

BMSB on Specialty Cut Flowers and Herbaceous Perennials

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Purpose of this project

- To establish if BMSB feeds on herbaceous perennials
- To establish if BMSB feeds on specialty cut flowers
- If they feed, determine if there is detectable damage to the plants from feeding or any diseases transmitted to the plants

Funding

- USDA-ARS grant
- ASCFG Grant

Herbaceous Perennial Operations monitored in 2013

- Grasshopper Nursery, Knoxville, MD (Washington county) – hot bed of BMSB activity – Scouted by Debby Smith-Fiola
- Glade Nursery, Walkersville, MD (Washington County) – Scouted by Debby Smith-Fiola
- North Creek Nursery, PA – scouted by Brian Kunkel
- Holly Hill Nursery, Earlsville, MD – Scouted by Brian Kunkel
- Marshall River Bank Nursery, Salisbury, MD – scouted by Ginny Rosenkranz

Size of the Herbaceous Perennial Industry

- 326 wholesale listed growers in the Perennial Plant Growers Association
- Perennial Industry Grosses \$820,000,000 per year (2012 figure)
- Average size operation is 10 acres for something over 3000 acres.

- Source: Steven Stills, Ohio State University of Exe Secretary of PPA

Specialty Cut Flower Industry

- The Association of Specialty Cut Flower Growers (ASCFCG) has 514 active growers in 36 states. Fifty six cut flower growers in Maryland
- Field acreage
- 48 Under half acre
- 150 ½ to 3 acres
- 74 3 to 10 acres
- 21 10 to 50 acres
- 17 50+ acres
- Source: Judy Lauschman , Executive Secretary ASCFCG

Farmhouse Flowers and Plants

Flowers chosen based on previous year's reports from growers of BMSB activity on cut flowers

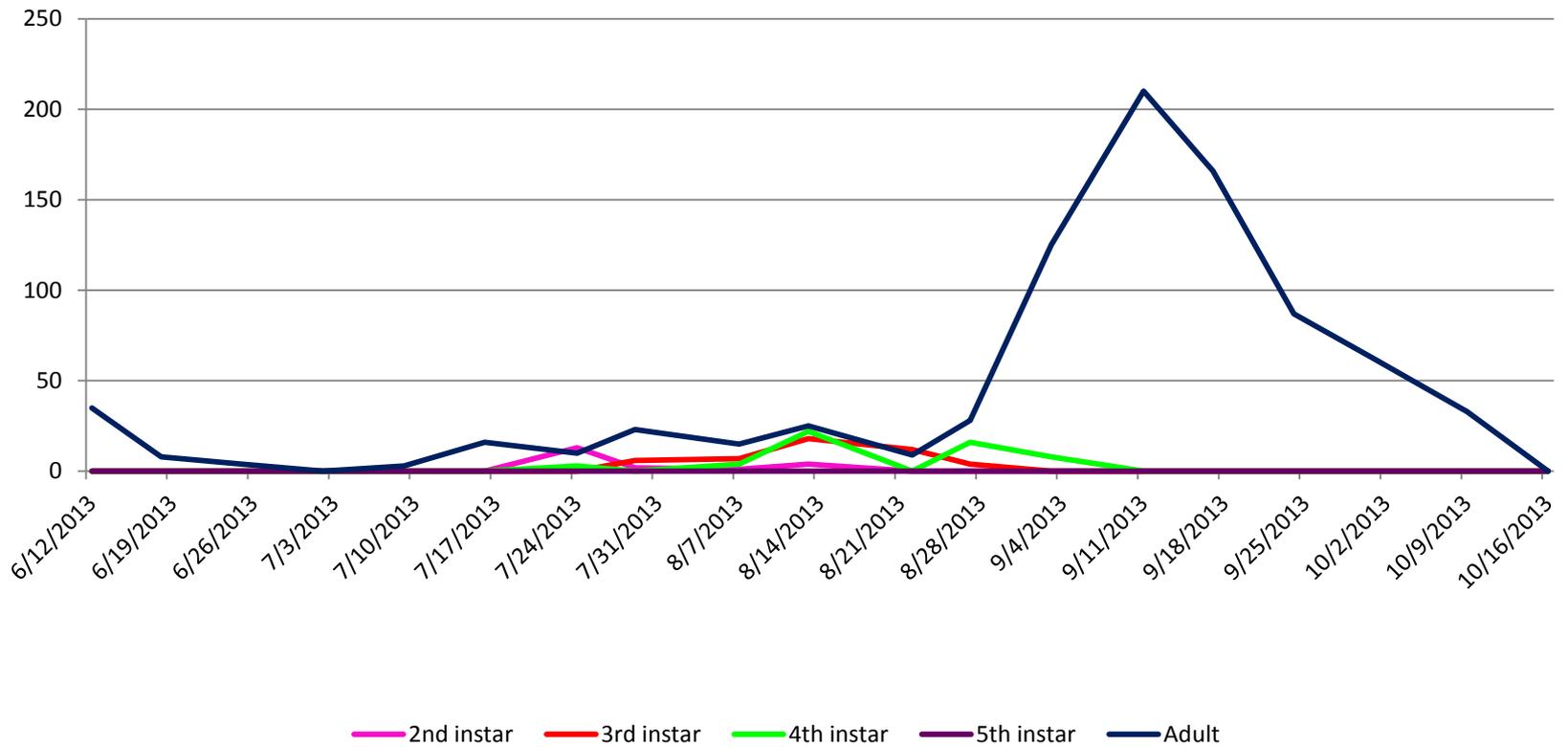
- Started monitoring on June 12, 2013 and continued through October of 2013
- **Crops monitored:**
- Zinnias (examined 3 different planting dates)
- Amaranthus (Orange and Red flowering varieties)
- Gladiolus
- Sunflowers (examined 4 different planting dates)
- Dahlias (Karma series)
- Celosia (examined two different planting dates)
- Hydrangea (Limelight variety)

Trap baited with #10 USDA pheromone and standard pheromone and kill strip Vapona strip placed at each nursery and cut flower operation that was monitored



Trap Counts at Farmhouse Flowers

Trap Counts



Used three people each time for timed examination of 50 plants



Karen Rane removed plants being fed on by BMSB to examine plants for potential diseases that could be transmitted by BMSB

Zinnias and Amaranthus

Survey of cut flower growers at field days in 2011 and in 2012 revealed most frequent plants that they find BMSB feeding on is zinnias and amaranth.



***Amaranth* before bloom time was covered with
Disonycha glabrata - Pigweed Flea Beetle**

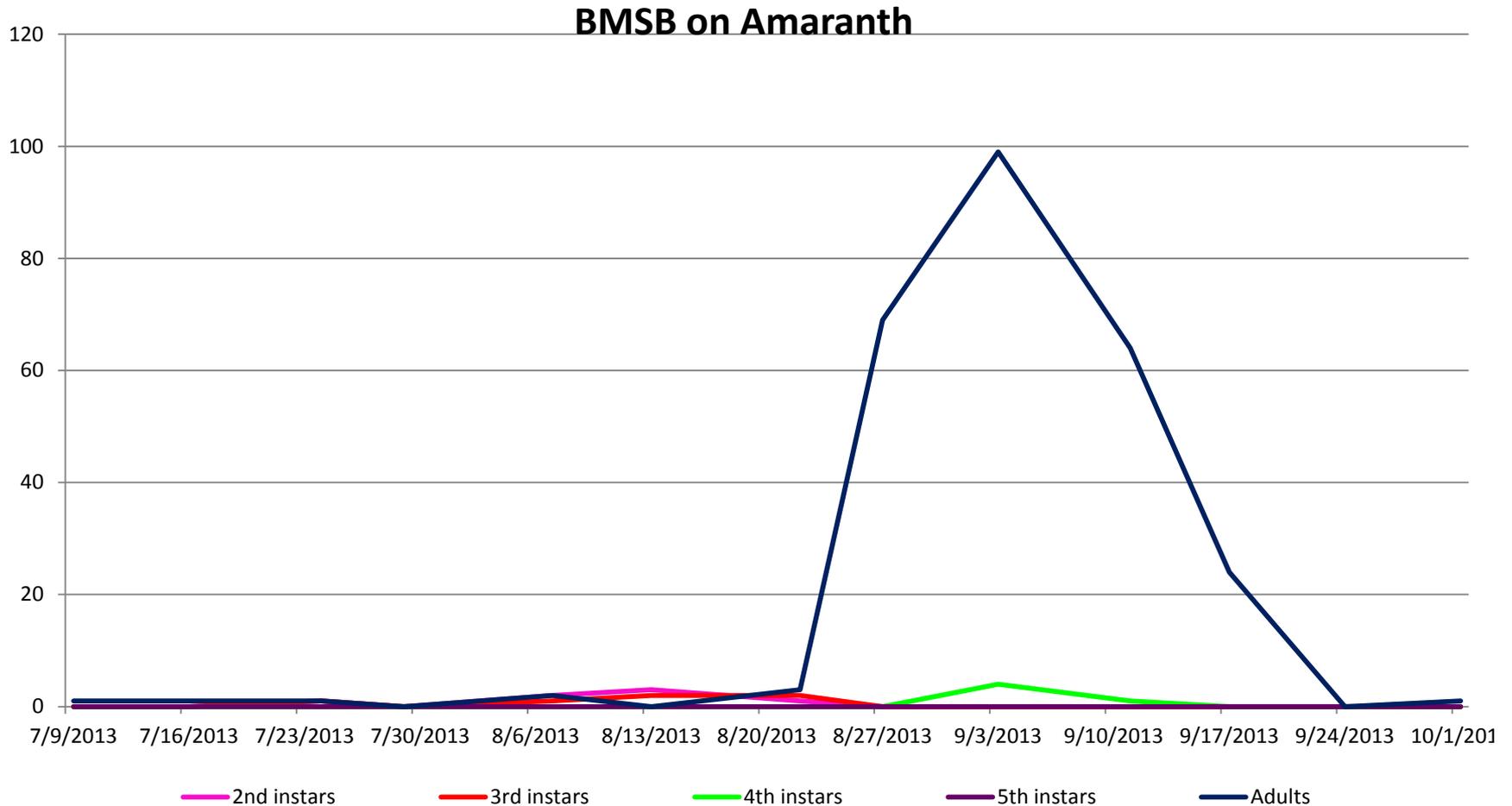


Amaranth before bloom BMSB did not feed on the stems or leaves but nymphs and adults were all over the plant when in flower and seed production.



Note damage to foliage from pigweed leaf beetle

Amaranth- BMSB – little interest in the plant until bloom time.





Orange flower was preferred by BMSB when in flower



Red fed on by BMSB but not as preferred as orange flowers

No measureable damage detected in Amaranth blooms.
Grower brushed off insects and sold stems



BMSB on Smartweed – August 26, 2013



One thing we observed

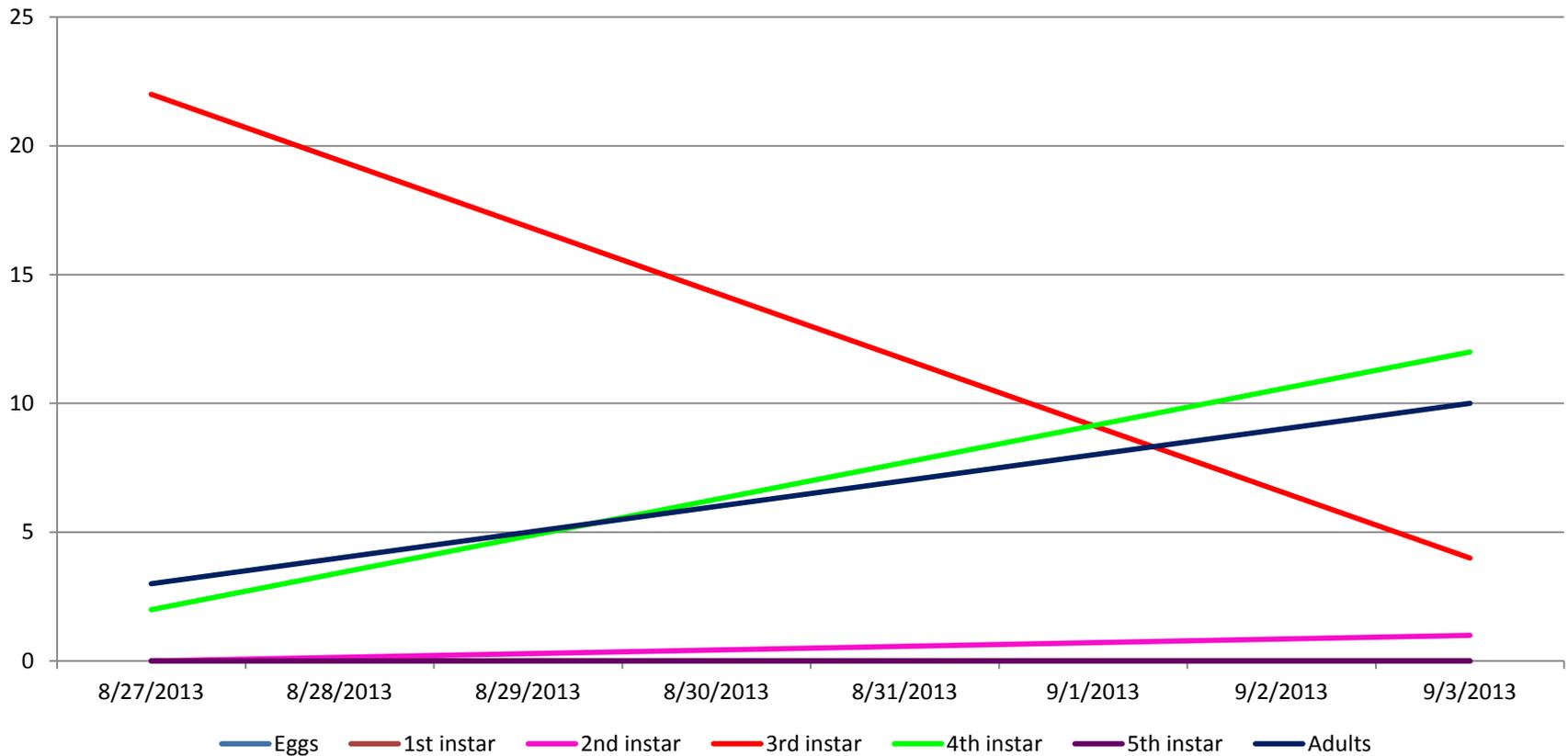
- We found egg masses on some cut flowers, but not the number that correlated to the number of BMSB being found

BMSB on wheat celosia flower
little activity until blooms started to
form



BMSB on celosia- later summer planting

BMSB on Celosia



Procut sunflower
planting block
4 sequenced
planting blocks
examined from June
until October



Stink bugs like to feed on unopened sunflower buds



Feeding on leaves and stems but no damaged detected

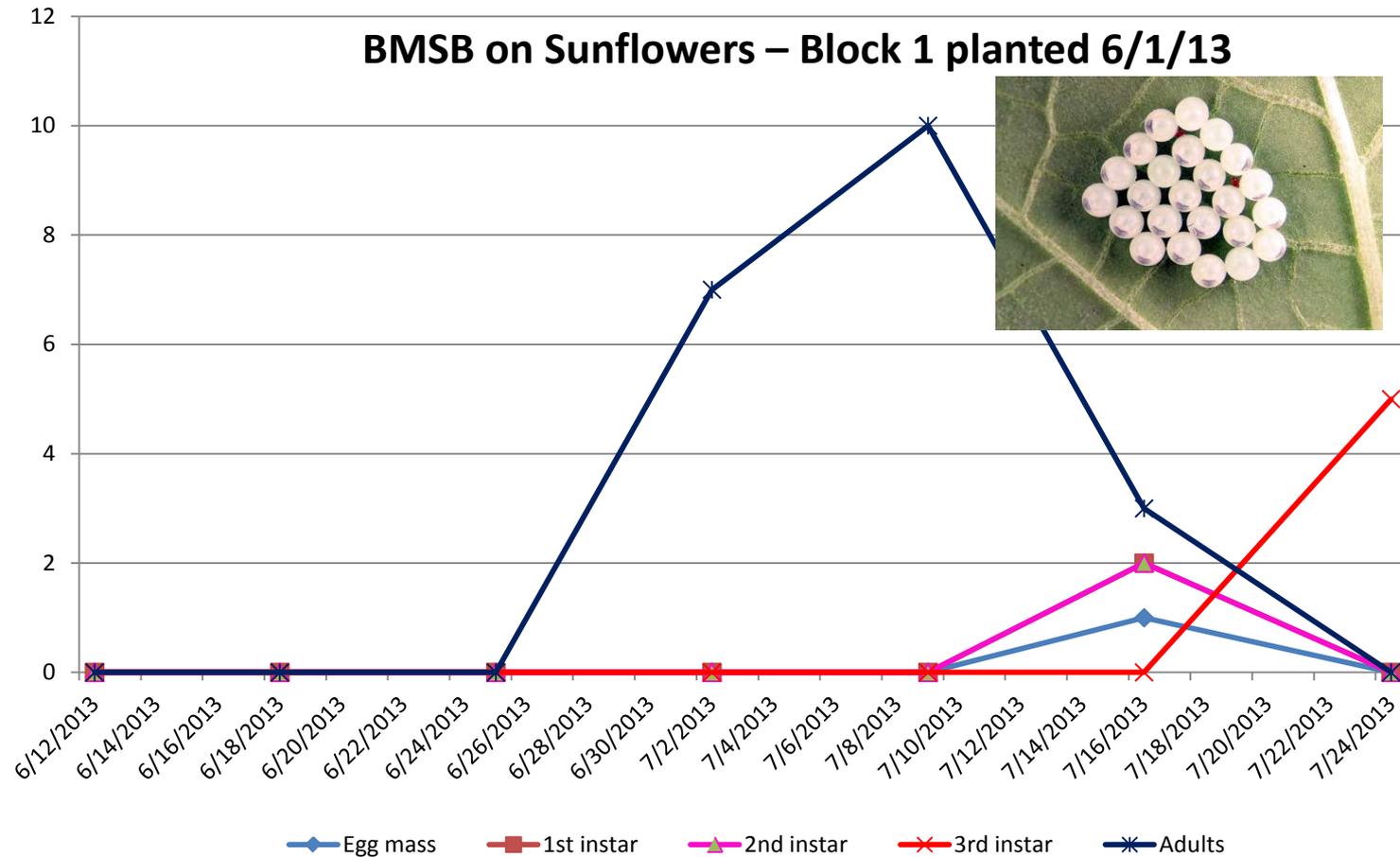


BMSB on Sunflowers



- Cut flower growers harvest the flowers when one or two petals separate from the disk. This prevents cucumber beetles from feeding on the petal rays.
- They place the sunflowers in the barn or cooler and let them open.
- Little chance of BMSB injury to flower heads with the system used by most growers

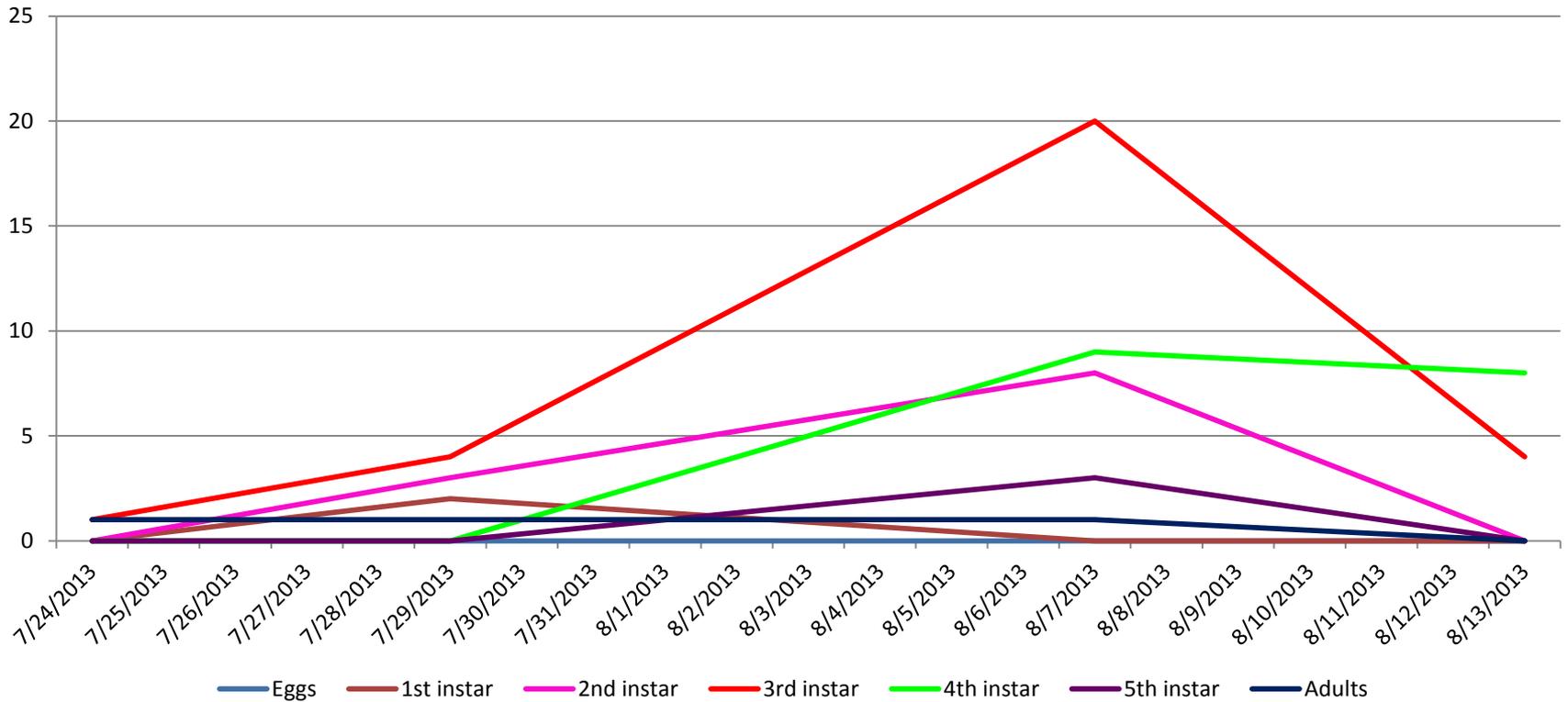
Sunflowers planted in sequence planting blocks (4 -5 weeks between plantings) to come in different parts of season





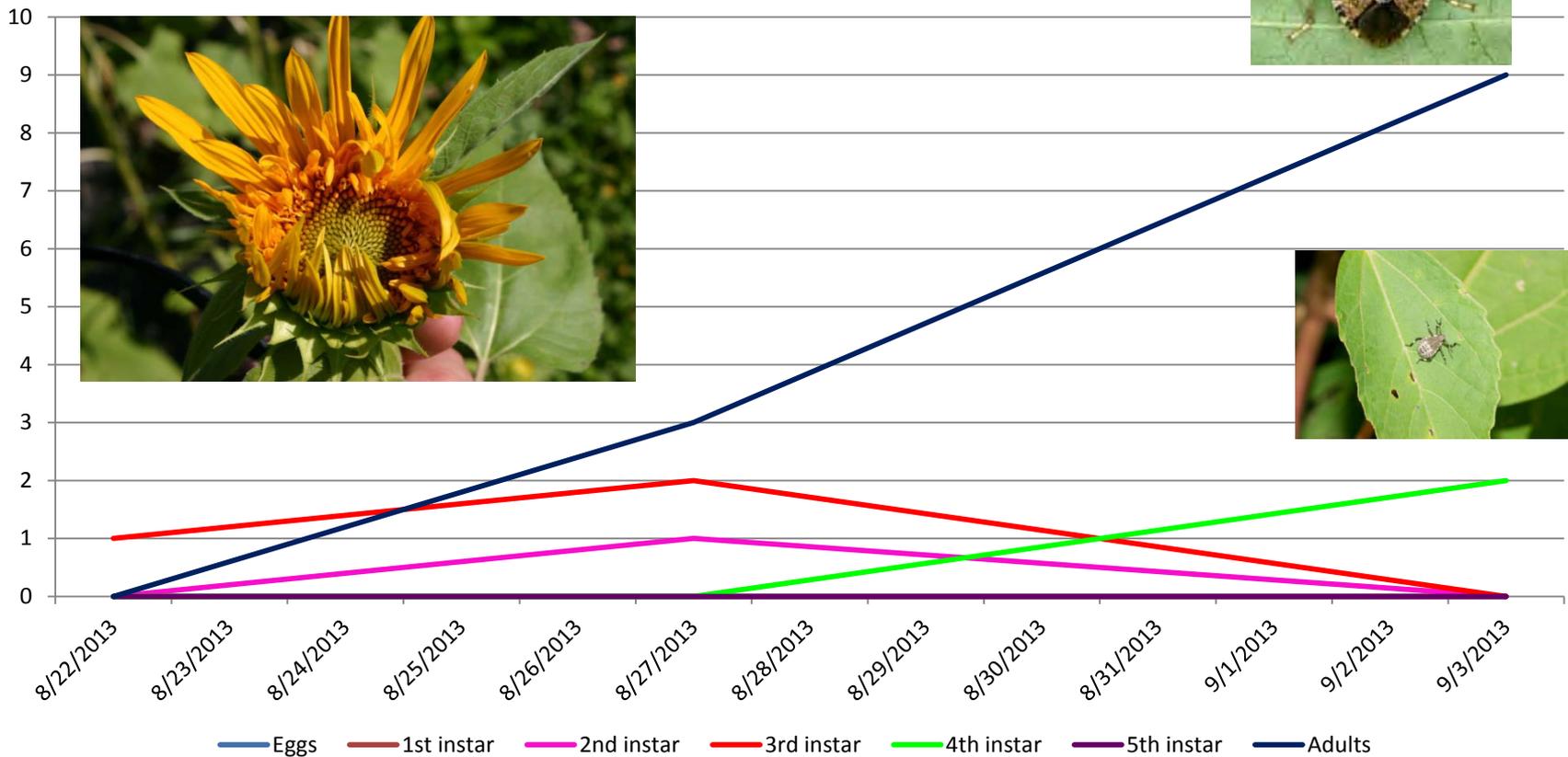
Sunflowers

BMSB on Sunflowers-2nd planting block planted 7/1/13



Sunflower row 3

BMSB on Sunflower - Block 3



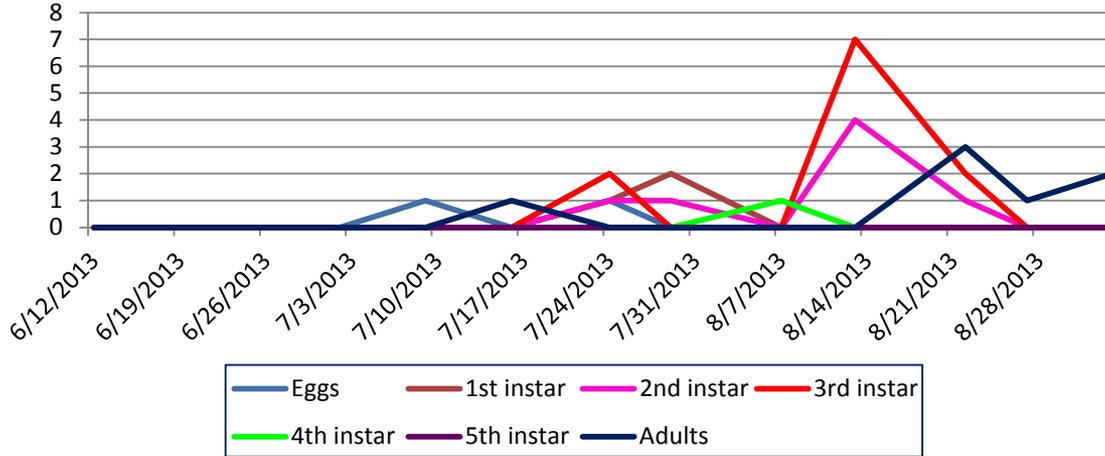
Zinnias - Adults do feed on flower parts, stems and leaves. We had some egg laying on foliage.



Adult feeding on unopened flower bud



BMSB on Zinnia – Planting block 1

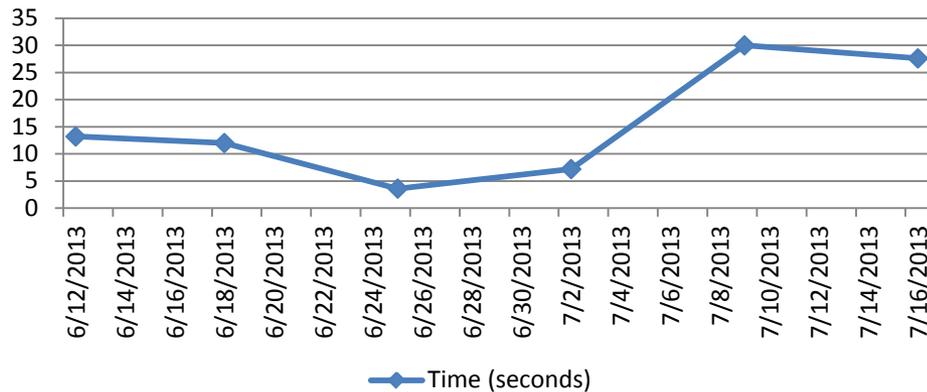


2nd and 3rd instars reached a peak on zinnias on August 14, 2013

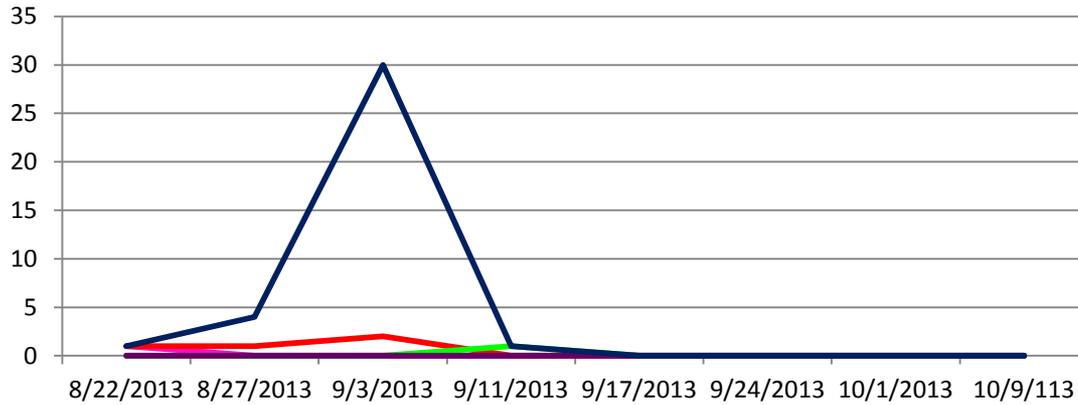
No damage noted on flowers or leaves

No diseases were found associated with the feeding sites

Time scouting per zinnia plant (50 plants total)



BMSB on Zinnia – Planting Block 2



Peak adult BSMS on Sept 3, 2013 on zinnias. Again no major damage detected.

— Eggs — 1st instar — 2nd instar — 3rd instar
— 4th instar — 5th instar — Adult

In August, a greenhouse cut flower grower had BMSB feeding on snapdragons in his greenhouse damaging flowers





We found egg masses laid on:
Zinnias
Sunflowers
Hydrangea
Smartweed



Newly laid BMSB eggs



BMSB eggs and 1st
instar nymphs



BMSB eggs just before hatching

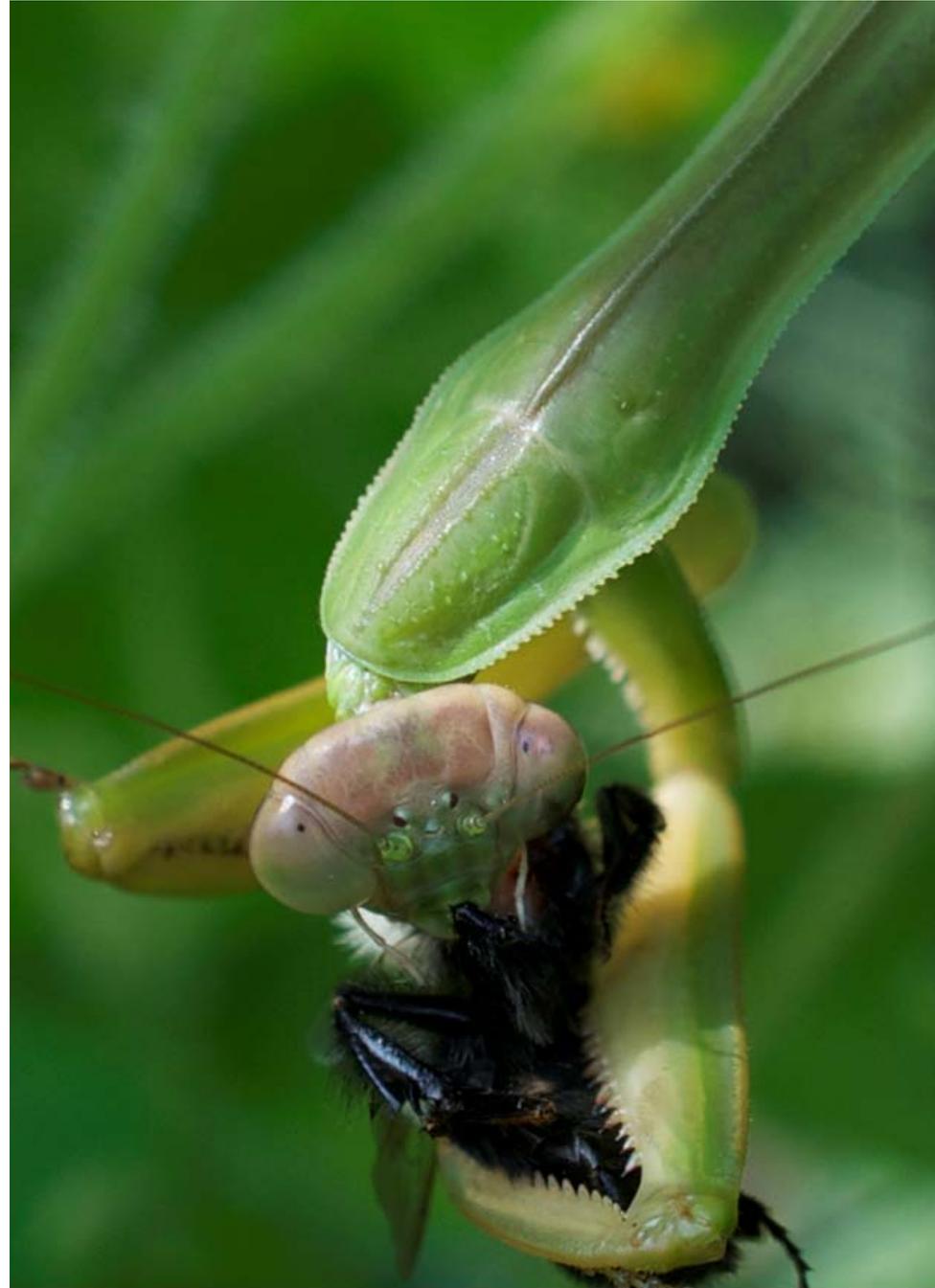
Nymphs going to 2nd instar



We recorded predators
in the cut flowers:

Praying mantids

Assassin bugs

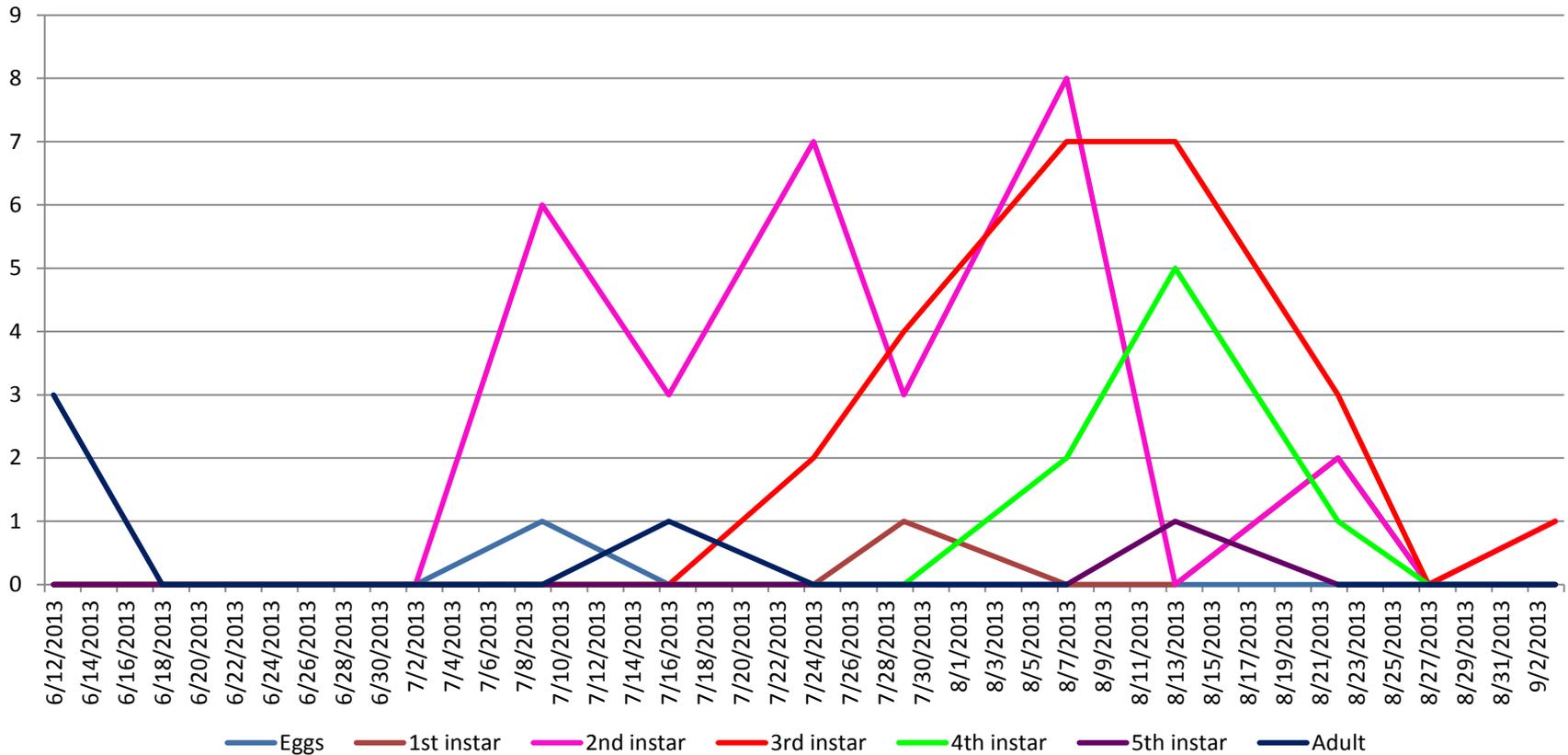


Florida predacious stinkbug, *Euthyrhynchus floridanus*
Peak activity in – Late June to mid August 2013



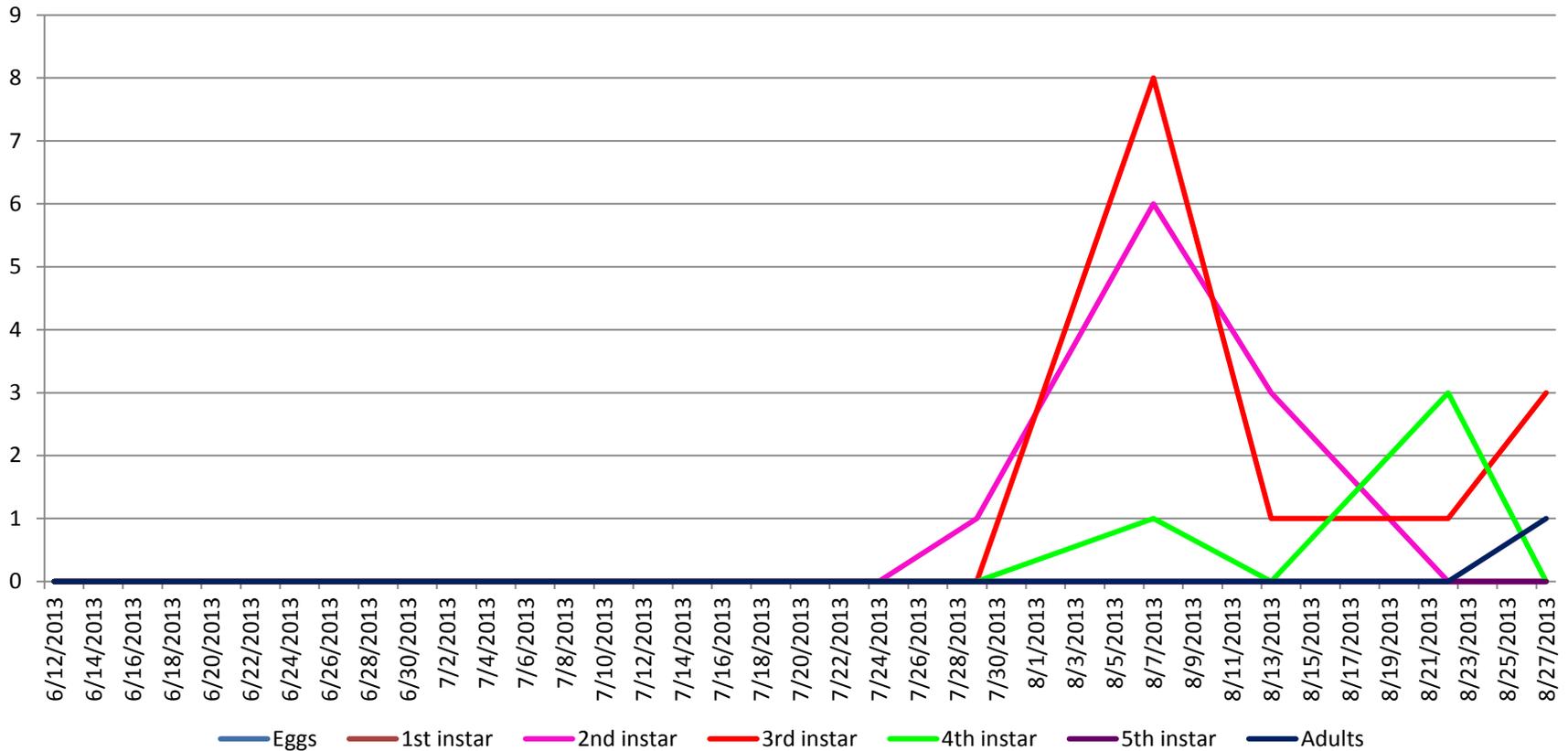
Egg masses found on hydrangea early in July

BMSB on Hydrangea 'Limelight'



BMSB on Dahlias peaked in July and August

BMSB on Dahlias

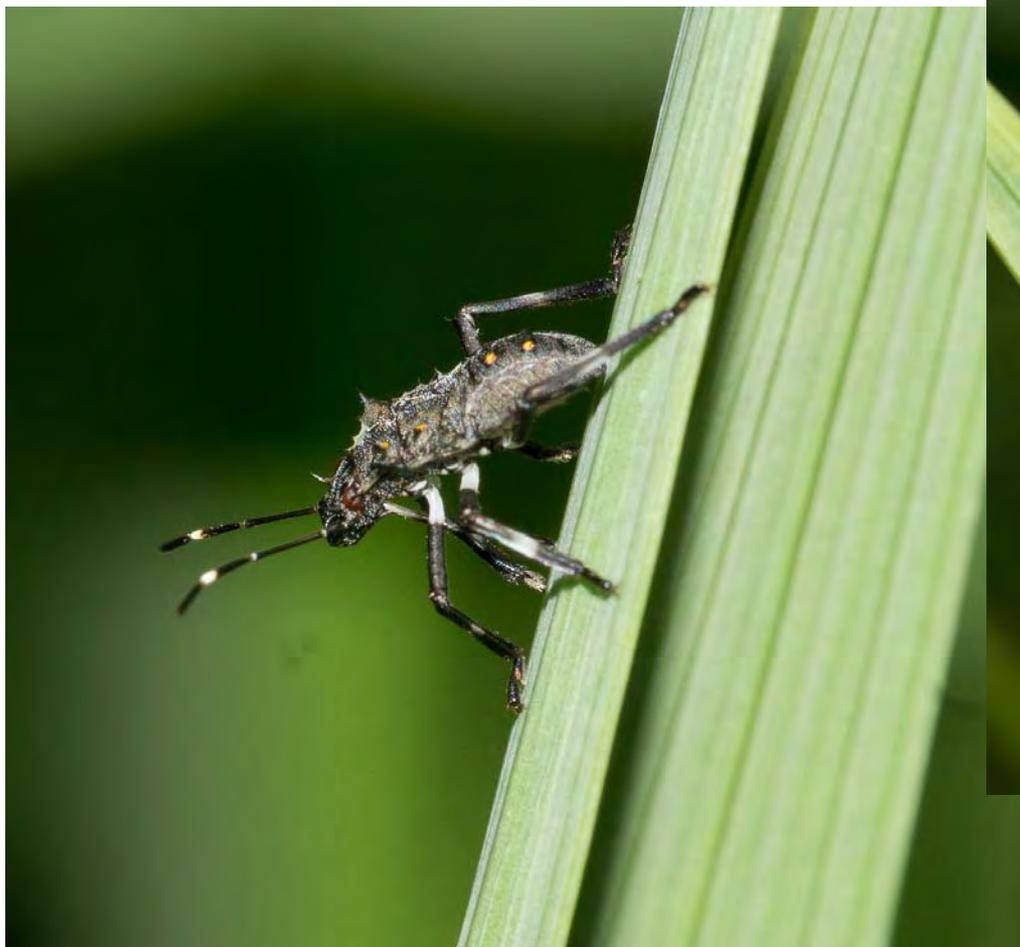




August 3 – 14, 2013 BMSB were all over gladiolus leaves, stems and unopened flower buds

Injury detected on leaves and flower buds.
Flowers opened normal.
Sample taken to Karen Rane lab – negative
for any disease transmission

BMSB on gladiolus



- Grasshopper Perennial Nursery (GPN), a small wholesale/retail operation near Sharpsburg, MD. GPN both propagates and grows perennial liner plants for use in its landscape division, as well as for direct sale. GPN grows 4,000 perennials (~300 varieties)
- In the spring of 2013 overwintering BMSBs were found by the hundreds between pots, bags of soil mix, between stacked pavers.

Grasshopper Perennial Nursery

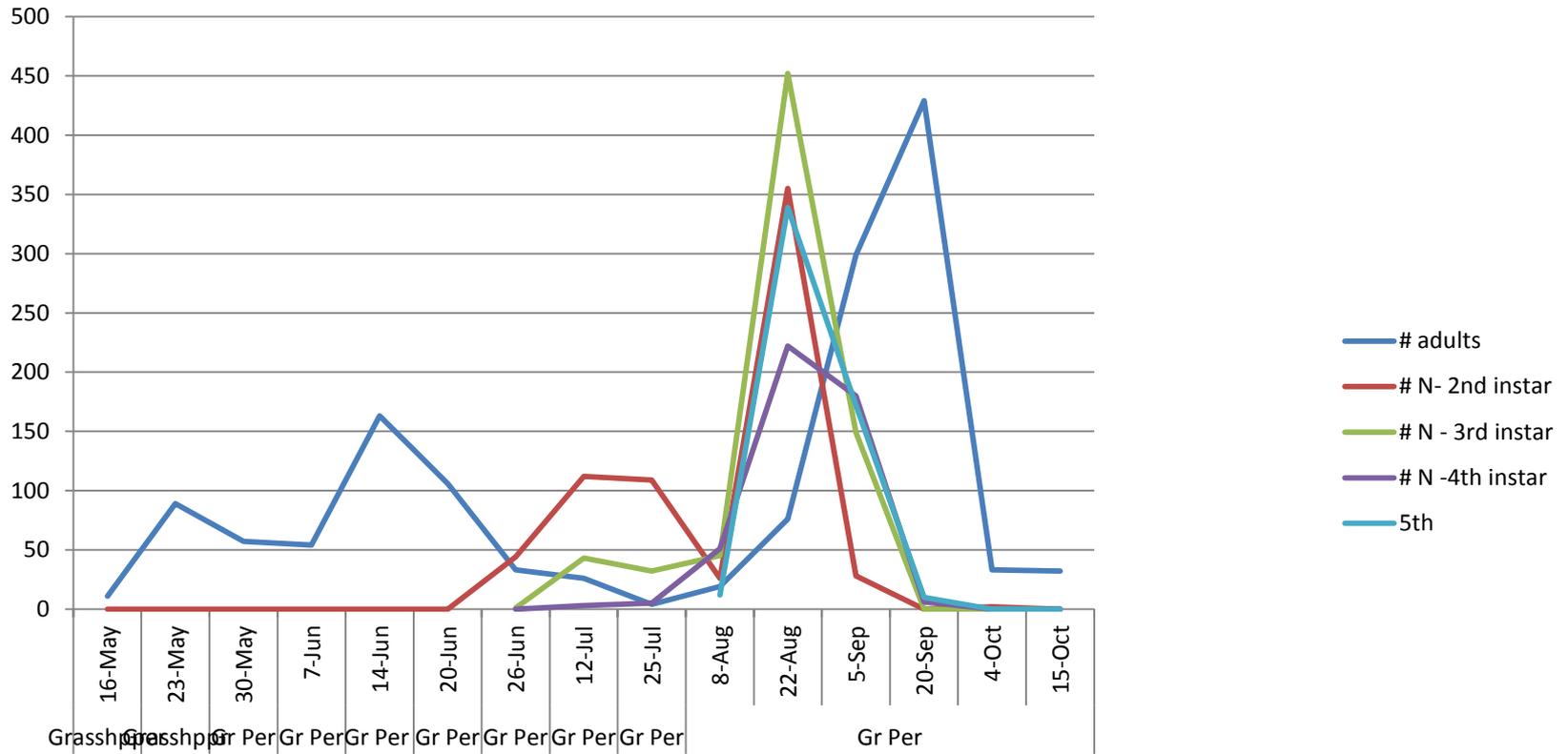
- Perennial plants were monitored weekly in 2013 from the **first week of May through mid June, and then bi-weekly until frost (mid October)**.
- Each cultivar of perennial plant was monitored for BMSB for a total of 2 – 5 minutes each. Five to ten individual plants were inspected visually for BMSBs on foliage and stems, and then the pot lifted up to inspect for egg masses and bugs on the undersides of leaves.
- All sightings of BMSBs were recorded for each plant, including life stage, time of day, weather conditions, feeding/non-feeding, specific location on plant (leaf/stem/flowers/seed) and the percent damage. In addition, any beneficial insects noticed were also recorded.

Trap counts form May 16 to October 15 2013

- Trap Counts. The number of BMSBs in and around the nursery site were high the entire monitoring season.
- A total of 3,685 BMSBs were counted:
- 1,327 adults
- 2,358 immatures



Pheromone Trap at Grasshopper Nursery



Grasshopper nursery – Perennials that BMSB was found feeding on:

Caryopteris 'Dark Knight'

Centranthus ruber (Jupiter's beard – native to med area)

Cleome

Helenium 'Rotgold'

Hibiscus moschetos

Hibiscus

Lobelia

Eupatorium coelestinum

Persicaria

Sedum 'Autumn Joy'

Solidago 'Rigida Sun'

Stokesia

Verbena tenuisecta

Veronica 'Sunny Border Blue'

'Monarda 'Marshall's Delight' (Bee balm))

Phlox 'Franz Schubert'

BMSB Egg masses laid on:
Persicaria (knotweed family)
Stokesia
Veronica 'Sunny Border'

On hibiscus



- Egg masses – only 4 egg masses were found on perennial plants (Althea, Veronica, and Persicaria) at GPN in 2013. The first egg mass was found on July 12. Low counts found on plants



BMSB Feeding on foliage

- **Feeding on foliage (7 different plant species)**

- Lychnis 'Maltese Cross' (total 1)

- (1 Adult; 5/30)

- Caryopteris 'Dark Knight' (Blue mist shrub) - (total 8)

- (1 adult; 6/14), (1- 3rd N, 6/20), (1- 4th N; 7/12), (2- 2nd +3rd; 8/8), (2: 2nd N+5th N; 8/22), 1-5th feeding on foliage, 9/5)

- *Polemonium viscosum* 'Blue whirl' (Jacob's-Ladder)(total 1)

- (1 adult; 6/20)

- Veronica 'Sunny Border Blue' (total 8)

- (1- 3rd N; 7/12), (7- 1st N, hatching from EM; 7/25)

-

- *Althea lasiocarpus* (= *Hibiscus moscheutos* subsp. *lasiocarpos*, Hairy rose mallow) (total 9)

- (5 newly hatched 1st instars from EM; 7/12)(1 adult, 9/5)(3 adults, 9/20)

- Monarda 'Marshall's Delight' (Bee balm) (total 3)

- (2: 1-2nd N and 1-3rd N, 7/25)

- Phlox 'Franz Schubert' – (total 1)

- 1 adult, 9/20

BMSB FEEDING –BMSBs preferred to feed on flowers, buds, or just under a bud (on the swollen peduncle/receptacle of a flower) and newly forming seeds or seedpods when existing on plants..

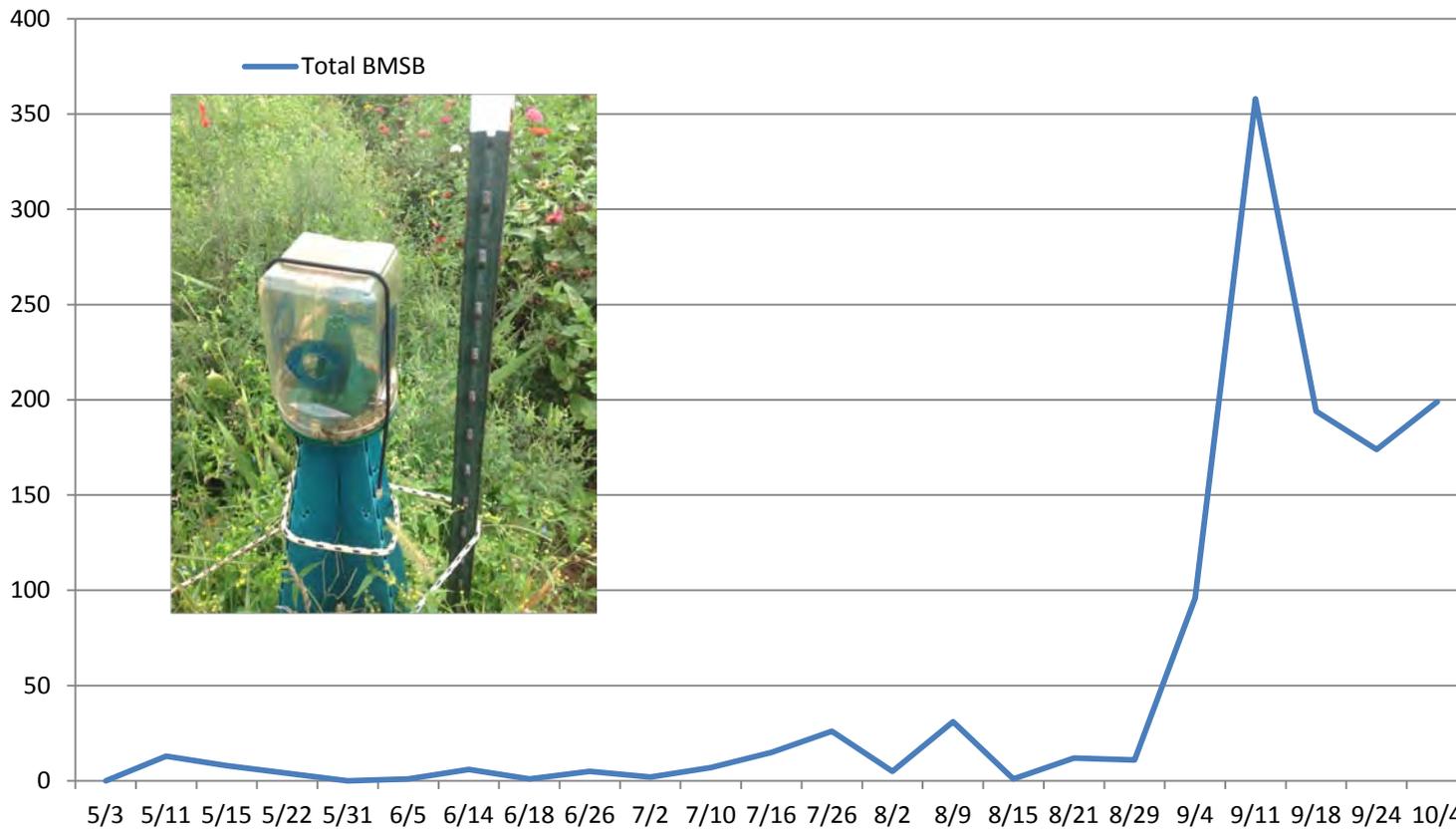
The following perennial plant species/cultivars were documented with active BMSB feeding

• **BMSB Feeding on flowers/flower buds (11 different perennials species)**

- Stokesia ‘Klaus Jelitto’ (Stoke's Aster) - (total 8)
 - (7 adults & 1- 2nd on flower bud about to open)
- Eupatorium coelestinum (Mist flower) –(total 1)
 - 1-5thN; 7/25- feeding at base of flower
- Coreopsis ‘Zagreb’ – (total 1)
 - (1-4th N feeding beneath flower/base 8/8)
- Verbena tenuisecta (moss verbena)- (total 1)
 - 1 adult feeding at base of flower cluster 8/8
- *Hibiscus macheatos* (Dwarf rose mallow)- (total 9)
 - 5: 1 A; 2- 3rd Ns, 1- 4th N, 1-5th N; 8/22) (1-2nd N; 7/25),(3 adults, 9/20)
- *Althea lasiocarpus* (= *Hibiscus moscheutos* subsp. *Lasiocarpos*, Hairy rose mallow) (total 3)
 - 1-adult at base of flower+ 2-5th N on buds, 9/5)
- Echinacea ‘Big Sky Sundown’-(Purple Coneflower) – (total 1)
 - 1 A feeding on base of flower, 9/5
- Aster novae-angliae ‘Purple Dome’ (Dwarf New England Aster) (total 1)
 - 1 adult feeding on yellow center ray, 9/20
- Shasta Daisy ‘silver princess’ – (total 1)
 - 1 adult on flower, 9/20
- Chrysanthemum ‘Pink Sheffield’ (total 1)

North Creek Nursery pheromone baited traps

Total BMSB



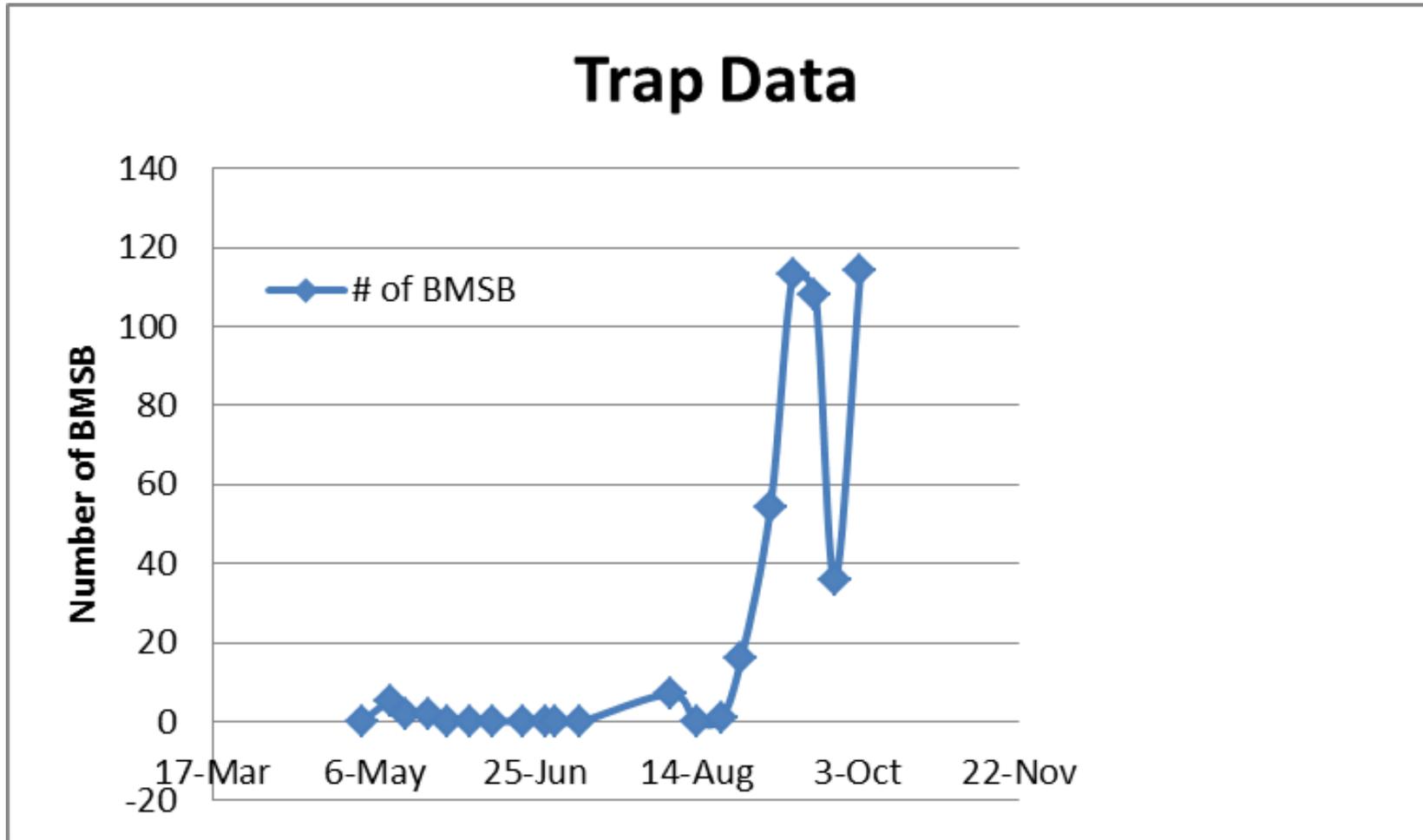
North Creek Nursery- Brian Kunkel and team – 10 plants examined of each cultivar

Plant	Cultivar	Date	Egg Mass	Nymph	Adult	Plant Phenology	Further notes
Baptista	Twilite Prairie Blues	26 July		1 -2 nd sit under leaf		Foliage only	
	Purple Smoke	2 August			1 under leaf 1 feed on stem	Foliage only	
Caryopteris	Sterling Silver	16 July	1	34 (27 early instar; 7 late instar walking)		Foliage only	
	Sterling Silver Grand Bleu	26 July		2 (both undr leaf); 12 (9 underside leaf)		Foliage only	On terminal leaves; 2 stem, 1 upper leaf
	Sterling Silver Longwood Blue	9 August		2 (sit under) 2 (sit under)	1 (sit under)	Foliage only	All early instars
	Longwood Blue	15 August		7 (early instar)		Foliage only	All early instars 3 upper/4 under
	Snow Fairy	4 October				1 walking on leaf	Foliage only

Hibiscus, Asclepias, Phlox, and Monarda: 0 BMSB

Holly Hill

BMSB Observations thru 4 October 2013



Hibiscus @ Holly Hill

Cultivar	Date	Egg Mass	Nymphs	Adults	Plant Phenology	
Kopper King Fireball	16 July	1		1	Foliage only 20% bloom	
Blue River II Fantasia	23 July	2	1 (early instar)	1 (walking on flower)	20% bloom 20% bloom	
Fireball	29 July	1			30% bloom	
Fireball	14 August			1 (walking on stem)	50% bloom	
Blue River II	28 August			1 (walking on leaf)	80% bloom	
Blue River II	13 September			1 (walking around seeds)	20% bloom	
Blue River II	26 September			2 (walking on foliage)	100% fruit/seed set	
Lord Baltimore	26 September			1	20% flower bud; 10% seed set; 10% flower	Walking on foliage and flower
Kopper King	26 September			1 (terminal end of stem)	10% bloom; 10% fruit/seed set	sitting
Plum Crazy	26 September			2 (walking upper leaf surface); 1 feeding near seeds	60% fruit/seed set	
Fireball	26 September			1 (underside of leaf)	10% bloom	sitting

No feeding injury found on any of the perennials

- BMSB will lay eggs on herbaceous perennials which do not appear to be preferred host site
- BMSB Egg masses laid on:
- *Persicaria* (knotweed family)
- *Stokesia*
- *Veronica* 'Sunny Border'
- They will feed on stems, leaves, flowers and seed pods but do not do any major damage.



Brown Marmorated Stink Bugs On Annuals and Herbaceous Perennials

Fact Sheet FS-XXX-2013

The brown marmorated stink bug (BMSB) has spread into over 40 states (2013) and is being found feeding on a number of species not recorded in its native habitat. This bug was introduced from Asia and has rapidly spread across the United States, and into Canada. Officials in Mexico are anticipating that it will visit them soon. It has even managed to make its way into Switzerland (2011). European growers are very nervous about the potential of this pest entering Europe. This pest has the ability to adapt to the climate of Central America and most of Europe. Six states are currently listed (2013) as the epicenter of this outbreak: Maryland, Pennsylvania, West Virginia, Virginia, New Jersey and Delaware.

Brown marmorated stink bugs (BMSB) were seen in extremely high numbers in the mid-Atlantic region in 2010. During the 2010 season the BMSB was observed feeding on many new species of plant material. The BMSB is responsible for causing major economic damage to fruits and vegetables on a number of orchards and farms. The number of herbaceous annuals and perennial fed on by the BMSB has not been well documented. Besides the damage to plants and fruits, brown marmorated stink bugs are a major nuisance to people. Adult stink bugs often seek shelter inside houses and other buildings, although they do not bite people or pets, nor do they damage buildings.

In 2010 - 2013 BMSB was reported to feed on herbaceous annuals and perennials by growers and landscape managers. In 2011 the University of

Maryland conducted trials at the University greenhouse to evaluate the feeding impact of BMSB on annuals and perennials. The purpose of the study at the University of Maryland Central Maryland Research and Education Center was to develop a list of herbaceous annuals and perennial, based on grower input, that could serve as potential host of BMSB that would be observed in greenhouse environment over a 3 month period to observe the feeding, damage and potential disease transmission by the bug. Several of the plants observed in our trial are listed in the following tables.

Greenhouse Plants

In our trials at the University of Maryland we confined BMSB on plants in a greenhouse. In these confined situations they fed on herbaceous transplants such as snapdragon, petunia, dahlia, baptisia, pepper and tomato. BMSB did not survive well in the greenhouse environment. In a survey of commercial greenhouses (125 greenhouses surveyed) BMSB was found in head-houses and in sheds and barns but were not found in greenhouse growing structures, and none were found feeding on any of the plant material. We suspect that one or more factors in the greenhouse environment is not conducive to BMSB. This is good news for greenhouse growers. In 2012 we found one commercial cut flower grower in Harford County, growing snapdragons that had stink bugs invade the

Have we learned anything here?



Conclusion

- BMSB feeds on sunflowers, amaranth, celosia, dahlias, hydrangea but no significant damage or economic impact to growers. **There is a level of damage to snapdragons and gladiolus from BMSB feeding.**
- BMSBs were quite active at Grasshopper Perennial Nursery during the 2013 season, but did not cause aesthetic nor economic damage to perennials. The top preferred perennial species that were both fed upon and visited by BMSB at
- **Althea lasiocarpus**
- **Caryopteris**
- **Veronica**
- **Hibiscus .**

