

## 2016-2017 USU Extension Grant – Final Report

**Project Leader:** Ricardo Ramirez and Madeleine Dupuy (PhD candidate and USU collaborator)

**Project Title:** The contribution of predatory arthropods toward billbug suppression in Intermountain West turfgrass

**Project Beginning Date and End Date:** June 1, 2016-May 30, 2017

**Total Requested** \$9429.20

**Project Summary:** Billbugs, an insect pest of turfgrass, are managed through preventive applications of insecticides that harm predators. Predators feed on pests providing a benefit to plants. The objectives of this study were first to 1) characterize the predator community, 2) evaluate the effects of predators on billbugs, and 3) develop outreach for monitoring arthropods in turfgrass.

### Project Results:

Using linear pitfall traps, we found that carabid beetles and spiders dominated the turf predator community. Specifically, predatory ground beetles comprised 63% of all predatory taxa, with major genera (>15%) including *Pterostichus*, *Harpalus*, *Amara*, and *Anisodactylus* spp. Wolf spiders also made up a major component of the predator community, 16%. In a field trial, we evaluated billbug suppression by tethering billbugs along a transect in recreational turf areas and recorded mortality. We found that field predation varied from 3-10%. To isolate the effect of each specific predator, we set up lab studies using arenas to investigate the direct mortality each of the most abundant predators had on billbugs. We found that spiders and smaller carabids (*Amara*, *Anisodactylus*) did not feed on billbug adults and that *Pterostichus* and *Harpalus* both caused adult billbug mortality. The overall predation resulting from *Pterostichus* and *Harpalus* was 6% and 18%, respectively. We assessed the ability of predators to feed on larvae at four soil depths (1, 3, 5, and 10 cm) within a range seen in the field in a series of lab trials, using last instar *Galleria mellonella* (waxworms) as a sentinel host. Lycosid spiders fed on waxworms at the 1 cm depth at a rate of 4.5%, but not any deeper. *Pterostichus* fed on waxworms only at the 1 cm depth at a rate of 22%. *Anisodactylus* did not feed on waxworms at any depth. It is noteworthy that Lycosids, *Anisodactylus*, and *Pterostichus* were all shown to be capable of feeding on waxworms in a petri dish arena (not buried in soil). We assessed the ability of predators to locate and consume billbug eggs within stems in the lab. A predator was placed in a petri dish with a turf stem in which a billbug egg had been hidden. *Anisodactylus*, *Amara*, *Pterostichus*, and *Harpalus* located and consumed the eggs at a rate of 46%, 33%, 31%, and 17%, respectively. Lycosid spiders did not consume any eggs. Overall egg predation appears to be where most of the impact of predators on billbug suppression may be.

From this work (objective 3), we developed a video factsheet ([www.youtube.com/watch?v=wqvVWMwdHq0](http://www.youtube.com/watch?v=wqvVWMwdHq0)) describing how to build and install monitoring traps that capture billbugs and insect predators that are ground dwelling. Currently, the video has been viewed 124 times and is available at the Utah Pests website. We also provided information gathered from this work at the USU School IPM Conference and the Utah Pest Control and Lawn Care Association Annual Conference, to an audience of 60 and 150 turf managers, respectively. Finally, we provided highlights of our findings at the USU Extension Annual Conference “brief presentations” and for the pre-

conference Utah Pests In-service workshop where Ms. Dupuy discussed these findings to USU county faculty in attendance.

Results from the work gathered here are a component of Ms. Dupuy's graduate work and are being formatted for submission to *Environmental Entomology*, a journal from the Entomological Society of America. This project provided the opportunity to collaborate with other researchers involved in turf insect management, particularly of billbugs. In collaboration with researchers at Purdue and University of Missouri, a proposal entitled "Developing Innovative IPM Tactics for Billbug Control in Urban Environments through Early Detection and Non-Chemical Approaches," was submitted to the USDA-NIFA Crop Protection and Pest Management Grants Program.

**Disseminating results and lessons within USU Extension:**

In accordance with the funding requirements, the results gathered for this project were presented at the USU Extension Annual Conference "brief presentations" session. In addition, Ms. Dupuy provided an update on our findings to USU Extension faculty who participated in the Utah Pests In-service Training held during the pre-conference. Finally, our work and video fact sheet are discussed in the 2017 Utah Pests Newsletter (summer edition).

**Outputs:**

**Ramirez, R.A.** 2016. Billbug monitoring using pitfall traps. Utah Pests and USU Extension Publication. Video Fact Sheet. [www.youtube.com/watch?v=wqvVWMwdHq0](http://www.youtube.com/watch?v=wqvVWMwdHq0)

**Ramirez, R.A.** and M. Dupuy. 2016. Cutting Edge: Improving a predictive model for billbug management. *Golf Course Management (GCM) Magazine* (July) p. 85

**Ramirez, R.A.** 2017. Turf Insects and IPM. Utah Pest Control and Lawn Care Association Annual Conference, Ogden, UT. FEB 1

**Ramirez, R.A.** 2017. Turf Insect Management. USU School IPM Conference, Sandy, UT. APR 27