia vineyards. Annual Meeting of the Entomological Society of America, November 11-14, Knoxville, TN.
- Basnet, S., D. Pfeiffer, T.P. Kuhar, and C. Laub. 2013. Stink bug community in primocane-bearing raspberry planting in southwest Virginia. Entomological Society of America, Eastern Branch Annual Meeting 2013, March 16-19; Lancaster, PA.
- Bergh, J.C. 2012. Impact on orchard crops. Brown marmorated stink bug SCRI Advisory Panel annual meeting. November 28, Kearneysville, WV.
- Bergh, J.C. 2012. IPM in orchard crops. Brown marmorated stink bug SCRI Advisory Panel annual meeting. November 28, Kearneysville, WV.
- Bergh, J.C. and J.P. Engelman. 2012. BMSB management trials in Virginia, 2012. Cumberland-Shenandoah Fruit Worker's Conference, November 29-30, Winchester, VA.
- Bergh, J.C., S. Joseph, T.C. Leskey, D. Polk, G. Krawczyk, B. Butler and S. Wright. 2012. Distribution of brown marmorated stink bug injury within mid-Atlantic apple orchards. Entomological Society of America, 60th Annual Meeting, November 11-14, 2012, Knoxville, TN .
- Bergmann, E., H. Martinson, and M.J. Raupp. Does host origin influence patterns of utilization in BMSB? Entomological Society of America National Meeting. November 2012, Knoxville, TN.
- Bergmann, E., H. Martinson, D-H. Lee, K. Kamminga, and M.J. Raupp. How patterns of movement, refugia, and woody hosts create the perfect storm for the invasive brown marmorated stink bug, *Halyomorpha halys*. 24nd USDA Interagency Research Forum on Invasive Species. Annapolis, MD. January 2013.
- Bickerton, M. Host plant utilization of the brown marmorated stink bug. ESA Annual Meeting, November 11, 2012, Knoxville, TN.
- Bickerton, M., M. Abney, J. Walgenbach, T.P. Kuhar, and K. Kamminga. 2012. Wild host utilization of *Halyomorpha halys* and implications for establishment for in the southeast. BMSB Working Group Meeting. November 30, 2012, Winchester, VA.
- Biddinger, D and N. Joshi. Workshop. Invasive species and their impact on IPM. Pennsylvania Association for Sustainable Agriculture, Farming for the Future Conference, February 9, 2013, State College, PA.
- Biddinger, D. "Ecologically-based pest management: beneficial insects and invasive species." Pennsylvania Association for Sustainable Agriculture 22nd Annual Farming for the Future Conference, February 9, 2013.
- Chen, S., A.L. Nielson, J. Timer, M. Saunders and S. J. Fleischer. 2013. Environment Driven Individual Based Model for Brown Marmorated Stink Bug Population Dynamics. Brown Marmorated Stink Bug IPM Working Group. June 11-12, Bridgeton, NJ.
- Cissel, W., Mid- Atlantic Vegetable Workers Conference - Brown Marmorated Stink Bug Management Update in Sweet Corn, November 2012, Newark, DE
- Coffey, P. and G.P. Dively. An experimental artificial diet for the brown marmorated stink bug, *Halyomorpha halys*. Eastern Branch ESA. March 2013.
- Day, E.R. and Carrie Koplinka-Loehr. "Grower survey on the impact of the Brown Marmorated Stink Bug: first years results" November 27, 2012, Brown Marmorated Stink Bug Working Group, Winchester, VA
- Dieckhoff, C. Annual Meeting of the Entomological Society of America, November 11-14, 2012. "Classical biological control of the brown marmorated stink bug: Behavioral observations of *Trissolcus* spp.,

- potential biological control agents”
- Dieckhoff, C. and K. Hoelmer. Host range evaluations of *Trissolcus* spp. – potential biological control agents of the brown marmorated stink bug, *Halyomorpha halys*. Eastern Branch Meeting of the Entomological Society of America, March 16-19, 2013.
- Dieckhoff, C. and K. Hoelmer. Overview of Obj. 2.2.5 - Asian Natural Enemies of BMSB, November 27, 2013, Kearneysville WV
- Dieckhoff, C. Discussion on biocontrol Surveys, BMSB Planning meeting, February 8, 2013, Kearneysville WV.
- Dieckhoff, C., K. Hoelmer, and M. Buffington. Parasitoids of the BMSB: 2nd Specialized Training Workshop for SCRI grant participants and other interested researchers June 2013, Bridgeton, NJ
- Hedstrom, C., V. Walton, J. Miller, P. Shearer, and J. Olsen. 2013. Feeding Damage on hazelnuts by *Halyomorpha halys*, Brown Marmorated Stink Bug (Hemiptera: Pentatomidae). 87th Annual Orchard Pest and Disease Management Conference. Portland, OR, January 10, 2013.
- Hedstrom, C., V. Walton, J. Miller, P. Shearer, and J. Olsen. 2013. Feeding Damage on hazelnuts by *Halyomorpha halys*, Brown Marmorated Stink Bug (Hemiptera: Pentatomidae), Entomological Society of America Pacific Branch Meeting. Tahoe, NV, April 7-10.
- Hamilton, G.C., G.P. Dively, T.P. Kuhar, J. Whalen. Evaluation of fruit damage in different pepper varieties due to feeding by the brown marmorated stink bug. ESA Annual Meeting. November 2012.
- Hoelmer, K. "BMSB and biocontrol possibilities", presentation at W3185 Western Regional Biological Control Working Group annual meeting, October 3, 2012, Asilomar, CA
- Hoelmer, K. "Brown marmorated stink bug in America" - presentation at Yunnan Academy of Agricultural Science, July 18, 2013, Kunming, China.
- Hooks, C.R.R., A. Rosario-Lebron, J. Hinds, and E. Zobel. 2012. Symposium title: Proceeding Along the IPM Continuum: Developing Multifaceted Approaches for Invasive Species. Talk title: Influence of winter cover crops and flowering borders on brown marmorated stink bug mortality. Entomological Society of America Annual Meeting, November 11-14, Knoxville, TN.
- Jones, A.L., P.M. Shrewsbury, and C.R.R. Hooks. 2012. Indigenous natural enemies of the brown marmorated stink bug. Entomological Society of America Annual Meeting, Knoxville Convention Center, November 11-14, Knoxville, TN.
- Joseph, S.V., B.D. Short, T.C. Leskey, and J.C. Bergh. 2012. Injury to peaches and apples from brown marmorated stink bug following discrete exposure periods during the growing season. Entomological Society of America annual meeting, November 11-14, Knoxville, TN
- Kammaing, K. and T. Kuhar. 2012. Understanding the seasonality of the brown marmorated stink bug in Virginia. Annual Meeting of the Entomological Society of America, November 11-14, Knoxville, TN.
- Krawczyk, G., T.C. Leskey, and D. Polk. Brown marmorated stink bug - panel. 2013 Mid-Atlantic Fruit and Vegetable Convention. Hershey, PA. January 31
- Krawczyk, G., L.A. Hull, and D. Biddinger. 2012. Alternative management options for the brown marmorated stink bug in fruit orchards. Entomological Society of America, 60th Annual Meeting, Knoxville, TN (Entomological Society of America annual meeting, November 11-14)
- Krawczyk, G., L.A. Hull, and D. Biddinger. 2012. The impact of invasive stink bug *Halyomorpha halys* on IPM systems in Pennsylvania fruit orchards. IOBC-WPRS 8th International Conference on Integrated Fruit Production. Kusadasi, Turkey, October 07-12, 2012
- Kuhar, T.P., J.D. Aigner, and C.R. Philips. 2013. Management of brown marmorated stink bug in vegetable crops. Oral presentation: Georgia Entomological Society Annual Meeting, April 10-12, Dawsonville, GA.
- Kuhar, T.P., K. Kamminga, and J. Aigner. 2012. Efficacy of insecticides for control of brown marmorated stink bug (*Halyomorpha halys*) in vegetable crops. Annual Meeting of the Entomological Society of America, November 11-14, Knoxville, TN.
- Lee, D-H, J.P. Cullum, S.A. Wiles, S.E. Wright and T.C. Leskey. a Defining risk posed by *Halyomorpha halys* populations overwintering in natural landscapes. Entomological Society of America annual meeting, November 11-14, Knoxville, TN
- Lee, D-H, S.E Wright and T.C. Leskey. Characterization of overwintering sites of *Halyomorpha halys* in the natural landscape. Entomological Society of America annual meeting, November 11-14, Knoxville, TN
- Leskey, T.C. 2013 Monitoring BMSB movement into specialty crops: Recent advances and unanswered questions. Entomological Society of America-Eastern Branch Annual Meeting. Lancaster, PA.
- Leskey, T.C. 2013 Red Tomato Annual Growers Meeting. BMSB: Solutions emerging after two years of research. Bard College, Annandale-on-Hudson, NY.
- Leskey, T.C. Annual South African Avocado Growers Association Research Symposium and Stink bug Committee Workshop. Management of stink bugs for the South African Avocado Growers Association. Tzaneen, South Africa. 2013

- Leskey, T.C. Iowa State University, Department of Entomology. Seminar entitled Developing Monitoring Tools and Management Solutions for the Brown Marmorated Stink bug. Ames, IA.
- Leskey, T.C., S.E. Wright, A. Khimian, A. Zhang, and D.C. Weber. Season-long patterns of attraction of brown marmorated stink bug to pheromone lures in orchard agroecosystems. Entomological Society of America. Knoxville, TN.
- Lohr, A.K., T.P. Kuhar, B.L. Aigner, J.D. Aigner and C.R. Philips. 2013. Maximum lethal temperature and its potential use in predicting the distribution of the brown marmorated stink bug (*Halyomorpha halys*) in the US. Entomological Society of America, Eastern Branch Annual Meeting 2013, March 16 – 19; Lancaster, PA.
- Lohr, A.K. Management Update in Sweet Corn, November 2012, Newark, DE
- Martinson, H., and M.J. Raupp. Spatial patterns of brown marmorated stink bug host use in nurseries: A multi-scale analysis, in the New Pest vs. Young Scientist Symposium. Entomological Society of America National Meeting Knoxville, TN. November 2012.
- Nielsen A.L. "Incorporating Physiology and Behavior into Management Plans for BMSB" 2013 Colloquium Series, Rutgers-Newark DEENR
- Nielsen A.L. "Reduced-risk Management Options for BMSB" 2013 Eastern Branch ESA
- Nielsen A.L., "Incorporating the reproductive biology of brown marmorated stink bug into phenological models" 2012 Entomol. Soc Am. Knoxville, TN
- Nielsen A.L., and A. Rucker "Steps toward BMSB Management in Peach" Cumberland-Shenandoah Fruit Workers Conf (November 2012)
- Nielsen A.L., and T.C. Leskey "Steps toward developing management programs for brown marmorated stink bug in the Mid-Atlantic region" 2012 Entomol. Soc Am. Knoxville, TN
- Pfeiffer, D.G. 2013. Brown marmorated stink bug (*Halyomorpha halys*) and two invasive drosophilids affecting fruit crops in the mid-Atlantic region, and prospects for the Southwest. Entomol. Soc. Am., February 25-28, Southwestern Branch, Las Cruces, NM
- Polk, D. and A.L. Nielsen. The Challenges of Invasive Pests to Fruit IPM, Four hour symposium. Entomological Society of America - Eastern Branch, Lancaster, PA March 17, 2013.
- Raupp, M.J. Managing Stink bugs, Exotic Borers, and other Threats to Sustainable Landscapes. St. Mary's College, St. Mary's, MD. February. 2013.
- Raupp, M.J. Ready to use products that will kill eggs, nymphs, and adults of BMSB. Effects of pheromone trap placement on the number of stink bugs found on and subsequent damage to tomatoes. Brown Marmorated Stink Bug Research Output Conference. Westminster, MD. April, 2013.
- Rondon, S.I., and NG Wiman. 2012. Nuevas plagas en la región del Nor-Oeste del Pacífico. 108th Annual Meeting, Washington Horticultural Association, Yakima WA, 12 November
- Soergel, D. and G. Krawczyk. 2013. Diurnal and nocturnal activities of the brown marmorated stink bug, *Halyomorpha halys*, in a Pennsylvania orchard. Eastern Branch Entomological Society of America Annual Meeting, Lancaster, PA (March 16-19, 2013)
- Tomasino, E., N. Wiman, J. Osborne, C. Hedstrom, and V. Walton. 2013. Impact of brown marmorated stink bug on Pinot noir wine quality. 64th American Society for Enology and Viticulture National Conference. Monterey, CA, 24 June.
- Venugopal, P.D., G.P. Dively, D.A. Herbert, Environmental and spatial factors influencing patterns in stink bug communities in soybean. Eastern Branch ESA. March 2013.
- Walgenbach, J.F. Update on brown marmorated stink bug in the southern region. BMSB IPM Working Group Meeting. Bridgeton, NJ. June 11, 2013.
- Walgenbach, J.F., M.A. Abney, A.M. Agnello, A. Herbert, and T.P. Kuhar. Determine the lag time and impact of BMSB as it colonizes new habitats. BMSB SCRI Advisory Meeting. Kearneysville, WV. November 28, 2012.
- Wallner, A.M., N. Hahn, C. Rodriguez-Saona, AL Nielsen, and GC Hamilton "Examining landscape factors that are facilitating the distribution of the brown marmorated stink bug (*Halyomorpha halys*) in New Jersey" 2012 Entomol. Soc Am. Knoxville, TN
- Wiman, N.G, S.I. Rondon, P.W. Shearer, and V.M. Walton. 2012. Host plant use patterns of BMSB in Oregon. Brown Marmorated Stink Bug Working Group Meeting. Winchester, VA. November 21, 2013.
- Wiman, N.G., and S.I. Rondon. 2012. Approaches to management of brown marmorated stink bug. Farm Fair OSU-HAREC. Hermiston, OR, 29 November
- Wiman, N.G., C.H. Hedstrom, and V.M. Walton. 2013. Brown marmorated stink bug: an emerging pest in OR winegrapes (poster). Oregon Wine Research Institute Grape Day. April 2, 2013, Corvallis, OR.
- Wiman, N.G., P.W. Shearer, and V.M. Walton, and S.I. Rondon. 2013. Life history of brown marmorated stink bug in Oregon: inferences from laboratory life tables on field collected insects. Symposium: Invasive

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- insect pests: updates on biology and management. Pacific Branch of the ESA, Lake Tahoe, NV, 9 April.
- Wiman, N.G., S.I. Rondon, and V.M. Walton, and P.W. Shearer. 2013. Documenting an invasion: brown marmorated stink bug in Oregon. 87th Annual Orchard Pest and Disease Management Conference. Portland, OR, 10 January
- Wiman, N.G., S.I. Rondon, P.W. Shearer, and V.M. Walton. 2013. Prospects for conservation biological control of brown marmorated stink bug in Oregon. Symposium: Biological control: application, innovation, and exploration. Pacific Branch of the ESA, Lake Tahoe, NV, 9 April.
- Wiman, N.G., S.I. Rondon, V.M. Walton, and P.W. Shearer. 2013. Distribution of brown marmorated stink bug in Oregon and risk for specialty crops. 72nd Annual Pacific Northwest Insect Management Conference. Portland, OR, 8 January
- Wiman, N.G., V. Walton, and P.W. Shearer. 2012. Biology and identification of brown marmorated stink bug. Umpqua Valley Tree Fruit IPM Day. Roseburg, OR. 18 October.
- Wiman, N.G., V. Walton, P.W. Shearer, S.I. Rondon, J. Miller, and J. Lee. 2012. Brown marmorated stink bug in OR: current research and outlook for specialty crops. OSU Department of Horticulture Seminar Series. Corvallis OR. 20 November
- Wiman, N.G., V.M Walton, P.W. Shearer and S.I Rondon. 2013. Flight capacity of brown marmorated stink bug in Oregon and implications for dispersal. 87th Annual Orchard Pest and Disease Management Conference. Portland, OR, 10 January
- Wiman, NG, PW Shearer, VM Walton, SI Rondon, J Lee, J Miller, JF Brunner and T Murray. 2013. Western Region Update. Brown Marmorated Stink Bug Working Group Update. Bridgetown, NJ, 11 June.
- Xu J., D. Fonseca, G.C Hamilton, K. Hoelmer, A.L. Nielsen "Tracing the origin of US BMSBs" BMSB Working Group (June 2013)



Research Posters

- Aigner J.D., D.E. Mullins, T.P. Kuhar, K.L. Kamminga, S.B. Gabbert, A.K. Lohr and B.L. Aigner. 2012. Temperature extremes of the brown marmorated stink bug (*Halyomorpha halys*). Poster presented at: Entomological Society of America, National Annual Meeting 2012, November 12 – 14; Knoxville, TN.
- Brust, G.E. and T.K. McCoy. 2013. IPM for vegetables: a program evaluation to determine value. American Evaluation Association. Washington DC. (growers were surveyed to see whether BMSB disrupted their vegetable IPM programs, how many more insecticide sprays were used for BMSB control and did the training/presentations by UME help in their management of the pest.)
- Buffington, M., Valley, S., Dieckhoff, C., and Hoelmer, K.A. Poster presentation, “Visual identification of *Trissolcus* species parasitizing the brown marmorated stink bug, *Halyomorpha halys*”, Annual Meeting of the Entomological Society of America, November 11-14, 2012.

Research Workshops/Meetings/Symposia

- Polk, D. and T.C. Leskey. The Challenges of Invasive Pests to Fruit IPM. Eastern Branch of the Entomological Society of America Annual Meeting. Lancaster, PA. 8 speakers.
- Hoelmer, K.A., C. Dieckhoff, M. Buffington and E. Talamas. 2013. 2nd Workshop on BMSB Parasitoid Identification, presented in June 2013 in Bridgeton NJ preceding the BMSB IPM Workgroup Meeting.
- Lee, D-H, C. Harris and S. Joseph. New Pest vs. Young Scientists: Advances Against Brown Marmorated Stink Bug. 2012 Entomological Society of America Annual Meeting, Knoxville, TN. 10 speakers from 2 countries.
- Klick, J. and T.C. Leskey, Proceeding along the IPM Continuum: Developing Multifaceted Approaches for Invasive Species. 2012 Entomological Society of America Annual Meeting, Knoxville, TN. 12 speakers.

Research Workshops/Meetings/Symposia

- OSU BMSB website, as well as digital extension publications: <http://horticulture.oregonstate.edu/group/brown-marmorated-stink-bug-oregon>
- Scholar site for BMSB Working Group maintained at Virginia Tech, <http://scholar.vt.edu> (by enrollment only)
- IPMNET website with BMSB fact sheets and section devoted to current BMSB research at <http://Extesion.umd.edu/IPM>
- Use of Citizen Science-based data to track BMSB throughout NYS. <http://imapinvasives.org/nyimi/map/> 2013 Brown Marmorated Stink Bug Activity in Agriculture.

Research Publications

- Jentsch, P. 2013. Assessing the Invasiveness of the Asian Brown Marmorated Stink Bug. NY Fruit Quarterly. 21(3): 17-22.
- Joseph, S., J.C. Bergh, S.E. Wright and T.C. Leskey. 2013. Factors affecting captures of brown marmorated stink bug, *Halyomorpha halys* (Hemiptera: Pentatomidae) in baited pyramid traps. Journal of Entomological Science. 48: 43-51.
- Kuhar T.P., H. Doughty, K. Kamminga, and L. Lilliston. 2012. Evaluation of insecticides using a bean dip bioassay for control of brown marmorated stink bug, 2011. Arthropod Management Tests 2012, Vol. 37: L1. Online publication. doi: 10.4182/amt.2012.L1.
- Kuhar, T.P, H. Doughty, K. Kamminga, A. Wallingford, C. Philips, and J. Aigner. 2012. Evaluation of foliar insecticides for the control of brown marmorated stink bug in tomatoes in Virginia, 2011. Arthropod Management Tests. Vol. AMT37. Sec. E72. doi: 10.4182/amt.2012.E72.
- Lee, D.-H., B.D. Short, S.V. Joseph, J.C. Bergh and T.C. Leskey. (2013). Review of the biology, ecology, and management of *Halyomorpha halys* (Hemiptera: Pentatomidae) in China, Japan, and the Republic of Korea. Environmental Entomology 42: 627-641.
- Lee, D-H, B.D. Short, A.L. Nielsen, and T.C. Leskey. Impact of organic insecticides on the survivorship and mobility of brown marmorated stink bug (Hemiptera: Pentatomidae). Florida Entomologist (accepted).
- Lee, D-H, S.E. Wright, G. Boiteau, C. Vincent, and T.C. Leskey. 2013. Effectiveness of glues for harmonic radar attachment on *Halyomorpha halys* (Hemiptera: Pentatomidae) and their impact on adult survival

- and mobility. *Environmental Entomology*. 42:515-523.
- Lee, D-H., S.E. Wright, and T.C. Leskey. 2013. Impact of insecticide residue exposure on the invasive pest, *Halyomorpha halys* (Stål) (Hemiptera: Pentatomidae): analysis of adult mobility. *Journal of Economic Entomology*. 106(1): 150-158.
- Leskey, T.C., B.D. Short, and D-H. Lee. 2013. Efficacy of insecticide residues on adult *Halyomorpha halys* (Stål) (Hemiptera: Pentatomidae) mortality and injury in apple and peach orchards. *Pest Management Science*. (accepted).
- Martinson, H.M., P.M. Shrewsbury, and M.J. Raupp. 2013. Invasive stink bug wounds trees, liberates sugars, and facilitates native Hymenoptera. *Annals of the Entomological Society of America* 106: 47-52.
- Talamas E., Buffington M., and Hoelmer K. (2013). New Synonymy of *Trissolcus halyomorphae* Yang. (published in *Journal of Hymenoptera Research*)
- Timer, J. and M. Saunders. 2013. Meridic Diet for *Halyomorpha halys*. *Journal of Entomological Science* (accepted).

Extension Talks and Meetings

- 2013 Hudson Valley Commercial Fruit Growers School. Brown Marmorated Stink Bug Impacts and Needs – An Audience Survey. Kingston, NY. February.
- 2013 Hudson Valley Commercial Fruit Growers School. Creature Features: Predictions and Management of BMSB and 17-Year Cicada in the Hudson Valley for 2013. Kingston, NY. February.
- 2013 Capital District Pesticide Recertification Day. March 22. Update on Invasive Pests.
- 2013 Capital District Vegetable and Small Fruit Meeting. February, 27. Update on Invasive Pests.
- 2013 Conference: 7th Ann. NYSTLA NY Botanical Garden Field Day - Update on Invasive Pests, September 13, 2013, 101 attendees
- 2013 Conference: Brooklyn Landscape Gardeners' Assn, March 3, 2013, 38 attendees
- 2013 Conference: New England Grows, 6 February 2013, 1800 attendees
- 2013 Conference: NY State Arborists: Cornell Entomology Update: Notes and Noteworthy Landscape Pests, January 27, 2013, 89 attendees
- 2013 Conference: NY State Arborists: Cornell Entomology Update: Notes and Noteworthy Landscape Pests, January 27, 2013, 61 attendees
- 2013 Conference: PCA of Long Island: Out with the old, in with the new: Past and predicted problems, January 24, 2013, 110 attendees
- 2013 Garden Insect Walk/ Peconic Land Trust, July 12, 2013, 12 attendees
- 2013 Master Gardener Open House/LIHREC, July 13, 2013, 200 attendees
- 2013 Master Gardeners, Suffolk Co. Coop. Ext.master, April 10, 2013, 52 attendees
- 2013 Population Increase, Movement and Impact of the BMSB into New York State Orchards. Upper Hudson / Champlain Commercial Tree-Fruit School, February
- 2013 Updates on spotted wing drosophila and brown marmorated stink bug, Plant Science Day, LIHREC, July 11, 2013, Riverhead, NY. 75 attendees.
- 2013 Workshop: Certified Nursery and Landscape Professional, 26 February 2013, 7 attendees
- 2013, Conference: NYS Turf and Landscape Assn –Landscape Pests: the Least-Wanted List, 23 October, 80 attendees (estimated)
- Bergh, J.C. 2013. Brown marmorated stink bug management for 2013. Fruit schools for commercial tree fruit producers, February 11-15, Patrick, Botetourt, Nelson, Rappahannock and Frederick counties, VA
- Bergh, J.C. 2013. Pest management update. Extension meetings (11 from April through August) for commercial tree fruit producers at various locations in Virginia.
- Bergh, J.C. 2013. Where are we with monitoring and managing BMSB in fruit orchards? Annual meeting of the Virginia/West Virginia Horticultural Societies, January 22-24, Richmond, VA
- Biddinger, D. "Ecologically-based pest management: beneficial insects and invasive species." Pennsylvania Association for Sustainable Agriculture 22nd Annual Farming for the Future Conference, February 9, 2013.
- Biddinger, D. Lancaster County Fruit Twilight Meeting. Management of BMSB and other fruit pests in orchards. May 7, 2013, Lancaster, PA. 100+ Attendees
- Biddinger, D. and N. Joshi. Workshop. Invasive species and their impact on IPM. Pennsylvania Association for Sustainable Agriculture, Farming for the Future Conference. February 9, 2013, State College, PA.
- Dieckhoff and KA Hoelmer. BIIR Display on BMSB at UDEL AgDay 2013.
- Dieckhoff, C., B.T. Cutting, and K.A. Hoelmer, Updated an identification key for "Hymenopteran parasitoids

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- associated with Pentatomidae in North America” (co-authors:). The key is a compilation of already published material in scientific literature and was updated from the version initially given to collaborators and participants of the specialized training workshop held by BIIR in April 2012. The updated version was distributed at the June 2013 ID workshop.
- Dupont, T. and S.J. Fleischer. Insect scouting, ID, and organic management. Pennypack Farm and Education Center. August 20, 2013, Horsham, PA.
- Fleischer, S.J. Pheromone trap networks, phenology models, and trap crops for invasive species. Discovery Days, Southeast Research and Extension Center. July 18, 2013, Landisville, PA.
- Fleischer, S.J. Stink bug update. Central Susquehanna Vegetable Meeting. January 22, 2013, Mifflinburg, PA. (also delivered by John Eslinger at the Northeast Vegetable Producer Meeting on January 24, 2013).
- Hamilton, G. Invasives of Concern: Brown Marmorated Stink Bug. Society of American Florists. February 2013.
- Hamilton, G. What We've Learned About BMSB. Maryland BMSB Workshop. 50 Attendees.
- Hamilton, G. Brown Marmorated Stink bug. Central Jersey Turf and Ornamentals Institute. March 2013. 200 Attendees.
- Jacobs, S. Attack of the stink bugs: what are they, where they come from, what to do. Ag Progress Days. August 13, 2013, Rock Spring, PA. 30 Attendees
- Krawczyk, G. Brown marmorated stink bug – three years later. Ag Progress Days. August 15, 2013, Rock Spring, PA. 20 Attendees
- Krawczyk, G. The impact of BMSB management on IPM systems in orchards, including scale and woolly apple aphid control. President Day Fruit Growers Educational Meeting. February 18, 2013, Biglerville, PA, 250 Attendees.
- Krawczyk, G. BMSB and seasonal orchard IPM updates. Adams County Twilight IPM meeting. May 8, 2013, Fairfield, PA. 90 Attendees.
- Krawczyk, G. BMSB and seasonal orchard IPM updates. Central Susquehanna Twilight IPM meeting. May 23, 2013, Richfield, PA. 55 Attendees.
- Krawczyk, G. BMSB and seasonal orchard IPM updates. Erie County Tree fruit IPM meeting. May 16, 2013, North East, PA. 25 Attendees.
- Krawczyk, G. BMSB and seasonal orchard IPM updates. Franklin County Twilight IPM meeting. May 9, 2013, St. Thomas, PA. 25 Attendees.
- Krawczyk, G. BMSB and seasonal orchard IPM updates. Southeast region Orchard Twilight IPM meeting. May 22, 2013, Kempton, PA. 75 Attendees.
- Krawczyk, G. BMSB and seasonal orchard IPM updates. Western PA Twilight IPM meeting. May 15, 2013, Enon Valley, PA. 45 Attendees,.
- Krawczyk, G. Brown marmorated stink bug management and monitoring update. PSU FREC Plant Protection Day, September 11, 2013, Biglerville, PA. 49 Attendees.
- Krawczyk, G. Integrated fruit production update for the new season. Regional IPM meeting, April 11, 2013, Chambersburg, PA. 32 Attendees.
- Krawczyk, G. Management of BMSB and other pest in organic orchard. Pennsylvania Association for Sustainable Agriculture (PASA Summer in Organic Orchard workshop), August 02, 2013, Rochester, PA. 18 Attendees
- Krawczyk, G. New challenges and opportunities in managing insect pests. Western PA Tree Fruit Growers Meeting. March 6, 2013, Wexford, PA. 48 Attendees.
- Krawczyk, G. New challenges and opportunities in managing insect pests. Erie County Tree Fruit Growers Meeting. March 7, 2013, North East, PA. 52 Attendees.
- Krawczyk, G. Stink Bug and Tree fruit IPM. New Holland Vegetable Day. January 21, 2013, New Holland, PA. 63 Attendees
- Krawczyk, G. The impact of BMSB management on IPM systems in fruit orchards. Western PA Tree Fruit Growers Meeting. March 6, 2013, Wexford, PA. 48 Attendees.
- Krawczyk, G. The impact of BMSB management on IPM systems in fruit orchards. Erie County Tree Fruit Growers Meeting. March 7, 2013, North East, PA. 52 Attendees.
- Krawczyk, G. The impact of BMSB management on IPM Systems. Appalachian Region Fruit Growers Meeting. March 5, 2013, Bedford, PA. 37 Attendees.
- Krawczyk, G. The impact of BMSB management on IPM. Northeast PA Tree Fruit Meeting. February 14, 2013, Avoca, PA. 47 Attendees.
- Krawczyk, G. The impact of BMSB management on IPM. Snyder County Tree Fruit Meeting. February 13, 2013, Mifflinburg, PA. 67 Attendees.
- Krawczyk, G. The impact of BMSB management on IPM. Southeast PA Tree Fruit Meeting. February 13, 2013, Leesport, PA. 83 Attendees.

- Krawczyk, G., BMSB and seasonal orchard IPM updates. Appalachian region Fruit Growers Twilight IPM meeting. May 21, 2013, New Enterprise, PA. 42 Attendees.
- Kuhar, T.P. 2013. Efficacy of insecticides for controlling tomato pests including brown marmorated stink bug. Tomato Session . 2013 New Jersey Agriculture Convention and Trade Show, February 4-6, Atlantic City, NJ.
- Kuhar, T.P. 2013. Efficacy of new insecticides for controlling worms, aphids, and stink bugs in sweet corn, peppers and cole crops – Hot Topics Session – 2013 New Jersey Agriculture Convention and Trade Show, February 4-6, Atlantic City, NJ
- Kuhar, T.P. and J.D. 2013. Ongoing vegetable research at Kentland Farm in Blacksburg, VA and an update on brown marmorated stink bug. Oral Presentation. On-Farm Twilight Grower Meeting. July 9, 2013. Brightwood, VA.
- Kunkel, B. Summer Turf and Nursery Expo, Discussed research projects regarding BMSB for nursery, landscape and turfgrass professionals. August 2013.
- Kunkel, B. Tri-State Brown Marmorated Stink Bug Conference, Discussed insecticide trials from last fall and help provide hands-on with parasitoids of BMSB: parasitoids placed in resin. April 2013.
- Leskey, T.C., Blue Ridge Mountain Association Meeting. What we have learned about the brown marmorated stink bug. Bluemont, VA.
- Leskey, T.C., Mid-Atlantic Fruit and Vegetable Convention. BMSB update. Hershey, PA
- Leskey, T.C., University of Maryland, Carroll County Extension Center. Improving Detection Tools for Brown Marmorated Stink Bug. Westminster, MD
- Leskey, T.C., Utah State University. Spotted Wing Drosophila and Brown Marmorated Stink Bug Workshop for Commercial Fruit Growers. BMSB and SWD Management. Spanish Forks, UT.
- Mills, C. and S.I. Rondon. Bugs at the Library!. Topic: Insects 4 Kids. July 13, 2013 , Heppner, OR.
- Murphy, A. and S.I. Rondon Integrated pest management. Master gardening training. February 22, 2013, Pendleton, OR.
- Nielsen, A.L. "GBM, SWD and BMSB - Managing the alphabet soup" Maryland Grape Growers Association– June 2013 .
- Nielsen, A.L. "Two invasive late-season pests in wine grapes" Grape Expectations, February 2013 .
- Nielsen, A.L. "Brown Marmorated Stink Bug: Invasion, Biology, Monitoring and Management" 2013 eOrganic webinar. 135 Attendees.
- Nielsen, A.L. "Steps toward a sustainable management for BMSB and key orchard pests" NRCS NJ twilight, October 2012.
- Nielsen, A.L. and D Polk. "Using a Phenological Model and Border Spray for BMSB" Mid-Atlantic Fruit and Vegetable Convention, January 2013 .
- Nielsen, A.L., "BMSB Phenology and Management in Fruit (What to spray and when)" N. Jersey Commercial Fruit Growers Mtg, March 2013.
- Pfeiffer, D. G. 2013. Spotted wing drosophila and brown marmorated stink bug - the biggest challenges to berry growers. Sixth Virginia Berry Conference. March 14, Virginia State Univ., Petersburg, VA
- Polk, D. "Tree Fruit IPM Update for 2013." North Jersey Commercial Fruit Growers Meeting, Asbury, NJ. March 5, 2013. 68 growers.
- Polk, D. "What We Know About BMSB Management in Small Fruit – Blueberries and Grapes." Mid-Atlantic Fruit and Vegetable Convention, January 31, 2013, Hershey, PA. 210 growers and industry reps.
- Polk, D. Fruit IPM Update. Hunterdon, Mercer, Morris, Warren, Monmouth County Twilight Meeting. May 23, 2013 32 growers
- Polk, D. IPM Update for Tree Fruit and Grapes. Gloucester/Cumberland/Salem County Twilight Meeting. April 23, 2013. 28 growers.
- Polk, D. Post Bloom IPM Update for Blueberries. Atlantic/Burlington County Blueberry Twilight Meeting. May 30, 2013. 85 growers
- Rondon, S.I. Integrating research and extension in the USA: the entomological perspective. 2013. Organized by University of Rennes 1, June 11, 2013, Rennes, France.
- Timmer, J. Grower's coffee pot meetings, Erie, PA. 60 Attendees.
- Tooker, J. Managing insect pests in soybeans. Pennsylvania State Extension Soybean Workshop, December 14, 2012, Collegeville, PA. 25 Attendees.
- Tooker, J. Managing insect pests in soybeans. Pennsylvania State Extension Soybean Workshop, December 13, 2012, Mexico, PA. 35 Attendees.
- Tooker, J. Managing insect pests in soybeans. Pennsylvania State Extension Soybean Workshop, December 12, 2012, Bedford, PA. 7 Attendees.
- Tooker, J. Managing insect pests in soybeans. Pennsylvania State Extension Soybean Workshop, December

- 11, 2012, Mercer, PA. 8 Attendees.
- Tooker, J. Review of 2012, preview of 2013: an entomological perspective. Western Pennsylvania Crops Day- Butler County, February 26, 2013, Prospect, PA. 67 Attendees.
- Tooker, J. Review of 2012, preview of 2013: an entomological perspective. Crop Management Team Webinar Series. Statewide (presented online from University Park campus), February 25, 2013. 34 Attendees.
- Tooker, J. Review of 2012, preview of 2013: an entomological perspective. Crops and Pesticides Update - One Day Seminar, Somerset County, February 21, 2013, Somerset, PA. 10 Attendees.
- Tooker, J. Review of 2012, preview of 2013: an entomological perspective. Professional Crop Producers Conference, February 20, 2013, Lancaster, PA. 70 Attendees
- Tooker, J. Review of 2012, preview of 2013: an entomological perspective. Huntingdon County Crop Day, February 13, 2013, Warriors Mark, PA. 65 Attendees.
- Tooker, J. Review of 2012, preview of 2013: an entomological perspective. Crops and Pesticides Update - One Day Seminar, Bradford County, February 12, 2013, Wysox, PA. 65 Attendees.
- Tooker, J. Review of 2012, preview of 2013: an entomological perspective. Schuylkill County Ag Day, February 7, 2013, Schuylkill Haven, PA. 22 Attendees.
- Tooker, J. Review of 2012, preview of 2013: an entomological perspective. Crops and Pesticides Update - One Day Seminar, Dauphin County, February 6, 2013, Berrysburg, PA. 65 Attendees.
- Tooker, J. Review of 2012, preview of 2013: an entomological perspective. Crops and Pesticides Update - One Day Seminar, Union County, February 5, 2013, Lewisburg, PA. 45 Attendees.
- Tooker, J. Review of 2012, preview of 2013: an entomological perspective. Crops and Pesticides Update - One Day Seminar, Franklin County, January 31, 2013, Chambersburg, PA. 60 Attendees.
- Tooker, J. Review of 2012, preview of 2013: an entomological perspective. Crops and Pesticides Update - One Day Seminar, Blair County, January 18, 2013, Altoona, PA. 50 Attendees.
- Tooker, J. Review of 2012, Preview of 2013: An Entomological Perspective. Crops and Pesticides Update - One Day Seminar, Lancaster County. January 17, 2013, Lancaster, PA. 150 Attendees
- Tooker, J. Review of 2012, preview of 2013: an entomological perspective. Keystone Crops and Soils Conference 2012, October 19, 2012, Grantville, PA. 110 Attendees.
- Walgenbach, J.F. 2013. Managing spider mites and stink bugs. Winter Vegetable Conference. February 21, 2013, Asheville, NC.
- Walgenbach, J.F. 2013. Status of apple IPM programs in the southeast after five years of reduced-risk IPM. Southeastern Apple Growers Meeting. January 16, 2013, Asheville, NC.
- Walgenbach, J.F. 2013. Apple pest management recommendations. Wilkes County Apple Growers. February 18, 2013, Wilkesboro, NC.
- Walgenbach, J.F. 2013. Progress in using the brown marmorated stink bug pheromone trap. Henderson County Preharvest Apple Tour. August 6, 2013, Eedneyville, NC.
- Walgenbach, J.F. and S.C. Schoof. Comparison of foliar versus drip irrigation application of insecticides for insect control on tomatoes, pepper and cucumber. Fresh Market Tomato and Vegetable Field Day. August 8, 2013, Mills River, NC.
- Walgenbach, J.F. 2013. 2013 Apple Insect Update. Blue Ridge Apple Growers Association Meeting. February 6, 2013, Hendersonville, NC.
- Walton, V.M. Brown Marmorated Stink Bug in Wine Grapes - Columbia Gorge Growers Field Day. June 11, 2013, Mosier, OR.
- Walton, V.M. Impact of Brown Marmorated Stink Bug in Wine Grapes. Willamette Valley Technical Workgroup. March 6, 2013, Salem, OR.
- Whalen, J. Lima Bean Forum - Brown Marmorated Stink bug Management Update. December 2012 .
- Whalen, J. New Jersey Ag Convention and Trade Show Jersey Vegetable Growers Meeting - Stink bug Damage and Control in Sweet Corn. January 2013.
- Wiman, N.G. 2013. Brown marmorated stink bug update for tree fruits. Southern Oregon Research and Extension Field Day. July 11, 2013, Central Point, OR.
- Wiman, N.G. and V.M. Walton. Brown Marmorated Stink Bug update for blueberries. Blueberry Field Day. July 17, 2013, Canby, OR.
- Wiman, N.G. and V.M. Walton. Brown Marmorated Stink Bug update for caneberries. Caneberry Field Day. July 10, 2013, Canby, OR.
- Wiman, N.G., and V.M. Walton. Brown marmorated stink bug (BMSB): A potential new pest of OR Caneberries. Peerbolt Crop Management Group Caneberry Meeting. February 27, 2013, Woodburn, OR.
- Wiman, N.G., P.W. Shearer, V.M. Walton, and S.I. Rondon. Brown marmorated stink bug – biology and management. Malheur County Extension Entomology Short Course. February 19, 2013, Ontario, OR.
- Wiman, N.G., P.W. Shearer, and V. Walton. Brown marmorated stink bug: biology, management and current

- status. Hood River Winter Horticulture Meeting. February 6, 2013, Hood River, OR.
- Wiman, N.G., P.W. Shearer, and V. Walton. Brown marmorated stink bug: An emerging pest in the Pacific Northwest. Willamette Valley Tree Fruit Growers Association Annual Meeting. February 9, 2013, Salem, OR.
- Wiman, N.G., V. Walton, E. Tomasino, C.H. Hedstrom, P. Shearer, and S.I. Rondon. Brown marmorated stink bug: an emerging pest in OR winegrapes. OVS Willamette Valley Winegrape Growers Meeting. March 9, 2013, McMinnville, OR.
- Wiman, N.G., V.M. Walton, C.H. Hedstrom. Brown Marmorated Stink Bug in Hazelnut - Hazelnut Summer Tour. August 7, 2013, St. Paul, OR.

Extension Workshops

- Advanced Landscape IPM Workshop. Morris Arboretum of the University of Pennsylvania. December 5-7, 2012.
- Aliens in our midst: The consequences of introductions of non-native insects and plants to our urban forests. Association of Consulting Arborists. San Bernardo, CA. November 29, 2012.
- Biological Control in Landscapes. Western Tree Management Symposium. Cal Tech, June 19, 2013, Pasadena, CA.
- Borers, beetles, and bugs. SavATree Conference. February 6, 2013, Floram Park, NJ.
- Brust, G.E. 2013. New management guidelines for BMSB in vegetables. Southern MD Fruit and Vegetable Meeting. Loveville, MD.
- Diagnostic workshop for invasive insect pests. Tree Care Industry Association Expo. Baltimore, MD. November 7, 2012.
- Dively, G. Status of the BMSB on the Eastern Shore of Maryland. Maryland Pesticide Conference. February 2013.
- Dively, G. Biology and Management of the BMSB. Iowa State University Hemiptera Research Conference. March 2013.
- Dively, G., M. Lekveishvili Presented talks on BMSB biology, damage and management at several county grower meetings, and at the MD Pesticide Conference, IL Crop Advisor Conference, TN Crop Expo, and Eastern Branch Meeting of the ESA
- Frederick Association of Landscape and Nursery Managers Winter Conference, Frederick, MD
- Hooks, C.R.R. Baltimore County Field Crops Day, Upperco, MD. Impact of natural enemies, spider mites and GMOs on pest and/or yield in field crops, December 6, 2012. 145 Attended
- Hooks, C.R.R., A. Jones, K. Kamminga, J. Whalen, J. Tooker, P.M. Shrewsbury and T.P. Kuhar. 2012. Biology, Ecology and Management of Brown Marmorated Stink Bug in Orchard Crops, Small Fruit, Grapes, Vegetables and Ornamentals: Emphasis on Native Natural Enemies. Stakeholder Advisory Panel Meeting. USDA, Appalachian Fruit Research Station, Kearneysville, WV, November 28, 2012.
- Hooks, C.R.R., Dorchester Agronomy, Cambridge, Maryland. Research updates and profiles of some pests and their management in field crops, January 15, 2013. 55 Attended
- Hooks, C.R.R., Maryland Agricultural Pesticide Conference. Stink bugs, spider mites and Bt corn updates. Frederick, MD. February 12, 2013. 125 Attended
- How a Changing Climate and Exotic Species threaten the Sustainability of Our Landscapes and Gardens. EcoSavvy Symposium. Alexandria, VA. February 23, 2013.
- How bugs make the world go around. Rachel Carson Council. Kensington, MD. May 4, 2013.
- Identification and management of invasive insect pests. National Park Service. Shepherdstown, WV. May 23, 2013.
- Insect update. Green Industry Professional Seminar, Professional Grounds Maintenance Society, Annandale, VA. January 24, 2013.
- Insecticidal and Non-Insecticidal Approaches for Managing the Brown Marmorated Stink Bug in Landscapes and Homes, Landscape Contractors Pesticide Recertification Conference, Chevy Chase, MD, February 14, 2013.
- Landscape invaders and the great outdoors. Kentucky Pest Control Shortcourse. University of Kentucky. Lexington, KY. October 2, 2012.
- Managing Stink bugs, Exotic Borers, and other Threats to Sustainable Landscapes. St. Mary's College, St. Mary's, MD. February 20, 2013.
- MANTS and MNLA Winter Meeting at Mid Atlantic Nursery and trade show in Baltimore, MD
- New tools and strategies for smacking-down exotic and native insects and mites. University of Tennessee Grounds Maintenance Short Course. Knoxville, TN. January 30, 2013.

- Occasional invaders. Virginia Pest Management Association. Richmond, VA. May 14, 2013.
- Parasitoids of BMSB. Brown Marmorated Stink bug Conference, Jones - Hands-on lab: University of Maryland Extension, Westminster, MD. April 2013
- Pest Management Conference, Carroll Community College, Westminster, MD
- Ready to use products that will kill eggs, nymphs, and adults of BMSB. Effects of pheromone trap placement on the number of stink bugs found on and subsequent damage to tomatoes. Brown Marmorated Stink Bug Research Output Conference. Westminster, MD. April 10, 2013.
- Shemin University Winter Conference for Nursery and Landscape Managers, Baltimore, MD
- Shrewsbury, P.M. Brown marmorated stink bugs. The Pest World Experience - 2012, National Pest Management Association Conference. Boston, MA. October. 2012
- Shrewsbury, P.M. BMSB research on woody ornamentals. Brown Marmorated Stink bug Conference, University of Maryland Extension, -Westminster, MD. April 2013
- Shrewsbury, P.M. Invasive Insect Pests of Forests and Landscapes. Integrated Pest Management Principles and Practices Training Workshop, National Park Service, Shepherdstown, WV
- The stinker at the window. Virginia Pest Management Association. Richmond, VA. October 4, 2012.
- Threats to sustainability of our urban forests. Keynote Address. University of Tennessee Grounds Maintenance Short Course. Knoxville, TN, January 30, 2013.
- Tri-State Brown Marmorated Stink Bug Research Update Conference for the horticultural industry, Carroll Community College, Westminster, MD. Project purpose: To conduct outreach effort for the research conducted on Brown Marmorated Stink bug an practical applications of this information for Maryland green industry personnel and Master Gardener Coordinators. This event combined lecture with hands-examination of the BMSM and the predators and parasites that are helping reduce populations of this bug. April 10, 2013. 53 Attended

Extension Oriented Websites and Digital Products

- Bergh, J.C. 2013. Tree Fruit Pest Management Updates. Blog site for disseminating information about tree fruit pests, including BMSB. <http://blogs.ext.vt.edu/tree-fruit-pest/>
- Bug of the Week. The gathering storm: Brown marmorated stink bug. September 13, 2013. <http://bugoftheweek.com/blog/2013/9/13/the-gathering-storm-brown-marmorated-stink-bug-ihalyomorpha-halysi> . ~700 visits.
- Bug of the Week. To eat a stink bug, part 1 – A curious reunion, Brown Marmorated Stink Bug, *Halyomorpha halys* and Chinese praying mantis, *Tenodera sinensis*, September 20, 2013, <http://bugoftheweek.com/blog/2013/9/20/> ~1000 visits.
- Bug of the Week. To eat a stink bug, part 2 – Bug vs. Bug, Brown Marmorated Stink Bug, *Halyomorpha halys*, meets the wheel bug, *Arilus cristatus*. September 30, 2013.
- Confirmed BMSB submission locations, Hudson Valley Regional Tree Fruit link: <http://hudsonvf.cce.cornell.edu/bmsb1.html>
- ENY Brown Marmorated Stink Bug Project: <http://hudsonvf.cce.cornell.edu/bmsb1.html> (incorporates Flash and Vimeo movies of presentations on BMSB for tree fruit and small fruit growers, plus additional websites and online resources)
- Grow it Eat It. Home and Garden Information Center. Stink bug related videos. 2,359 visits. <http://bugoftheweek.com/blog/2013/9/30/death-of-a-stink-bug-part-2-bug-vs-bug-brown-marmorated-stink-bug-ihalyomorpha-halysi-meets-the-wheel-bug-iarilus-cristatusi> ~1300 visits
- Insecticide use and efficacy information: <http://hudsonvf.cce.cornell.edu/resources/TreeFruit/NY> BMSB Insecticides Efficacy Update 8-9-13.pdf
- Maryland Vegetables(<http://extension.umd.edu/mdvegetables>) -various articles on BMSB posted.
- Nielsen, A.L., "BMSB in Peaches" <http://plant-pest-advisory.rutgers.edu/?p=4790>
- Nielsen, A.L., "BMSB Movement into Orchards" <http://plant-pest-advisory.rutgers.edu/?p=4177>
- Nielsen, A.L., "Insecticide Trial Results for BMSB in Peaches" <http://plant-pest-advisory.rutgers.edu/?p=6666>
- Nielsen, A.L., "BMSB Populations in Mid-July" <http://plant-pest-advisory.rutgers.edu/?p=6450>
- PestWorld.org, The Truth About Stink Bugs, October 3, 2013, <http://www.pestworld.org/news-and-views/guest-columnists/posts/the-truth-about-stink-bugs/>
- Pfeiffer, D.G. 2013. Brown Marmorated Stink Bug, *Halyomorpha halys* (Stahl) (<http://www.virginiafruit.ento.vt.edu/BMSB.html>) - a component of Virginia Fruit web site (<http://www.virginiafruit.ento.vt.edu/>).
- Polk, D. Newsletter, The Rutgers Plant and Pest Advisory: <http://plant-pest-advisory.rutgers.edu>

- PSU based web site: stink-bug-info.org PSU stink bug mapping tool. Produced by PSU, but within the last year the reporting tool has been harmonized, with help from the University Georgia, with a reporting website from Rutgers University
- PSU Department of Entomology, BMSB factsheet - 164,803 page views
Published updates on BMSB research on <http://Extension.umd.edu/IPM>
- Walgenbach, J.F. and S. C. Schoof. Brown Marmorated Stink Bug in North Carolina.
<http://www.ces.ncsu.edu/fletcher/programs/apple/entomology/BMSB/index.html>
- Weekly articles on brown marmorated stink bug and management. Over 20 articles on BMSB YouTube, Home and Garden Information Center, "Think before you stink", 23,304 visits all sites
<http://www.youtube.com/watch?v=9jlqJ4WjryY>

Extension and Outreach Publications

- "Brown Marmorated Stink Bug (BMSB)" University of Maryland Extension Greenhouse TPM/IPM Weekly Report August 3, 2012 <http://www.ipmnet.umd.edu/greenhouse/grnhsandcutalerts/2012/12Aug03G.pdf>
- "Brown marmorated stink bug and Virginia fruit." What's HOT in Blueberry Production September 10, 2012 www.virginiafruit.ento.vt.edu/HotBlue.html;
- "Brown marmorated stink bug and Virginia fruit." What's HOT in Cranberry Production and Research September 10, 2012 <http://www.virginiafruit.ento.vt.edu/HotBramble.html>;
- Bergmann, E., K. Bernhard, G. Bernon, M. Bickerton, S. Gill, C. Gonzales, G. C. Hamilton, C. Hedstrom, K. Kamminga, C. Koplinka-Loehr, G. Krawczyk, T.P. Kuhar, B. Kunkel, T.C. Leskey, H. Martinson, A.L. Nielsen, M.J. Raupp, P. Shearer, P.M. Shrewsbury, J. Walgenbach, J. Whalen, and N. Wiman. "Host Plants of the Brown Marmorated Stink Bug in the U.S.", May 2013. <http://www.stopbmsb.org/where-is-bmsb/host-plants/>
- Bergmann, E., K. M. Bernhard, G. Bernon, M. Bickerton, S. Gill, C. Gonzales, G. C. Hamilton, C. Hedstrom, K. Kamminga, C. Koplinka-Loehr, G. Krawczyk, T.P. Kuhar, B. Kunkel, J. Lee, T.C. Leskey, H. Martinson, A.L. Nielsen, M.J. Raupp, P. Shearer, P.M. Shrewsbury, J. Walgenbach, J. Whalen, and N. Wiman. 2013. Host Plants of the Brown Marmorated Stink Bug in the U.S. Technical bulletin publication of the Brown Marmorated Stink Bug IPM Working Group in conjunction with the Northeastern IPM Center posted Online <http://www.StopBMSB.ORG>, October, 7, 2013.
- Bergmann, E., K.M. Bernhard, G. Bernon, M. Bickerton, S. Gill, C. Gonzales, G.C. Hamilton, C. Hedstrom, K. Kamminga, C. Koplinka-Loehr, G. Krawczyk, T.P. Kuhar, B. Kunkel, J. Lee, T.C. Leskey, H. Martinson, A.L. Nielsen, M.J. Raupp, P. Shearer, P.M. Shrewsbury, J. Walgenbach, J. Whalen, and N. Wiman. 2013. Host Plants of the Brown Marmorated Stink Bug in the U.S. Technical bulletin publication of the Brown Marmorated Stink Bug IPM Working Group in conjunction with the Northeastern IPM Center posted Online <http://www.StopBMSB.ORG>, October, 7, 2013.
- Biddinger, D., L.A. Hull, N. Joshi and H. Ngugi. 2013. Impact of selected insecticides used for brown marmorated stink bug control and fungicides used for scab resistance on the predatory mite, *Typhlodromus pyri*. Pennsylvania Fruit News 93(1): 45-57
- Brown Marmorated Stink Bug. Virginia Cooperative Extension publication number 2902-1100 <http://pubs.ext.vt.edu/2902/2902-1100/2902-1100.html> "The Northeast Center for IPM (Integrated Pest Management) Announces New Tools for Pest Tracking."
- Brust, G., K. Everts, J. Whalen, T.P. Kuhar, S. Fleischer, and G. Dively. 2013. Updates on BMSB chemical control. Commercial Vegetable Production Recommendations, EB-236. Mid-Atlantic Region. Rutgers Press.
- Brust, G.E., 2013. BMSB and other Stink Bug Damage Common in Tomatoes This Year. Weekly Crop Update. CCE Wayne County News Blog June 17, 2012 <http://blogs.cornell.edu/waynecce/news/> "Tracking the Brown Marmorated Stink Bug,"
- Day, E.R. 2013. Brown Marmorated Stink Bug. Virginia Cooperative Extension publication 2902-1100, <http://pubs.ext.vt.edu/2902/2902-1100/2902-1100.html>
- During the 2013 growing season BMSB information was published frequently in the weekly "Fruit and Vegetable Update" newsletter published by Cornell Cooperative Extension of Suffolk County distributed to 209 growers and trade representatives:2013

Fact sheet - joint publication with University of Delaware and University of Maryland Extension on Brown marmorated stink bugs damaging herbaceous annuals and perennials and cut flower plants.

- Fruit and Vegetable Newsletter Fruit Journal, "Brown Marmorated Stink Bug (BMSB) Update", June 13, 2013
- Fruit and Vegetable Newsletter Fruit Journal, "Brown Marmorated Stink Bug (BMSB) Update", June 27, 2013
- Fruit and Vegetable Newsletter Fruit Journal, "Brown Marmorated Stink Bug (BMSB) Update", August 8, 2013
- Fruit and Vegetable Newsletter Fruit Journal, "Brown Marmorated Stink Bug (BMSB) Update", September 5, 2013
- Fruit and Vegetable Newsletter Fruit Journal, "Brown Marmorated Stink Bug (BMSB) Update", September 12, 2013
- Fruit and Vegetable Newsletter Fruit Journal, "Brown Marmorated Stink Bug (BMSB) Update", September 26, 2013
- Gill, S. Factsheet on BMSB in Ornamentals - joint effort between University of Delaware Extension and University of Maryland
- Hedstrom, C., N. Wiman, V. Walton, P. Shearer, S. Rondon, and J. Lee. 2013. Identifying Brown Marmorated Stink Bug, Oregon State University Extension document (EM 9054).
- Hedstrom, C., N. Wiman, V. Walton, P. Shearer, S. Rondon, and J. Lee. 2013. El Chinche Apestoso Marrón Marmolado, *Halyomorpha halys* (EM 9054-S).
- Jones, A., C. Dieckhoff, K. Hoelmer, P.M. Shrewsbury. in prep. Whose eggs are these: Common stink bug egg mass guide. Fact sheet by University of Maryland and USDA ARS BIIR Delaware.
<http://extension.umd.edu/mdvegetables/vegetable-insect-ipm> (site has Fruit Journal discussing the latest information about BMSB in vegetables.
- Krawczyk, G., N. Ellis, T.R. Enyeart, B. Lehman and L.A. Hull. 2013. Understanding biology and behavior of brown marmorated stink bug as a basis for development of management programs in fruit orchards. Pennsylvania Fruit News 93(1): 28-34
- Kunkel, B. Ornamentals Hotline Issue 25, 2013. Brown marmorated stink bugs. Delaware Nursery Landscape Association
- Pfeiffer, D.G., A.B. Baudoin, J.C. Bergh and M. Nita. 2013. Grapes: Diseases and Insects in Vineyards. p. 3-1 – 3-18. In: 2012 Pest Management Guide for Horticultural and Forest Crops. Va. Coop. Ext. Pub. 456-017.
- Pfeiffer, D.G., C. Johnson, K.S. Yoder and J.C. Bergh. 2013. Commercial Small Fruits: Disease and Insects. p. 2-1 – 2-16. In: 2012 Pest Management Guide for Horticultural and Forest Crops. Va. Coop. Ext. Pub. 456-017.
- Pfeiffer, D.G., J.C. Bergh, R.D. Fell, C.R.R. Hooks, G.M. Peck, C.S. Walsh, K.S. Yoder, A.R. Biggs, J.B. Kotcon, J.F. Derr, R.S. Chandran, M. J. Weaver, A. Brown and J. Parkhurst. 2013. 2012 Spray Bulletin for Commercial Tree Fruit Growers. Va. Coop. Ext. Serv. Publ. 456-419. A regional manual for VA, WV and MD.
- Rondon, S.I., and N. Wiman. 2013. Brown marmorated stink bug in the Pacific Northwest. In PNW Proc. Kennewick, WA. November
- Scaffolds Fruit Journal, "2013 Fruit Arthropod Pest Review", September 3, 2013
- Scaffolds Fruit Journal, "Brown Marmorated Stink Bug (BMSB) Update", July 22, 2013
- Scaffolds Fruit Journal, "Brown Marmorated Stink Bug (BMSB) Update", August 5, 2013
- Scaffolds Fruit Journal, "Brown Marmorated Stink Bug (BMSB) Update", August 12, 2013
- Scaffolds Fruit Journal, "Brown Marmorated Stink Bug drawing nigh in agriculture", May 13, 2013
- Scaffolds Fruit Journal, "Hudson Valley Insect Update", June 24, 2013
- Shearer, P. W., and N. Wiman. 2013. Emerging pest: Brown marmorated stink bug – A pending threat to pacific northwest agriculture. Pacific Northwest Insect Management Handbook. Pacific Northwest Extension Publication. Corvallis, OR.
- Walgenbach, J.F. 2013. Dinotefuron and permethrin receive section 18 labels for apples and peaches. NC Apple Newsletter. June, 2013.
- Walgenbach, J.F. 2013. Apple Pest Posting. Volumes 1-20. Weekly newsletter targeting NC apple growers.
- Walton, V., P. Shearer, N. Wiman, B. Miller, D. Dalton, and C. Hedstrom 2013. Field Guide for Integrated Pest Management in Pacific Northwest Vineyards (PNW644)

Impact of Research and Extension Activities During Reporting Period

New Leveraged/Complimentary Resources

- Cornell. Jentsch, P., Fargione, M.S Ag and Mkts ARDP ; 04/01/12 to 3/31/14, Tree Host Survey, Monitoring and Management Strategies for the Invasive Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål): (Pentatomidae), Along Borders of NY Tree Fruit. \$14,400
- OSU. Tomasino, E., N. Wiman, V. Walton. Oregon Wine Board. 2013. Impact of taint on wine grapes, \$15,000.
- OSU. Walton, V., C. Hedstrom, N. Wiman. Oregon Hazelnut Commission. 2013. Feeding damage of BMSB on Hazelnut, \$30,000.
- OSU. Walton, V., N. Wiman. Agricultural Research Foundation. Determining of competitiveness and effectiveness of Imported and local BMSB egg parasitoids. \$12,500.
- PSU. Krawczyk, G. 2013. Understanding biology and behavior of brown marmorated stink bug as a basis for development of management programs in fruit orchards. State Horticultural Association of Pennsylvania \$23,670
- PSU. Saunders, M et al. 2013. Detecting Taint from Brown Marmorated Stink Bug in Concord Grape Juice. NY Wine and Grape Research Committee and the Extension Program Processor Funding. \$11,000.
- PSU. Saunders, M. et al. 2013 Monitoring the Invasion of the Brown Marmorated Stink Bug, Spotted Wing Drosophila, and European Grapevine Moth". NY Wine and Grape Research Committee. \$1,500.00.
- Rutgers. Nielsen, A.L. "Developing a reduced risk early season management program for BMSB in peach" IR-4 Biopesticide Program, \$6,041
- Rutgers. Polk, D. New Jersey Blueberry Cranberry Research Council. "Expansion of Detection, Monitoring and Management for Spotted Wing Drosophila and Brown marmorated Stink Bug in Highbush Blueberries." \$15,700
- Rutgers. Polk, D. New Jersey State Horticultural Society. "Monitoring and Management of the Brown Marmorated Stink Bug – Edge Effects and Control Tactics.", \$4,000
- Rutgers. Polk, D. and A. Nielsen. 2013. "Reduced Risk Methods to Control Peach Pests and Brown Marmorated Stink Bug" NE SARE Demonstration, \$17,000
- Rutgers. Polk, D. and A.L. Nielsen. USDA SARE NE Partnership Grants Program, "Mating Disruption and Reduced Risk Methods to Control Peach Pests and Brown Marmorated Stink Bug.", \$14,833
- UMD. Butler -Maryland State Horticultural Society. BMSB control with surround on Apples and Peaches and monitoring. \$2,000.
- UMD. Hooks, C.R.R. and Chen, G, 2013-2014. Designing a more sustainable weed and insect pest management system for vegetable producers. Maryland Agriculture Experiment Station Competitive Grants Program, \$25,000.
- UMD. Hooks, C.R.R. and G.P. Dively, 2012-2015. Whole farm organic management of BMSB and endemic pentatomids through behavior-based habitat manipulation. USDA-NIFA OREI, \$201,387.
- UMD. Hooks, C.R.R., Chen, G and Buchanan, A. 2013-2014. Developing economic and ecological sustainable pest management practices for growers of leguminous and solanaceous crops. USDA-NIFA Northeastern IPM Competitive Grants Program, \$83,058.
- UMD. Lebron-Rosario, A. and C.R.R. Hooks, 2013-2014. Using marigold as a flowering plant to attract natural enemies of the brown marmorated stink bug in soybean fields. Maryland Soybean Board, \$5,000
- UMD. Lebron-Rosario, A. and C.R.R. Hooks, 2013-2014. Using molecular methods to identify parasitoids and assess parasitism of the brown marmorated stink bug: deciphering the cause of unknown mortality, Maryland Grain Producers Utilization Board, \$15,000.
- USDA-ARS and Rutgers. Northeastern IPM Center. BMSB IPM Working Group. \$10,000.
- USDA-ARS. Bulk synthesis of BMSB pheromone for 2013. \$140,000.
- USDA-ARS. Post-Doctoral award to conduct a taxonomic revision of the Asian species of the genus *Trissolcus*, which includes all of the Asian BMSB natural enemies currently being evaluated as potential candidate biocontrol agents in the US \$100,000
- USDA-ARS and University of Delaware. Hoelmer, K. 2013. Host Range Evaluation of Asian Egg Parasitoids, APHIS Farm Bill , \$589,581
- VT. Bergh, J.C. 2013. Insecticide efficacy trials targeting brown marmorated stink bug in tree fruit crops. Various agrichemical companies, \$17,000

- VT. Bergh, J.C. and T.C. Leskey. 2013. Development and evaluation of an attract-and-kill strategy for brown marmorated stink bug in commercial apple orchards. USDA ARS Specific Cooperative Agreement, \$194,742
- VT. Bergh, J.C. and T.C. Leskey. 2013. Interpreting Data from Brown Mamorated Stink Bug Traps in Apple Orchards: Toward the Development of Trap-Based Management Decisions, Virginia Department of Agriculture and Consumer Services, Pesticides Division, \$93,813
- VT. Brunner, J., P. W. Shearer, N. Wiman, T.C. Leskey, and A. Khrimian. Washington Tree Fruit Research Commission and Oregon Sweet Cherry Commission. 2013-14. Improving tools for early detection of brown marmorated stink bug. \$182,546.
- VT. Kuhar, T.P. 2013. Insecticide efficacy trials targeting brown marmorated stink bug on vegetable crops. Various agrichemical companies, \$25,000
- VT. Kuhar, T.P. 2012. Control of Brown Marmorated Stink Bug on Fruits and Vegetables. IR-4 Special Research Grant; \$4,500; 1 year

Selected Media contacts and Press Coverage

Print

- Washington Examiner. August 24, 2013. "Feds build citizen army to attract and annihilate stink bugs: 100,000 found in a shed" by Paul Bedard.
- Charlottesville Weekly. November 23, 2012. For farmers, crop-hungry stink bugs are more than irritating houseguests.
- Citizensvoice.com. April 15, 2013. "Welcome to Creepy, Crawly Season" by Jill Whalen.
- Columbia Patch. September 28, 2013. Stink Bug Population 'May Be Ready to Explode' – And We're Right at the Epicenter, http://columbia.patch.com/groups/around-the-region/p/stink-bug-population-may-be-ready-to-explode--and-were-right-at-the-epicenter_8b181678
- DCist, Prepare Yourselves for the Invasion of the Stink Bugs, October 16, 2012, http://dcist.com/2012/10/prepare_yourselves_for_the_invasion.php
- East Oregonian. October 8, 2013. Stink Bugs Invade Hermiston.. http://www.opb.org/news/Fruit_Journal/beware-the-stink-bug/
- Entomology Today. July 15, 2013. Stink Bugs May be Good for Something After All, <http://entomologytoday.org/2013/07/15/stink-bugs-may-be-good-for-something-after-all/>
- Entomology Today. October 8, 2013. press release on impact of federal shutdown on BMSB research, "Government Shutdown is Bugging Entomologists" (<http://entomologytoday.org/2013/10/08/government-shutdown-is-bugging-entomologists/>). Picked up by The Weather Channel (<http://www.weather.com/home-garden/stink-bug-invasion-20131011>).
- International Association for the Plant Protection Sciences, September 27, 2013. Invasive Stink bug Population May Be Ready To Explode on East Coast <http://iapps2010.wordpress.com/2013/09/27/invasive-stink-bug-population-may-be-ready-to-explode-on-east-coast/>
- Jefferson Exchange. Jefferson Public Radio (Medford, OR). September 12, 2013. Stink Bug Invasion. <http://ijpr.org/post/stink-bug-invasion>
- Kid Friendly Organic Life. January 31, 2013. Invasion of the Stink Bugs (or Spring Preview), <http://kidfriendlyorganiclife.blogspot.com/2013/01/invasion-of-stink-bugs-or-spring-preview.html>
- Latest Information on Brown marmorated stink bug. Web video at [http://www.growingproduce.com/video/c:146/crop-protection/1592/?utm_source=SilverpopMailingandutm_medium=emailandutm_campaign=GPTV%20May%2024%202013%20\(1\)andutm_content=\(Winter_2013\)](http://www.growingproduce.com/video/c:146/crop-protection/1592/?utm_source=SilverpopMailingandutm_medium=emailandutm_campaign=GPTV%20May%2024%202013%20(1)andutm_content=(Winter_2013))
- Lower Macungie Patch, January 31, 2013, 10 Ways to Fend Off Stink Bugs, <http://lowermacungie.patch.com/groups/business-news/p/10-ways-to-fend-off-stink-bugs-960b69b9>
- Mail Tribune (Medford, OR). August 31, 2013. Stink bugs worry local vinters and orchardists. Mark Freeman, <http://www.katu.com/news/local/Stink-bugs-worry-Oregon-orchardists-and-vintners-221834631.html>
- MoCoVox. February 11, 2013, The Stink Bugs Are Back!, <http://www.mocovox.com/index.php/science-tech/environment/6472-the-stink-bugs-are-back>
- National Geographic News. March 1, 2013. "Stink bug threat has farmers worried" by Catherine Zuckerman.
- OSU press release, September 4, 2013. Growing populations of brown marmorated stink bug could harm late-season crops.

2013 Summary Report Year 2

- Patriot News. February 2013. Stink bug could threaten PA crops. (by Monica von Dobeneck)
<http://www.timesleader.com/stories/>
- Penn Live Blog. March 3, 2013. Bug-Sniffing Plants, a Crabgrass-Killing Oil and Stink bug Redux,
http://blog.pennlive.com/life/2013/03/bug-sniffing_plants_a_crabgras.html
- Philly.com. January 23, 2013. Big stink bug year on the horizon?,
<http://www.philly.com/philly/blogs/greenliving/Big-stink-bug-year-on-the-horizon.html>
- Pittsburgh Post-Gazette. April 22, 2013. "Pennsylvania could see stink bugs' return" by Amy McConnell Schaarsmith
- Pittsburgh Post-Gazette. October 3, 2012. Pittsburgh sees return of the stink bugs.
- PRWeb. September 19, 2013. Think the Stink Bug Has Vanished This Year; Think Again,
<http://www.prweb.com/releases/2013/9/prweb11136169.htm>
- Public Opinion, Chambersburg PA. Stink bugs just waiting for warmer weather so they can invade our homes. (by James Hook), http://www.publicopiniononline.com/ci_22732493/stink-bugs-just-waiting-warmer-weather-so-they
- Public Opinion, Chambersburg, PA. October 2013. Stink bug making a nuisance of themselves around Franklin County (by Andrea Rich) http://www.publicopiniononline.com/local/ci_24276405/stink-bugs-making-nuisance-themselves-around-franklin-county
- Public Opinion, Chambersburg, PA. Stink bugs: they are everywhere you don't want them to be. (by James Hook) http://whiteoakmanorcondo.com/files/STINK_BUGS.pdf
- Rappahanock News website. February 28, 2013. A little better known; a lot more coming,
<http://www.rappnews.com/2013/02/28/a-little-better-known-a-lot-more-coming/110881/>
- The Baltimore Sun. September 27, 2013. Stink bugs are on the move,
http://FruitJournals.baltimoresun.com/2013-09-27/features/bs-hm-design-qa-0929-20130929_1_stink-bugs-maryland-entomologist-mike-raupp-screens
- The Frederick News-Post. April 15, 2013. "Bracing for stink-bug onslaught" by Ike Wilson.
- The Tribune-Democrat, Johnstown, PA Raising a stink: as temperatures cool, battle against smelly bugs up (by Kathy Mellott). <http://tribune-democrat.com/latestnews/x862187708/Raising-a-stink-As-temperatures-cool-battle-against-smelly-bugs-heats-up>
- The Washington Examiner. April 16, 2013. "Stink bugs spread to 39 states, pest population soars 60 percent" by Paul Bedard
- The Washington Post. January 6, 2013. "Stink bugs ready to mount 2013 come back" by Caitlin Gibson.
- The Washington Times. October 15, 2012. Summer heat brings back the stink bugs,
<http://www.washingtontimes.com/news/2012/oct/15/the-stink-bugs-are-back/?page=all>
- The Winchester Star. January 24, 2013. "Stink bugs could be back in force in 2013" by Rebecca Layne.
- Washington Post. September 2, 2013. "Residents sought to help in stink bug study" by Cecilia Mason.
- Washington Post. September 29, 2013. Stink bugs are plentiful in Mid-Atlantic states, and they're ready to come indoors for winter. http://FruitJournals.washingtonpost.com/2013-09-29/national/42510851_1_tracy-leskey-bugs-water-bill
- Wearecentralpa.com. The race to stop stink bugs. http://www.wearecentralpa.com/story/the-race-to-stop-stink-bugs/d/story/scdSFbcTnE-fuE_mhKufcQ (May 2013)
- York Daily Record. August 2012. Penn State seeking help from the public on stink bug. (by Teresa A. Boeckel)
http://www.ydr.com/ci_21232077/penn-state-seeking-help-from-public-stink-bugs

Broadcast

- WJLA. Stink bugs returning to D.C. area as temperatures cool down, September 13, 2013. http://www.wjla.com/Fruit_Journals/2013/09/stink-bugs-returning-to-d-c-area-as-temperatures-cool-down-93979.html
- NPR. The influence of the Federal shutdown on research with the brown marmorated stink bugs, October 15, 2013.
- WLOS TV, Asheville, NC. Stink Bug Invasion. News video on WLOS news. September, 2013.
- WTOP. Cooler temperatures mean the return of stink bugs, September 13, 2013. <http://www.wtop.com/41/3451265/>
- WTOP. Shield your home against stink bugs, stiltgrass, and skunks, September 20, 2013.
<http://wtop.com/902/3458102/>
- CBS Baltimore, Stink Bug Population Expected To Rise In Maryland, January 9, 2013,
<http://baltimore.cbslocal.com/2013/01/09/stink-bug-population-expected-to-rise-in-maryland/>
- WAMU. Morning Edition. January 2, 2013. "Stink Bug Population Will Bounce Back In 2013" by Sabri Ben-

Anchour.

- WTOP. Get ready for the return of stink bugs, January 8, 2013. <http://www.wtop.com/41/3184627/>
- NPR News. January 18, 2013. "Stink bug's resurfacing may squash farmers' hopes for a strong 2013" by Sabri Ben-Anchour.
- NPR News, April 6, 2013. "Spring Blooms, and so do the creepy crawlers", by Jackie Lyden
- BBC News, Washington. April 25, 2013. "Stink bugs: the scientific battle against an insect invasion", by Jane O'Brien
- BBC News, Washington. April 25, 2013. "How to stop stink bugs: Radar tracks infestation" by Jane O'Brien
- BBC News, Washington. April 26, 2013. "US Farms Turned into Stink Bug Battlefield", by Jane O'Brien
- Weather.com. April 28, 2013. "Stink Bug Infestation: The Search for a Predator
- NPR Affiliate in northern Virginia. May 1, 2013. Kuhar, T. P. and T.C. Leskey. Brown marmorated stink bug radio interview with Tom Graham Senior Producer, Virginia Insight. WMRA — Previous broadcasts posted at <http://www.wmra.org/programs/virginia-insight>
- The Diane Rehm Show. May 7, 2013. "Environmental Outlook: Stink Bugs", by Diane Rehm.
- WV Public Radio. August 21, 2013. "You can help scientists study stink bugs" by Cecilia Mason.
- WTOP. What butterflies and stink bugs have in common, August 21, 2013. <http://www.wtop.com/41/3428131/>
- WITF Public Radio, PA. "Smart Talker", September 2013.
- Lite Rock Z 95.1 FM, September 13, 2013. Stink Bugs Return, <http://literockz951.com/les-sinclair/stink-bugs-return/>

Agricultural and Commodity-Related Press

- "A horticulturalist friend of mine sent me this link." ForestryForum.com blog post September 13, 2012. <http://www.forestryforum.com/board/index.php/topic,60617.0/nowap.html?PHPSESSID=d4de040121dafc3480070151a90e0058>
- "A New Website Brings the Latest Brown Marmorated Stink Bug Findings to Growers in North America." Maine.gov Dept. of Agriculture, Plant Health September 11, 2012. http://www.state.me.us/agriculture/pi/whatsnew/bmsb_2012.htm;
- "A new website, StopBMSB.org, has been created to provide information about the Brown Marmorated Stink Bug and its effect on agriculture." IPMInstitute.org September 2012 <http://www.ipminstitute.org/BMSB%20website%20release.pdf>
- "Are you having problems with the marmorated stink bugs?" West Virginia SARE FaceBook Page Post July 17, 2013. https://www.facebook.com/permalink.php?id=162780160512870andstory_fbid=208333445957541
- "Brown Marmorated Stink Bug Links." The Connection NorthCentral IPM Center Newsletter April 30, 2013. <http://www.ncipmc.org/connection/Connection0613.pdf>
- "Brown Marmorated Stink Bug." Applied Spatial Ecology and Technical Services. Dept. of Entomology, Michigan State Univ. May 10, 2013. <http://www.aset.msui.edu/tracking-the-brown-marmorated-stink-bug/>
- "Brown Marmorated Stink Bug." Cornell Univ. College of Agriculture and Life Sciences Notes, May 14, 2013. <http://cornellcals.tumblr.com/post/50421004523>
- "Catch The Latest On Stink Bug Control" FarmFutures.com September 25, 2012 edition <http://farmfutures.com/story-catch-latest-stink-bug-control-0-63531>
- "Entomology Professors Try to Predict the Stink Bug's Future Movements." GreenPestSolutions.com blog post October. 23, 2012. <http://www.greenpestsolutions.com/blog/entomology-professors-try-to-predict-the-stink-bugs-future-movements/>
- "Entomology Professors try to predict the Stink Bug's Future." GreenPestSolutions.com October. 23, 2012. <http://www.greenpestsolutions.com/blog/entomology-professors-try-to-predict-the-stink-bugs-future-movements/>
- "Ever wonder if your plants attract brown marmorated stink bugs?" NE IPM Center FaceBook Page post July 22, 2013. <https://www.facebook.com/pages/Northeastern-IPM-Center/106451722775609>
- "FYI - Researchers have published a list of 170 plants that the brown marmorated stink bug..." CCE Capitol Area Newsletter July 18, 2013 Pg. 4 <http://blogs.cornell.edu/capitalareaagandhortprogram/files/2013/07/Ag-Report-July-18-2013-2dxs22n.pdf>
- "Gearing up for those office days... When you are in the office, bookmark this site.." Master Gardener Program, University of Connecticut FaceBook page post March 7, 2013. <https://en-gb.facebook.com/UCONN.MasterGardeners/posts/612471675446490>

- “Here is a comprehensive website about the brown marmorated stink bug” UC Davis FB page posted September 2012 <https://www.facebook.com/strawberriesvegetables>
- “Meet Jim Monahan, our new videographer for the Stop BMSB project.” NE IPM Center FaceBook page post February 19, 2013. https://www.facebook.com/permalink.php?story_fbid=501054436598052&id=106451722775609
- “Meet Tig and Opal, the BMSB-detecting dogs!” NE IPM Center FaceBook Page post March 6, 2013. <https://www.facebook.com/permalink.php?id=106451722775609>
- “More info than you wanted to know about brown marmorated stink bug. This is one bad stink bug...” Pulaski County Horticulture, Cooperative Extension Univ. of Kentucky FaceBook page post September 13, 2012. https://www.facebook.com/permalink.php?id=107159122659485&story_fbid=457452537632267
- “New Brown Marmorated Stink Bug Video from NE-IPM Center.” Maine Invasive Species Network, Univ. of Maine May 2013. <https://umaine.edu/invasivespecies/2013/05/09/bmsbvideo/>
- “New Stink Bug Video Released.” PCT: Pest Control Technology April 16, 2013. <http://www.pctonline.com/stink-bug-video-NEIPM.aspx>
- “Researchers have published a list of 170 plants that the brown marmorated stink bug (BMSB)...” West Virginia Conservation Agency Watershed Resource Center FaceBook Page posting July 14, 2013. <https://ru-ru.facebook.com/wwrc/posts/565475616833173>
- “Researchers Publish List of BMSB Host Plants.” IPM Institute of North America News [www.ipminstitute.org](http://www.ipminstitute.org/News_Archive.htm) July 16, 2013 http://www.ipminstitute.org/News_Archive.htm
- “Scientists Draw maps to stop stink bug pirates.” Pennsylvania IPM News Blog October 18, 2012. <http://extension.psu.edu/ipm/news/2012>
- “Scientists Draw Maps to Stop Stink Bugs.” PESPWire EPA.Gov/pestwise November 12, 2012. <https://www.epa.gov/pestwise/news/pestwise/pestwise-2012-11.pdf>
- “Scientists publish on stink bug’s favorite plants, damage.” BugladySuzanne post on Twitter July 17, 2013. <https://twitter.com/BugladySuzanne>
- “Scientists publish on stink bug’s favorite plants, damage.” IR-4 Project FaceBook Page post July 16, 2013 . <https://www.facebook.com/IR4Project/posts/10151544788361045>
- “Scientists Publish On Stink Bug’s Favorite Plants, Damage.” New York Berry News July Issue Pg. 17, July 19, 2013. <http://blogs.cornell.edu/fruit/2013/07/19/july-2013-issue-of-new-york-berry-news/>
- “Scientists Publish on Stink bug’s Favorite Plants.” Cornell Fruit News and Events blog [www.fruit.cornell.edu](http://blogs.cornell.edu/fruit/) July 18, 2013 <http://blogs.cornell.edu/fruit/>
- “Scientists Publish on Stink bug’s Favorite Plants.” Growing Magazine-The Business of Fruits, Nuts and Vegetables blog post of July 23, 2013. <http://www.growingmagazine.com/blog-5365.aspx>
- “So far I am not seeing a lot of stink bugs but give it time...” BugLady Consulting FaceBook page post July 17, 2013. <https://www.facebook.com/BugLadyConsulting>
- “Stink Bug Info.” Vegetable Gardening Forum – GardenWeb blog post September 24, 2012. <http://forums2.gardenweb.com/forums/load/cornucop/msg0923354210766.html>
- “Stink bug sniffing dogs!” Montgomery County Master Gardeners - Maryland FaceBook Page post March 6, 2013. https://www.facebook.com/permalink.php?id=280977548602850&story_fbid=464226696983578
- “Stink bugs...” MikitFamiglia.com Your News Support July 25, 2013 www.tech.mikitfamiglia.com/Center-stinks.html
- “StopBMSB.org Website Launches Latest Stink Bug Science.” Association of New Jersey Environmental Commissions FB post September 11, 2012. <https://www.facebook.com/ANJECpage/posts/275302385913593>
- “StopBMSB.org Website Launches Latest Stink Bug Science.” IPMSouthNews.com September 17, 2012. <http://ipmsouthnews.com/2012/09/17/stopbmsb-org-website-launches-latest-stink-bug-science/>
- “StopBMSB.org Website Launches Latest Stink Bug Science.” Penn State Extension September 11, 2012 <http://extension.psu.edu/plants/tree-fruit/news/2012/stopbmsb.org-website-launches-latest-stink-bug-science>
- “StopBMSB.org Website Launches Stink Bug Science” Rutgers NJ Agricultural Experiment Station Plant and Pest Advisory Fruit Edition September 11, 2012. <http://njaes.rutgers.edu/pubs/plantandpestadvisory/2012/fr091112.pdf>
- “StopBMSB.org Website Launches Stink Bug Science” Rutgers NJ Agricultural Experiment Station Plant and Pest Advisory, Vegetable Crops Edition September 12, 2012. <http://njaes.rutgers.edu/pubs/plantandpestadvisory/2012/vc091212.pdf>
-

- "The brown marmorated stink bug has been detected in 40 states, posing severe agricultural problems in six states and nuisance problems in thirteen others." Northeast Sustainable Agriculture Research and Education FaceBook Page Post July 16, 2013
https://www.facebook.com/permalink.php?story_fbid=601778239862324&id=182010778505741
- "Tis the season...for brown marmorated stink bugs to invade. All the info you might possibly need here!" Bug G. Membracid Google+ blog post September 26, 2012.
<https://plus.google.com/115689049515322646080/posts/JJBVycC2sYZ>
- "Tracking the Brown Marmorated Stink Bug." Buzz of the Week, Entomological Society of America, May 2013.
<http://www.entsoc.org/buzz/tracking-brown-marmorated-stink-bug>
- "Tracking the Brown Marmorated Stink Bug." West Virginia Conservation Agency Watershed Resource Center FaceBook Page post April 11, 2013. <https://es-la.facebook.com/wwwrc>
- "Tracking the Brown Marmorated Stink Bug." West Virginia Univ. Kearneysville Tree Fruit Research and Education Center FaceBook Page Post May 9, 2013. <https://www.facebook.com/KTFREC/timeline>
- "WikiTalk Brown Marmorated Stink Bug" discussion on WikiProject Insect on the BMSB 1/2011 – 7/2013.
http://en.wikipedia.org/wiki/Talk:Brown_marmorated_stink_bug
- "You may have heard of bomb sniffing dogs." StopPests.org re-tweet of NorthEast IPM tweet March 9, 2013 @StopPests on Twitter · <https://www.facebook.com/StopPests>
- Adamczyk, J., Cochran, T., Sampson, B., Werle, C. The Brown Marmorated Stink Bug: Pest of Mississippi Blueberries? Mississippi Vaccinium Journal Vol. 2.1 January-March 2013.
<http://msucares.com/newsletters/vaccinium/2013/20130101.pdf>
- Bettiga, L. "Brown Marmorated Stink Bug." Salinas Valley Agriculture September 27, 2012.
<http://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=8399>
- Biggs, A. "New Brown Marmorated Stink Bug Resource." Kearneysville Tree Fruit Research and Education Center KTFREC-News September 13, 2012.
http://www.caf.wvu.edu/kearneysville/orchard_monitor/2012/KTFREC-News-09132012.pdf
- Boyd, V. "New marmorated stink bug website launched." The Grower September 10, 2012.
<http://www.thegrower.com/news/New-marmorated-stink-bug-website-launched-169212166.html>
- Boyd, V. "Video helps users identify marmorated stink bugs." The Grower, Vance Publishing Corp. April 29, 2013. <http://www.thegrower.com/news/205282551.html>
- Busse, S. "Stink bugs will move in for winter – again." The Charleston Gazette September 30, 2012.
<http://www.wvgazette.com/Life/201209270268>
- Degenford, H. Research paper "Invasive Species: Negative Impacts and Management." March 4, 2013.
<https://connect.hcps.org/high/eportfolio/artefact/file/download.php?file=153858&view=12841>
- Farms.com web site Insect Bytes. August 2013. <http://www.farms.com/news/insect-bytes-65904.aspx>
- Fruit Growers News. "Controlling BMSB top priority for research project" by Sharon Durham and Dennis O'Brien. April 2013.
- Gauger, M. "Researchers discover the Brown Marmorated Stink Bug's winter hideout." Blog post to Pennsylvania Association for Sustainable Agriculture PASAFarming.org August 10, 2012.
<http://www.pasafarming.org/blog/researchers-discover-the-brown-marmorated-stink-bugs-winter-hideout>
- Gill, S. "StopBMSB.org - Website Launches Latest Stink Bug Science." Univ. of Maryland Extension TPM/IPM Weekly Report for Arborists, Landscape Managers and Nursery Managers September 14, 2012.
www.ipmnet.umd.edu/landscape/LndscpAlerts/2012/12Sep14L.pdf
- Gonzales, C. "Old Monitoring System Helps Track Movements of BMSB" Fruit Growers News May 2013: p.26
- Gonzales, C. "Researchers Discover Stink Bug's Winter Hideout." Fruit Growers News, June 2013: p.20
- Gonzales, C. "Scientists draw maps to stop stink bug pirates." NortheastIPM.org October 16, 2012.
<http://www.northeastipm.org/about-us/publications/ipm-insights/scientists-draw-maps-to-stop-stink-bug-pirates/>
- Gonzales, C. "Scientists Publish on Stink Bug's Favorite Plants, Damage." NortheastIPM.org July 16, 2013.
<http://www.northeastipm.org/about-us/publications/ipm-insights/scientists-publish-on-stink-bug-favorite-plants-damage/>
- Good Fruit Grower. Stink bug is strong flier. pp. 24-25. March 1, 2013.
- Green, L. "Information on a relatively new terrestrial invader with devastating effect, moving up from the South." Univ. Rhode Island Watershed Watch listserv posting September 10, 2012.
<http://listserv.uri.edu/cgi-bin/wa?A2=ind1209&L=uriwatershedwatch&T=0&P=459>
- Growing Produce, "New Source for Stink Bug Information." September 11, 2012.
http://www.growingproduce.com/Fruit_Journal/30921/
- Hallberg, R. "The Northeastern IPM Center has two new stories on their website..." Blog post on

2013 Summary Report Year 2

- WordPress.com Northeastern Region blog October. 16, 2012. <http://en.wordpress.com/tag/flea-beetle/>
- Holistic Orchard Network. Brown marmorated stink bugs (by Dan Lefever) February 2013. <http://groworganicapples.com/phorum/read.php?8,377>
- Koplinka-Loehr, C. "Academy Award for the Brown Marmorated Stink Bug?" NortheastIPM.org February 19, 2013. <http://www.northeastipm.org/about-us/publications/ipm-insights/academy-award-for-the-brown-marmorated-stink-bug/>
- Krawczyk, G., J.C. Bergh, and T.C. Leskey. Growing Produce. June 2013. Brown marmorated stink bug: What's in store for 2013. (by Brian Sparks) http://www.growingproduce.com/Fruit_Journal/34492/brown-marmorated-stink-bug-whats-in-store-for-2013
- Lancaster County Agriculture Council. Stink bug severity still in question. July 2013. <http://keeplancastercountyfarming.com/81-july-2013/825-stink-bug-severity-still-in-question>
- Lancaster Farming, Stink bug will soon be known. June 2013. <http://www.lancasterfarming.com/Stink-Bug-Severity-Will-Soon-Be-Known-#.Umq41JH67IY> (by Philip Gruber)
- Lancaster Farming. Conquering stink bug remains an elusive quest. (by Chris Torres). January 2013. <http://www.lancasterfarming.com/-Conquering-Stink-Bugs-Remains-an-Elusive-Quest-#.Umq7JZH67IZ>
- Lancaster Farming. Stink bug having last hurrah of 2013. September 2013. <http://www.lancasterfarming.com/news/-Stink-Bugs-Having-Last-Hurrah-of-2013-#.UmrKQZH67IY> (by Philip Gruber).
- Leskey, T.C. twitter.com/September 2, 2012. "New marmorated stink bug website launched ." <https://twitter.com/BMSBresearch/status/245255639847284736>
- The Grower. "Study: Black pyramid traps catch more marmorated stink bugs" by Vicky Boyd. January 18, 2013.
- Vegetable Grower News. BMSB Numbers On The Rise Late In The Season By Derrek Sigler, Assistant Editor November 19, 2012.
- Worthington, L. "Designing Stink Bugs Out of the Landscapes." NortheastIPM.org May 14, 2013. <http://www.northeastipm.org/about-us/publications/ipm-insights/designing-stink-bugs-out-of-landscapes/>
- Worthington, L. "Stink Bug Detectives." NortheastIPM.org March 5, 2013. <http://www.northeastipm.org/about-us/publications/ipm-insights/stink-bug-detectives/>



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Stakeholder Advisory Panel

More than 30 independent growers, association directors, and business leaders from across the United States are working in our Stakeholder Advisory Panel. This group reviews project accomplishments, provides feedback on research plans, and guides the execution of objectives.

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