

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



Funding



United States
Department of
Agriculture

National Institute
of Food and
Agriculture

Specialty Crop Research Initiative
Grant #2011-01413-30937

Collaborating Institutions



Cornell University



Virginia Tech



Goals of the BMSB SCRI CAP Team

*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.*

Purpose of Stakeholder Advisory Panel

- The Stakeholder Advisory Panel (SAP) will meet annually to review project accomplishments, provide feedback on research plans, and guide the execution of objectives.
- The SAP will provide an overall assessment of the project and recommendations for future research and outreach efforts.
- Based on input from the SAP, we will modify objectives or procedures to ensure that the needs of specialty crop stakeholders are best served and the risk posed by BMSB is mitigated.

Original Grant Objectives

1. Establish biology and phenology of BMSB in specialty crops.
2. Develop monitoring and management tools for BMSB.
3. Establish effective management programs for BMSB in specialty crops.
4. Integrate stakeholder input and research findings to form and deliver practical outcomes.

Renewal Grant Objectives

1. Expand current knowledge of BMSB biology, ecology and behavior in specialty crops.
2. Develop and refine monitoring and management tools for BMSB.
3. Improve existing BMSB management programs and transfer information to other at-risk specialty crops.
4. Integrate stakeholder input and research findings to form and deliver practical outcomes.

Timeline and Funding

- Originally funded in 2011 for 3 years at \$5.7 million. Funding from September 2011 – September 2014. Delay in funding coming in until February 2012.
- Renewal application submitted in Spring 2014. Received two additional years of support. Funded in full with an additional \$5.3 million. Funding now extended until September 2016.
- Matching costs through Year 4 (2015).
- Will explore the possibility of a no-cost-extension for an additional year.

Accomplishments to Date

- ✓ Identification of high risk specialty crops and associated damage symptoms.
- ✓ Developed effective short-term mitigation strategies in susceptible specialty crops.
- ✓ Identification of the BMSB pheromone and synergist and prototype traps for monitoring activity.
- ✓ Established that adults have a long-range dispersal capacity and overwinter in protected areas in natural landscapes.
- ✓ Developed a comprehensive host plant list for BMSB in North America.
- ✓ Developed a better understanding of BMSB biology and behavior contributing to the development of models for establishing voltinism and landscape-level risk factors.
- ✓ Identification of effective native natural enemies and continued screening of potential Asian natural enemies.
- ✓ Development and launch of a national website www.stopbmsb.org and video series.
- ✓ Isolated salivary proteins, published transcriptome sequencing, and demonstrated the potential of gene silencing for BMSB establishing baseline information for plant breeding and molecular approaches for management.
- ✓ Established national and international scientific collaborative systems, enabling rapid scientific progress and sharing of new findings.



Specialty Crops at Risk to BMSB Damage

High Risk

Apple, Asian Pear, Beans (Green, Pole, Snap), Bee bee tree (*Tetradium daniellii*), Edamame, Eggplant, European Pear, Grape¹, Hazelnuts, Japanese pagoda tree (*Sophora japonica*), Nectarine, Okra, Peach², Peking tree lilac (*Syringa pekinensis*), Pepper, Redbud (*Cercis canadensis*), Sweet Corn, Swiss Chard, Tomato

Moderate Risk

Apricot, Asparagus, Blueberries^{1,3}, Broccoli, Cherry², Cauliflower, Collard, Cucumber, Florida dogwood (*Cornus florida*), Horseradish, Lima Bean, Little leaf linden (*Tilia cordata*), Serviceberry (Amelanchier x grandiflora), Tomatillo

Low Risk

Black gum (*Nyssa sylvatica*), Carrot, Cranberries, Garlic, Ginko (*Ginko biloba*), Greens, Japanese maple (*Acer palmatum*), Kohlrabi, Kousa dogwood (*Cornus kousa*), Leeks, Lettuce, Many Gymnosperms, Onion, Potato, Spinach, Sweet Potato, Turnip

Unknown

Almond, Citrus, Hops, Kiwi, Olive, Plum, Pistachio, Strawberries, Walnut

Non-Specialty Crop BMSB Hosts Contributing to Specialty Crops Risk

Soybean, Field Corn

¹Potential risk of taint/contamination, ²Additional risk potential due to bark feeding, ³Considered moderate-high risk,

Regulatory Issues

- 2014 Section 18s for Tree Fruit
 - Renewal of Section 18 for Dinotefuran (easy to add new states)
 - Renewal of Section 18 for Bifenthrin (difficult to add new states)
- 2012 was the last year for endosulfan use in peaches. Apples through 2015.
- Continued progress in host specificity screening for classical biological control program. Christine Dieckhoff will provide an update today.

BMSB SCRI Management

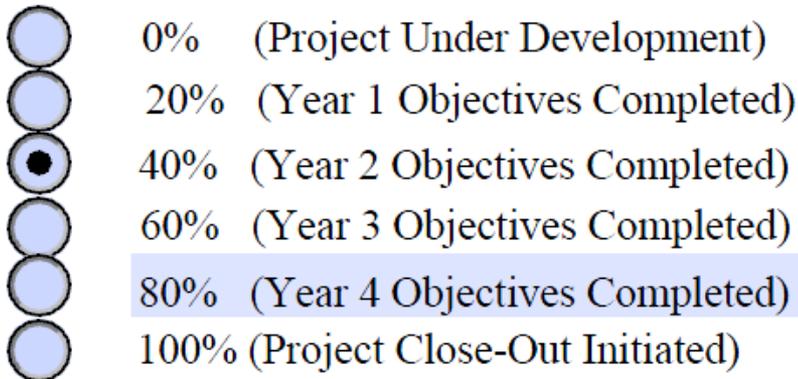
- **Project Support Assistant**
 - Donna Joy hired in January 2014. Replaced Teresa Mersing.
- **Institutional PDs**
 - Betsy Beers will replace Jay Brunner at WSU
 - Tom Kuhar will replace Chris Bergh at VT
- **Commodity Team Leadership**
 - Chris Bergh – Orchard Crops
 - Tom Kuhar – Vegetables
 - Anne Nielsen replaced Doug Pfeiffer for Grapes
 - Cesar Rodriguez-Saona – Small Fruit
 - Paula Shrewsbury - Ornamentals

Institutional Annual Reports

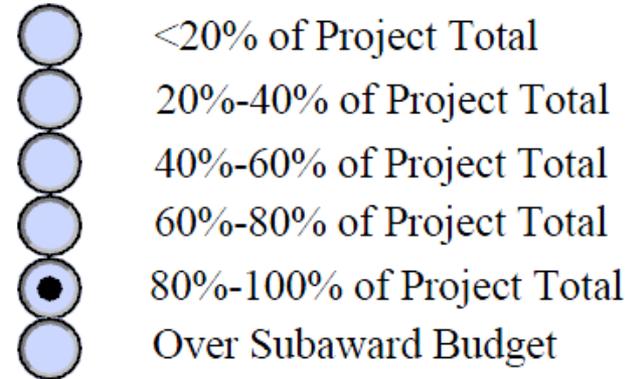
- Technical Summary of Progress
- Outlined Experimentation for Upcoming Period
- Barriers to Success
- Key Personnel Trained (post-docs, graduate students, undergrads)
- Research and Extension Products (talks, posters, workshops, publications)
- New/Leveraged Funding
- Media Contacts

Institutional Progress

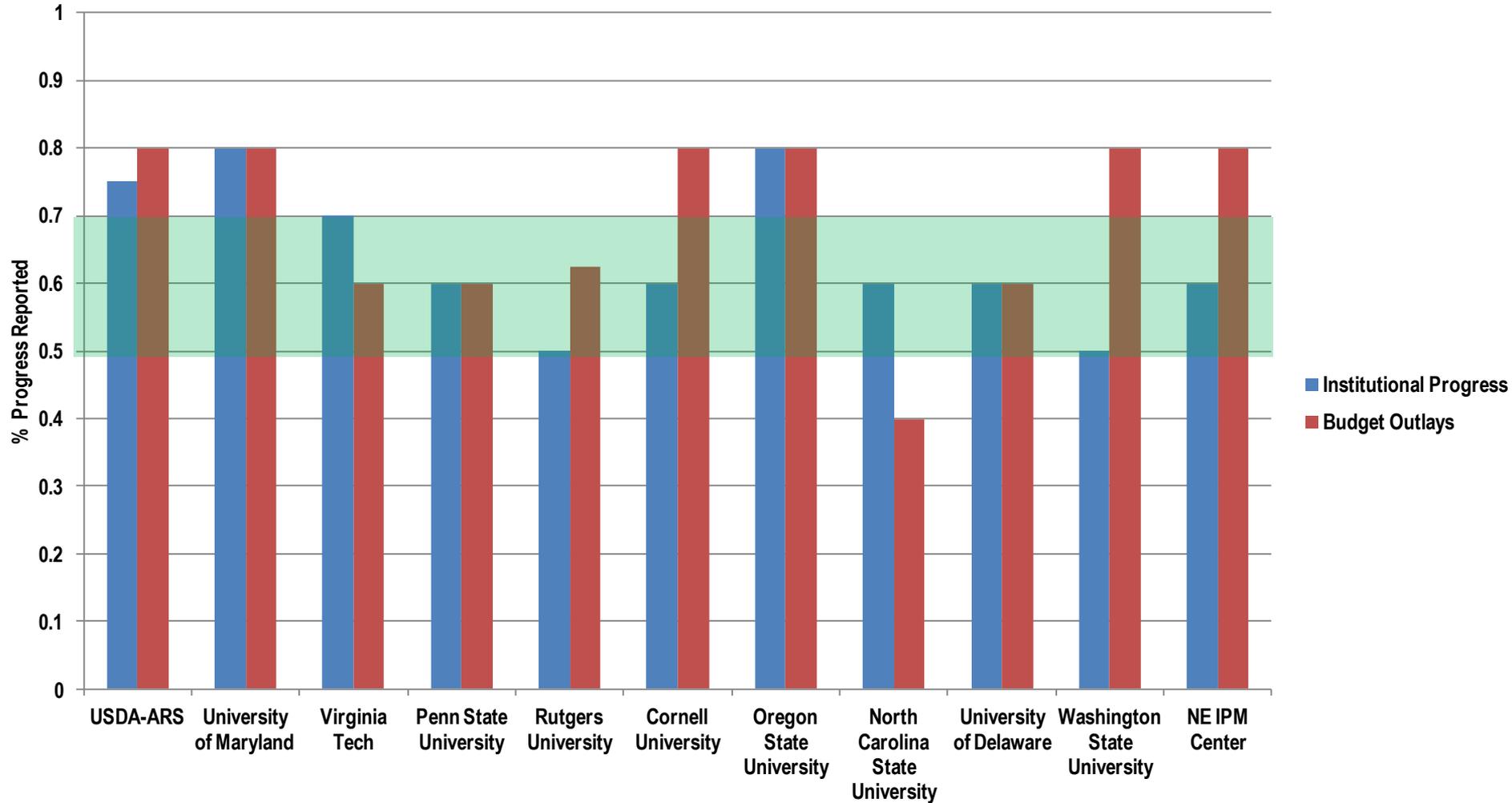
General Institutional Progress



Subaward Budget Outlays



Institutional Progress



Overall Project Progress

- Progress

- Calculated based proposed effort x progress reported per institution. Then summed across ALL institutions.

$$\Sigma (\text{Proposed Institutional Effort}) \times (\% \text{ Accomplished})$$

- ex., Cornell
 - 8.47 (Proposed Effort) x 25.0 (% Accomplished) = 2.12 (toward overall progress)

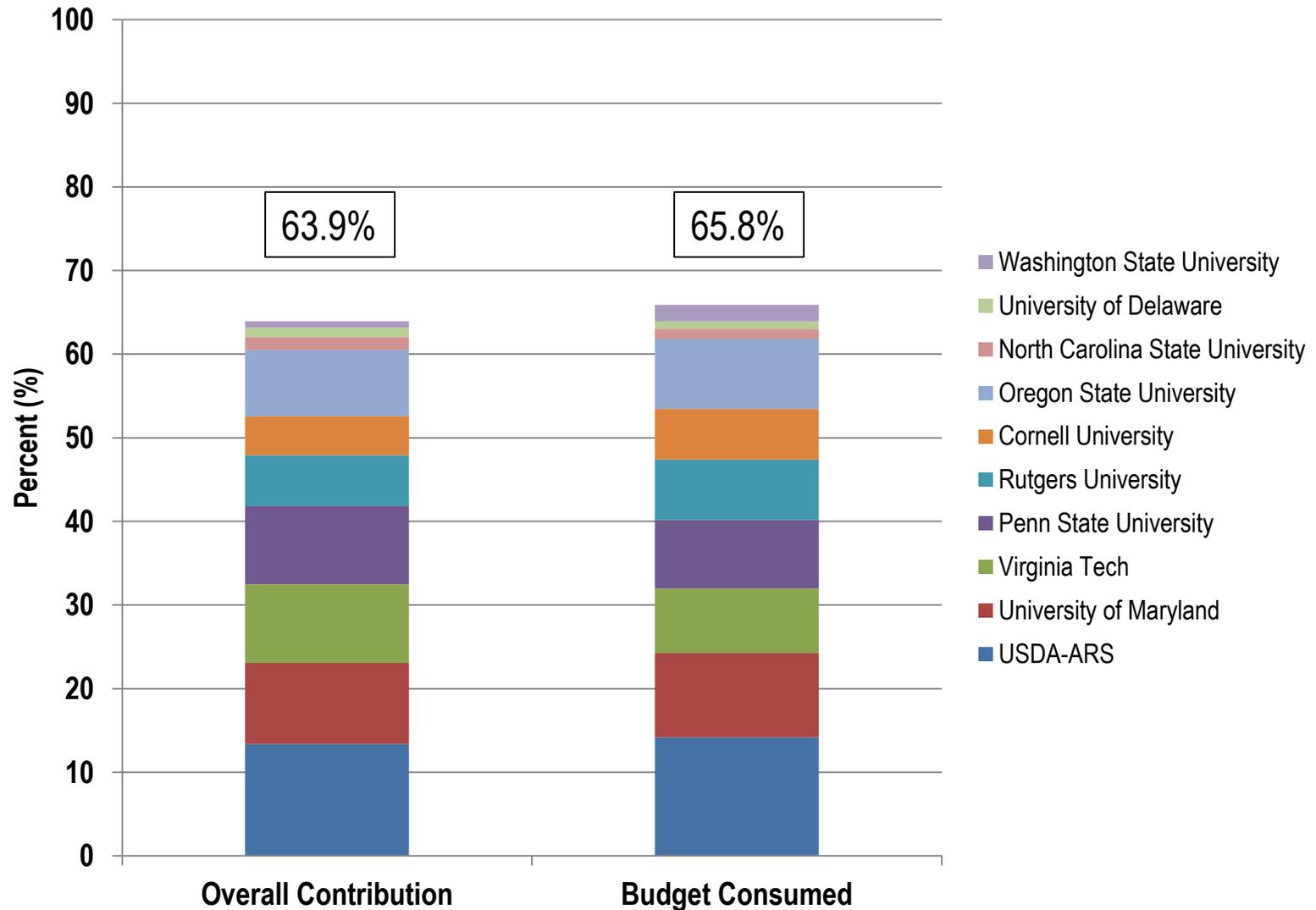
- Budget Consumed

- Calculated based proportional budget x subaward used per institution. Then summed across ALL institutions.

$$\Sigma (\text{Proportional Institutional Budget}) \times (\% \text{ Subaward consumed})$$

- ex., Virginia Tech
 - 10.45 (proportion of budget) x 37.5 (consumed) = 3.92 (toward overall budget consumption)

Overall Project Progress



Individual Objective Progress

Progress Toward Accomplishment of Individual Objectives

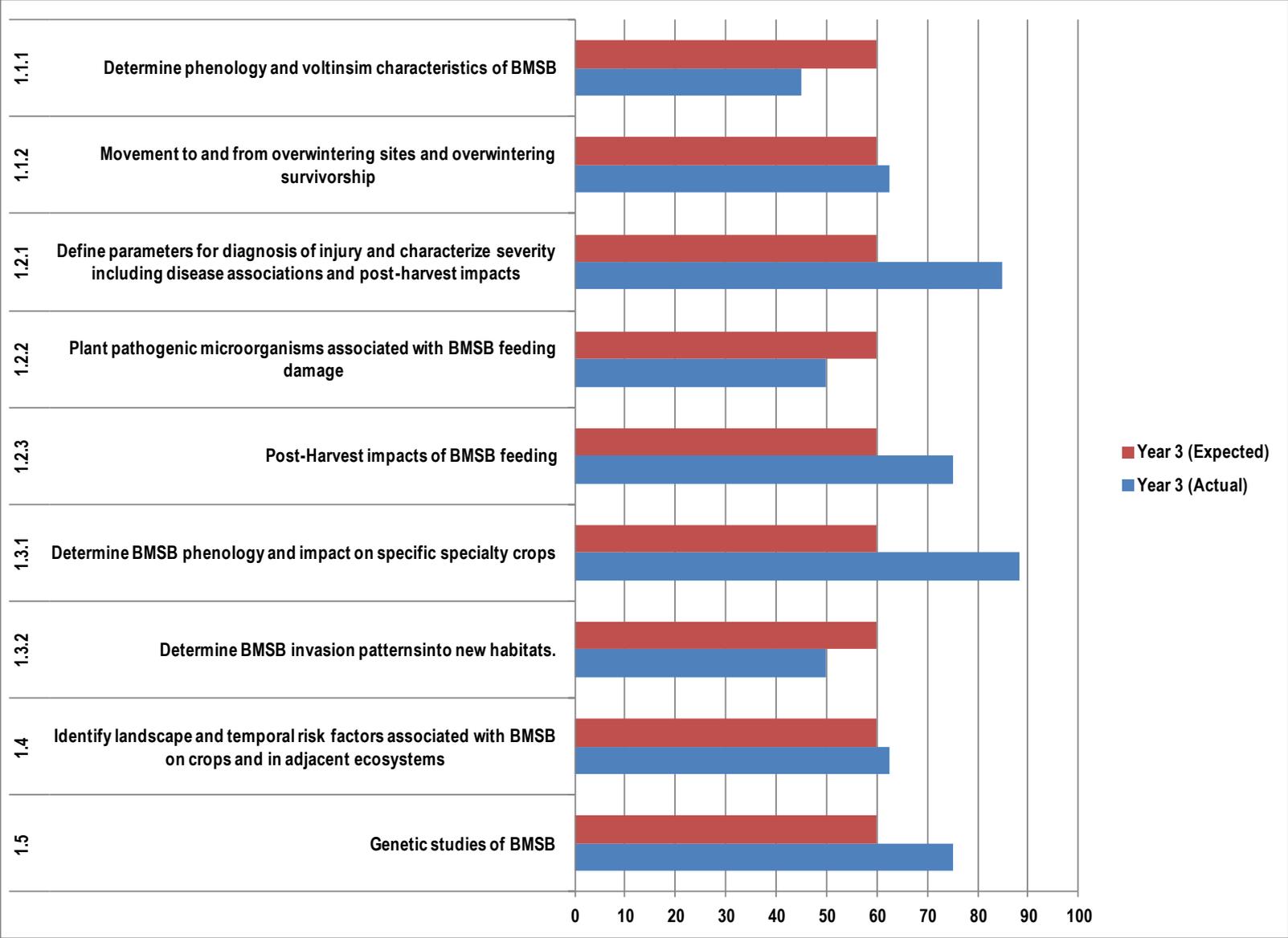
1.1.1. (Leskey)

Determining voluntarism characteristics of BMSB.

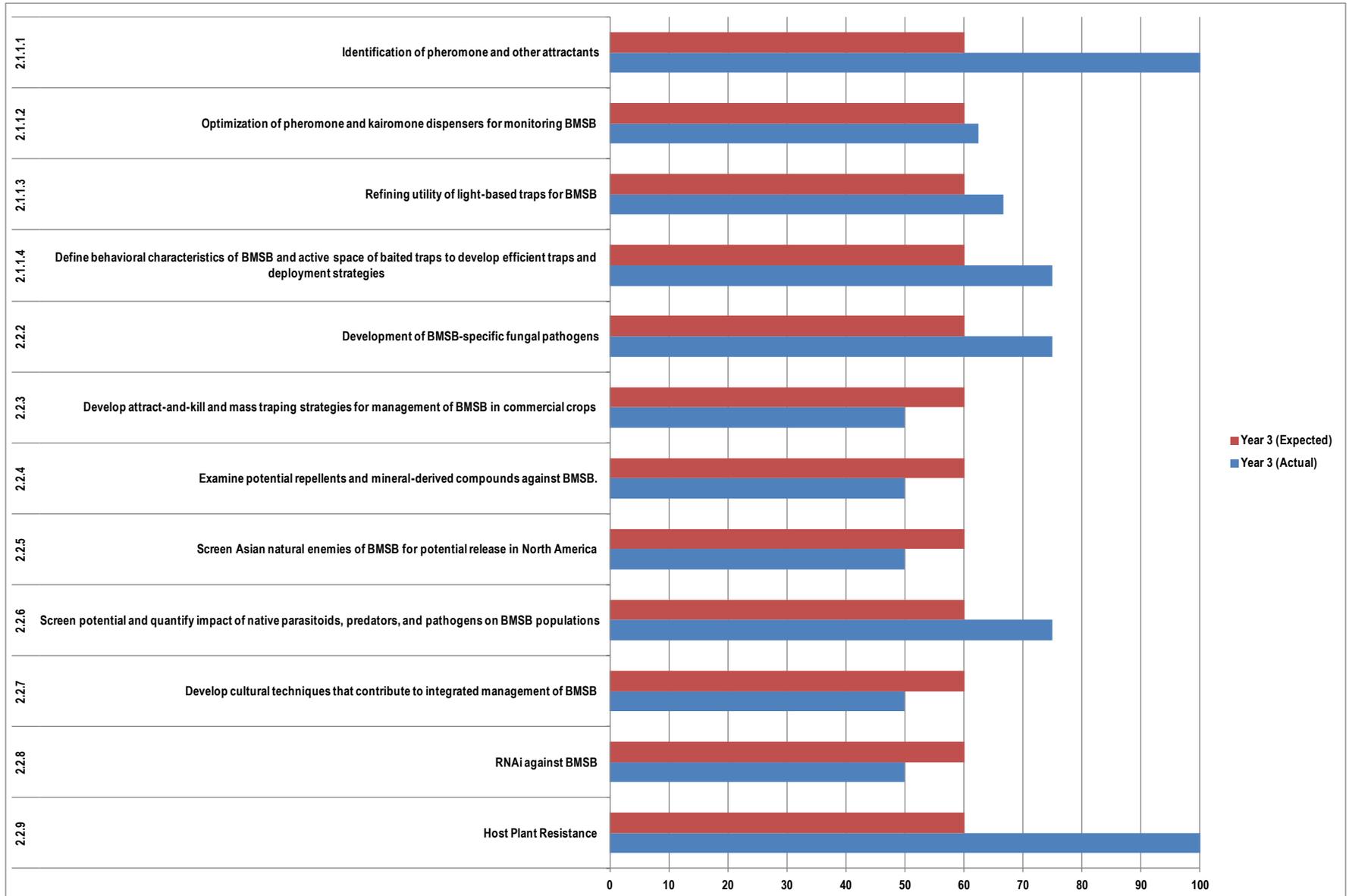
Categorical Progress

-  0% (Under Development)
-  25% (Project Initiated)
-  50% (Results Collected)
-  75% (Data Analysis Completed)
-  100% (Manuscript Completed)

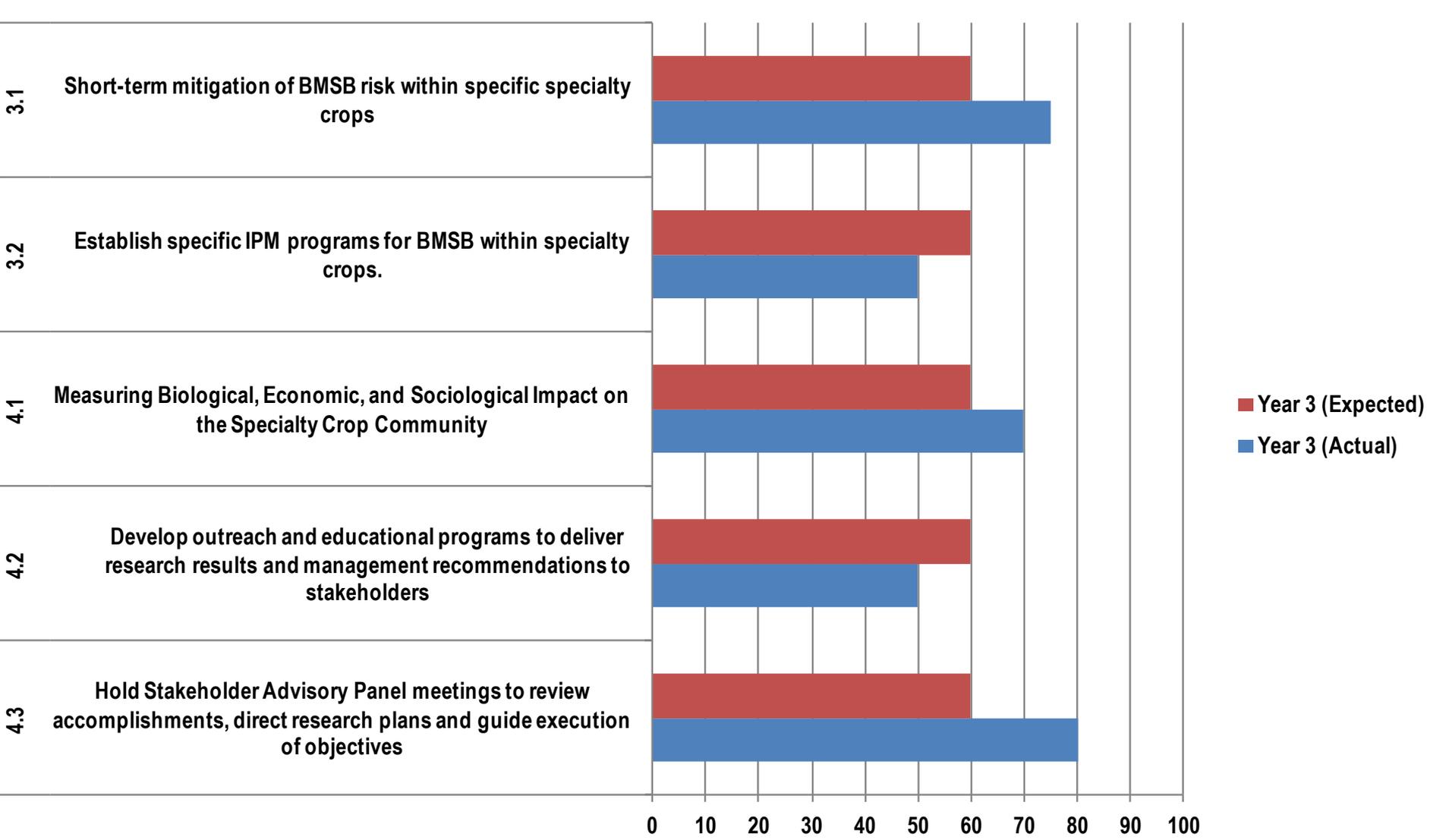
Objective 1. Establish biology and phenology of BMSB in specialty crops.



Objective 2. Develop monitoring and management tools for BMSB.



Objective 3. Establish effective management programs for BMSB in specialty crops *and* Objective 4. Integrate stakeholder input and research findings to form and deliver practical outcomes



Key Personnel Trained

Undergraduates	Graduate Students	Post-Docs
+128	+20	+20

Feedback from 2013 SAP Meeting

- Most liked the increased time for discussion, but also felt some reports were too brief.
- The need for an improved IPM practices was a major message.
- Most agreed that an annual meeting was acceptable.

BMSB SCRI SAP Schedule

- **Morning Session One**
 - Voltinism, Overwintering and Dispersal, Survey, Orchard Crops, Vegetables
 - Discussion
- **Morning Session Two**
 - Small Fruit, Ornamentals, Grape, Landscape/Temporal Risk
 - Discussion
- **Lunch**
 - OREI update
- **Afternoon Session One**
 - Genetic Studies, Gut Symbionts, Diet Optimization, Monitoring Tools, Biological Control
 - Discussion
- **Afternoon Session Two**
 - Economics, Outreach, Insecticides, Fungal Pathogens, Repellents
- **Open Discussion and Evaluations**