

# APCRP: Seasonal ecology of wetland plant-natural enemy interactions

## Capability

Biological control as a management strategy for aquatic invasive weeds has been ongoing for more than 40 years; however, successes have not been as common as predicted by earlier work. New target weeds emerge continuously and the development of new biological control technologies are expensive and time-consuming; therefore, prioritization is given to one weed over another. Because of limited resources for biological control, it is important to maximize the effectiveness of all aspects of program execution. This is particularly important for; overseas exploration for new control agents, prioritization of potential agents, release, establishment, and follow-up monitoring of agents once released in

the U.S. Current overseas exploration focuses on limited temporal examination, typically near the end of the growing season which potentially overlooks important agents whose populations may peak early. Domestic release and establishment of agents is also done with little concern for timing and the importance of plant phenology or plant quality (nutrition) on the performance of the control agent (Figure 1).

This work examines the influence of seasonality on interactions between biological controls (natural enemies) and their host plant, as influenced by seasonal variables (plant quality/nutrition, temperature). Field observations of weed populations will inform manipulative experiments in which performance of the biological control agents on plants of varying quality are then compared (Figure 2).

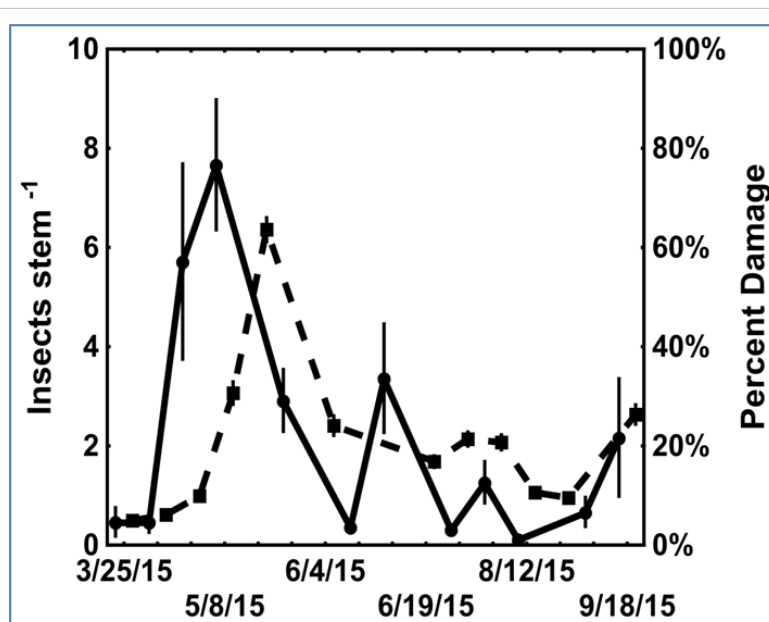


Figure 1: An early-season damage event by the alligatorweed biological control agent contributes to sustained control during the year. The solid line represents the biological control agent abundance and the dashed line represents plant damage. Inset is the alligatorweed flea beetle and a leaf damaged by the pathogen, *Alternaria alternantherae*.

## Application

Potential beneficiaries of this work include U.S. Army Corps of Engineer (USACE) districts, federal (U.S. Department of Agriculture-Agricultural Research Service) (USDA-ARS), state (Louisiana Wildlife and Fisheries Department, etc.) and local water resource managers. The expected program success includes a reduction in the time necessary to develop biological control agents for new and emerging weed species and less time/money needed to establish field populations of agents.

The USACE and Aquatic Plant Control Research Program (APCRP) maintain a role in overseas exploration of biological control agents. Overseas surveys typically occur late in the growing season, under the assumption that herbivorous insect populations will be at their peak then. However, evidence suggests herbivore communities are dynamic and may change with time; therefore, important agents may be missed during traditional year-end surveys. Because of the investment needed to continue overseas exploration, it is important to maximize cost/benefit ratio of the work. If it is determined that seasonality plays a substantial role in plant-natural enemy interactions, then surveys can be better timed to coordinate with particular species' phenologies or natural enemy population dynamics, allowing researchers to study potential agents and better gauge their impact to host plants.



**Figure 2: (a) Before and (b) after damage by the alligatorweed flea beetle to alligatorweed at Blind River, Louisiana.**

## Status

This research is ongoing and funded for FY15–19.

## Documentation and References

Harms, N. E., J. F. Shearer. In prep. A comparison of early-season alligatorweed biological control between southern and northern populations.

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# Article Sources and Contributors

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