

**Texas A&M AgriLife Extension Service  
Texas Water Resources Institute**

Quarterly Progress Report

**Water Quality at Caddo Lake**  
**Center for Invasive Species Eradication: Caddo Lake Giant Salvinia Eradication Project**  
USDA NRCS Agreement #: 68-7442-10-499  
AgriLife Contact #: 07-428530

Quarter No. 14 From: 10.01.2013 Through: 12.30.2013

**Abstract:**

The **Center for Invasive Species Eradication** (CISE) has continued operations this quarter. The focus of operations this quarter has been on maintaining and growing weevil populations at the Caddo Lake Salvinia Weevil Rearing Facility and monitoring weevil activity on the Caddo Lake. On-lake weevil population surveys continued this quarter and showed a continued weevil density increase until the first freeze of the fall/winter. At that point weevil densities decreased by more than 50%. Efforts to obtain weevils from South America resumed as a new post-doc to conduct cold-tolerance studies was finally identified. She will start work early next quarter. On-lake cold tolerance studies were initiated this quarter and documented the weevil population decline associated with the first freeze of the year. This freeze occurred several weeks earlier than normal. Before the freeze, weevils had demonstrated their ability to significantly reduce salvinia levels. In Lone Pine Stretch, the salvinia biomass at the release site was 80% less than the control site and near Bird Roost, more than 10 acres of open water were present as a result of the salvinia weevils.

Education and outreach continues to be a focus of the project. The Extension Assistant at Caddo Lake spoke with several groups about the project, Caddo Lake and the perils of giant salvinia this quarter along with numerous visitors who stop by the weevil rearing facility. The giant salvinia situation this year has really sparked local interest in combating the plant; especially with biological control methods. The Greater Caddo Lake Association of Texas has really taken the lead in efforts to establish another weevil rearing facility near Caddo Lake. The Cypress Valley Navigation District as well as the Caddo Lake Institute are supporting this effort.

**Overall Progress and Results by Task:**

**Task 1. Project Administration: Texas Water Resources Institute**

***Subtask 1.1:** Establish a Center for Invasive Species Eradication at Texas A&M University under the administrative leadership of Texas AgriLife Research and Texas AgriLife Extension Service to utilize funds provided through USDA Natural Resources Conservation Service to focus research and Extension educational programs on controlling invasive plant species.*

This action has been completed and the Center for Invasive Species Eradication is fully operational with personnel at TWRI handling day to day management activities.

#### **Task 100% Complete**

***Subtask 1.2:*** *Provide fiscal oversight of funds, make funds allocations to scientists and Extension personnel, establish contracts and subcontracts as necessary, perform accounting functions*

Fiscal management is being carried out by TWRI personnel. Budgets and planned expenditures are continually being monitored to ensure that expenses are within the scope of the project and within the available budget.

As of December 4, 2013 a total of \$697,241 has been spent on the project.

#### **Task 88% Complete**

***Subtask 1.3:*** *Facilitate project and program discussions between AgriLife Research and Extension administration and NRCS administrative personnel to ensure that programmatic goals and objectives are met in a timely manner through this project.*

Work for this task has continued as needed.

#### **Task 92% Complete**

### **Task 2. Project Coordination: Texas Water Resources Institute and other Agencies**

***Subtask 2.1:*** *Coordinate and facilitate meetings among project personnel to ensure research focus, maximum collaboration, educational programs and transfer of information*

Coordination and communication amongst project personnel continued this quarter with the focus being on improving weevil rearing capacity at Caddo Lake NWR, hiring a new researcher to expand and continue research on cold tolerance of weevils and their genetic adaptations, planning for the simultaneous application of chemical and biological controls.

#### **Task 92% Complete**

***Subtask 2.2:*** *Work with groups currently engaged in controlling Giant Salvinia and other invasive species to foster collaboration and information transfer on the state of the science in*

*controlling Giant Salvinia. These groups include those participating in the Interagency Giant Salvinia Control Team, including the Caddo Lake Institute, Cypress Valley Navigation District, East Texas Baptist University, Northeast Texas Municipal Water District, Northwestern State University, Louisiana Dept. of Fish and Wildlife, Louisiana State University, Texas AgriLife Research, Texas AgriLife Extension Service, Texas Parks and Wildlife Dept., USDA Agricultural Research Service, Animal & Plant Health Inspection Service, Natural Resource Conservation Service, US Army Corps of Engineers, Engineer Research & Development Center and Lewisville Aquatic Ecosystem Research Facility, and US Fish and Wildlife Service*

The CISE team continues to coordinate and discuss with entities engaged in giant salvinia control at Caddo Lake as well as other entities nationally. Discussions on how to expand biocontrol production efforts at Caddo and other lakes have increased as local interest has grown in biocontrol as the best long-term giant salvinia control option for Caddo Lake. The Extension Assistant has been instrumental in these discussions.

#### **Task 92% Complete**

***Subtask 2.3:*** *Work with project personnel to meet reporting requirements and to produce effective project publications*

The document titled “A Guide to Mass Rearing the Salvinia Weevil for Biological Control of Giant Salvinia” was completed published online. The document can be downloaded at: <http://cise.tamu.edu/caddo/>

A manuscript entitled “Biological control of giant salvinia (*Salvinia molesta*) in a temperate region: cold tolerance and low temperature oviposition of *Cyrtobagous salviniae*” was co-authored by Abhishek Mukherjee, Allen Knutson, Daniel Hahn and Kevin M. Heinz and was submitted to the *Journal Biological Control* and is in review.

#### **Task 92% Complete**

### **Task 3. Chemical Treatment and Evaluation: Texas AgriLife Research and Extension**

***Subtask 3.1:*** *Researchers and Extension Specialists will work with others to establish chemical treatment research and demonstration sites to the extent possible at Caddo Lake for Giant Salvinia control. (Killing Giant Salvinia at Caddo Lake is the primary focus; as such, demonstrations at private or isolated locations may be required for research demonstrations of chemical treatment combinations)*

No new treatments were made this quarter as giant salvinia growth slowed and completely ceased with the arrival of winter. Additional discussions are being held to plan employing integrated pest management approach using both herbicides and weevils for control.

### **Task 85% Complete**

***Subtask 3.2:*** *Test and evaluate chemical treatment practice alternatives for controlling Giant Salvinia at Caddo Lake using a variety of chemicals, surfactants, and combinations at various concentrations and timings (This may include contracting with local or private chemical applicators to chemically treat Caddo Lake)*

No new treatment combination trials were held this quarter and non are planned for the next growing season. Results will be documented in subsequent project publications.

### **Task 92% Complete**

***Subtask 3.3:*** *Evaluate the efficacy and cost effectiveness information of each treatment scenario*

Cost comparisons have been made and will be included in subsequent project publications.

### **Task 60% Complete**

***Subtask 3.4:*** *Work with personnel in Task 4 to evaluate the efficacy of utilizing chemical treatments in concert with biological control*

No new treatments were made this quarter as giant salvinia growth slowed and completely ceased with the arrival of winter. Additional discussions are being held to plan employing integrated pest management approach using both herbicides and weevils for control.

### **Task 85% Complete**

#### **Task 4. Biological Treatment and Evaluation: Texas AgriLife Research and Extension**

***Subtask 4.1:*** *Collaborate with other agencies and groups to setup new studies and cooperate in ongoing research and Extension educational programs dealing with biological strategies for controlling Giant Salvinia at Caddo Lake; practices which can be utilized for public and private lands statewide (If needed, research and demonstration sites away from Caddo Lake will be utilized as quickly killing Giant Salvinia at Caddo Lake is the priority)*

The research study initiated on Caddo Lake to provide data on weevil population increase and impact on salvinia using one meter square frames this summer at Lone Pine Stretch and Bird Roost continued. This study documented increasing weevil

densities through November and then a declining population in December. This coincided with the first freeze of the year which occurred on November 13, 2013.

In early November, a study was initiated to determine the overwintering survival of adult weevils at Lake Caddo. Twenty adult weevils were each placed in small, floating cages with salvinia plants at the Lone Pine Stretch release site and in the greenhouse rearing tank. Once a month, the number of live weevils was counted in four cages from each site. Results in December found that significant weevil mortality had occurred during November and December, confirming the field sampling data at Bird Roost and Lone Pine Stretch.

A new researcher was hired to continue the research collaboration that was set up with the Foundation for the Study of Invasive Species in Argentina. Once she begins work in February, she will evaluate the cold tolerance and low temperature reproduction ability of the weevils from Argentina. These weevils cannot and will not be released in Texas per USDA-APHIS guidelines.

#### **Task 92% Complete**

***Subtask 4.2:*** *Work with TPWD and local Caddo Lake agencies, organizations and individuals to enhance weevil rearing capabilities for use at Caddo Lake*

Weevil collection at Lake B.A. Steinhagen was coordinated with the Texas Parks and Wildlife Department and served as a supplement to the weevil population at the Caddo Lake NWR rearing facility. For unknown reasons, weevil numbers declined to extremely low levels in the tanks.

Discussions with CLI and the Greater Caddo Lake Association have also been initiated on ways to more closely involve the general public in expanding salvinia weevil production and application to infested waters. Public support for biological control has greatly increased this year as the giant salvinia infestation has grown to its highest levels yet. The Greater Caddo Lake Association is leading an effort to construct a second weevil rearing facility on the shores of Caddo Lake that is focused on mass production.

#### **Task 96% Complete**

***Subtask 4.3:*** *Coordinate with USACE's Lewisville Aquatic Ecosystem Research Facility to collaborate in ongoing efforts, transfer knowledge and expand their operations*

AgriLife Extension personnel continue to maintain routine contact with LAERF personnel regarding weevil rearing and release methodologies.

#### **Task 95% Complete**

**Subtask 4.4:** *Evaluate improved methods of rearing weevils, harvesting weevils, delivering weevils to infested areas in Caddo Lake and various timing options of weevil applications in Caddo Lake to determine the most effective biological treatment scenarios to employ to the extent possible; as indicated earlier, killing Giant Salvinia at Caddo Lake may result in the need for research demonstration sites in the vicinity of Caddo Lake.*

The research conducted evaluating weevil populations on the lake confirm the exponential growth of the weevil population throughout the year. This highlights the need to be able to release as many new weevils on to the lake as early in the growing season as possible.

Proximity to the lake has also been found to be critical in the effort to expand weevil production. Access to lake water has also proven critical and this point has been conveyed to local groups considering construction of an additional rearing facility on the lake.

The document titled “A Guide to Mass Rearing the Salvinia Weevil for Biological Control of Giant Salvinia” remains available online at <http://cise.tamu.edu/caddo/> and in the Texas AgriLife Extension Service Bookstore online at <https://agrilifebookstore.org/>.

#### **Task 96% Complete**

**Subtask 4.5:** *Assess practice efficacy and cost effectiveness of utilizing weevils in the control of Giant Salvinia*

No new activity to report.

#### **Task 40% Complete**

**Subtask 4.6:** *Use information gleaned from demonstration sites to develop biological treatment recommendations and guidelines for use of weevils to treat Giant Salvinia in infested areas*

Treatment recommendations for biocontrol continue to be developed based off of information gleaned thus far.

#### **Task 60% Complete**

**Subtask 4.7:** *Work with personnel in Task 3 to evaluate the efficacy of utilizing chemical treatments in concert with biological control*

Plans to evaluate the use of weevil's and chemical treatment simultaneously are completed. Small scale treatments indicated no adverse effects on weevils and this test will be carried out in the coming growing season using chemicals evaluated in Task 3.

### **Task 80% Complete**

#### **Task 5. Other Treatment: All involved agencies**

***Subtask 5.1:** Work with federal, state and local agencies as well as local entities and individuals to evaluate the feasibility, efficacy and cost effectiveness of utilizing other treatment options (hydrological, mechanical, others) for controlling Giant Salvinia*

No additional evaluations are expected to occur. This task is considered complete; however, should feasible options surface, they will be evaluated.

### **Task 100% Complete**

***Subtask 5.2:** Convert feasible options into treatment practice descriptions to include in recommended treatment strategies and guidelines*

No new activity to report this quarter.

### **Task 30% Complete**

***Subtask 5.3:** Develop treatment prescriptions suitable for inclusion in NRCS FOTGs, Extension printed materials and other guides for treating Giant Salvinia; these will take the form of job sheets, fact sheets, supplements to conservation practice standards and technical brochures.*

The document titled "A Guide to Mass Rearing the Salvinia Weevil for Biological Control of Giant Salvinia" was completed this quarter and published online at <http://cise.tamu.edu/caddo/> and in the Texas A&M AgriLife Extension Service bookstore online at <https://agrilifebookstore.org/>

Tri-fold "The Pond Destroyers: Common and Giant Salvinia" continues to be distributed at meetings.

While not a treatment prescription, the development of the manuscript titled "Biological control of giant salvinia (*Salvinia molesta*) in a temperate region: cold tolerance and low temperature oviposition of *Cyrtobagous salviniae*" will provide critical information to scientist actively engaged in the advancement of biological control application and effectiveness globally.

### **Task 88% Complete**

## **Task 6. Education and Outreach: Texas AgriLife Extension Service and Texas Water Resources Institute**

***Subtask 6.1:*** Extension and TWRI will work with TPWD and other agencies to enhance existing outreach and education efforts through the use of news releases, TV spots, demonstrations, and other communications focused on prevention of spread and control methods for Giant Salvinia

Several presentations have been made recently to local groups in the vicinity of Caddo Lake including the Harrison County Commissioners Court, the Dallas Caddo Club and the Cypress Valley Navigation District. Discussions focused on using biological control to manage the giant salvinia issue at hand. Approximately 65 people were in attendance in these meetings.

Newspaper articles, Facebook posts and blog posts continue to be published highlighting the giant salvinia problem at Caddo Lake, CISE efforts and other partner efforts. Progress made by the weevils has also been documented through online outlets and a newspaper article is also in the works.

### **Task 95% Complete**

***Subtask 6.2:*** Identify and secure partnerships with local, state, regional and national organizations (ex: B.A.S.S., fishing and hunting guides, cities, water sports manufacturers, Ranger Boats, Evinrude, Mercury, others) to expand the dissemination of educational materials on Giant Salvinia

Local support is growing significantly as a result of the larger than normal giant salvinia infestation this summer. CLI has been instrumental in garnering this support. The Greater Caddo Lake Association of Texas has become a huge advocate of biological control and is working to establish a second weevil rearing facility near Caddo Lake.

### **Task 60% Complete**

***Subtask 6.3:*** Develop and host CISE website for invasive species eradication information and as an outlet for information dissemination

Website development is complete and provides links to numerous information outlets. Content is continually being added to the site. In addition, a Facebook page and online blog are updated as new information is ready to be presented. All pages are advertised to the public when the opportunity is available.

CISE Web address: <http://cise.tamu.edu/>

Project Web address: <http://cise.tamu.edu/caddo>

Project blog: <http://caddosalvinia.blogspot.com/>

Facebook page: link can be found on the above blog.

### **Task 96% Complete**

#### ***Subtask 6.4: Facilitate education and outreach efforts and support media relations***

Several presentations have been made recently to local groups in the vicinity of Caddo Lake including the Harrison County Commissioners Court, the Dallas Caddo Club and the Cypress Valley Navigation District. Discussions focused on using biological control to manage the giant salvinia issue at hand. Approximately 65 people were in attendance in these meetings.

### **Task 92% Complete**

#### **Task 7. GIS Support: Texas AgriLife Research**

##### ***Subtask 7.1: Texas AgriLife Research will provide GIS support for all aspects of the project and develop maps illustrating project activities and demonstration locations***

CISE project personnel continue to document treatment and research activities using GIS when needed.

Recurring high water conditions in the lake have made tracking weevil dispersal impossible and have largely negated the need for GIS mapping.

### **Task 75% Complete**

#### **Task 8. Include Treatment Scenarios in Agency Guidelines: All Agencies**

##### ***Subtask 8.1: Using information gleaned from this project, develop detailed strategies and practices for control of Giant Salvinia for inclusion in agency guidelines such as NRCS FOTGs, Extension bulletins and factsheets, TPWD outreach information and other agency materials for utilization in both private and public water bodies***

The "Guide to Mass-Rearing Salvinia Weevils for Biological Control of Salvinia" was completed this quarter. This document provides a complete current state of knowledge for raising salvinia weevils under different scenarios. This document will be published as an AgriLife Extension Electronic Special Publication.

### **Task 80% Complete**

##### ***Subtask 8.2: Work closely with NRCS and other agencies to disseminate the control practices for Giant Salvinia as appropriate***

“The Pond Destroyers: Common and Giant Salvinia” continues to be distributed at Extension meetings.

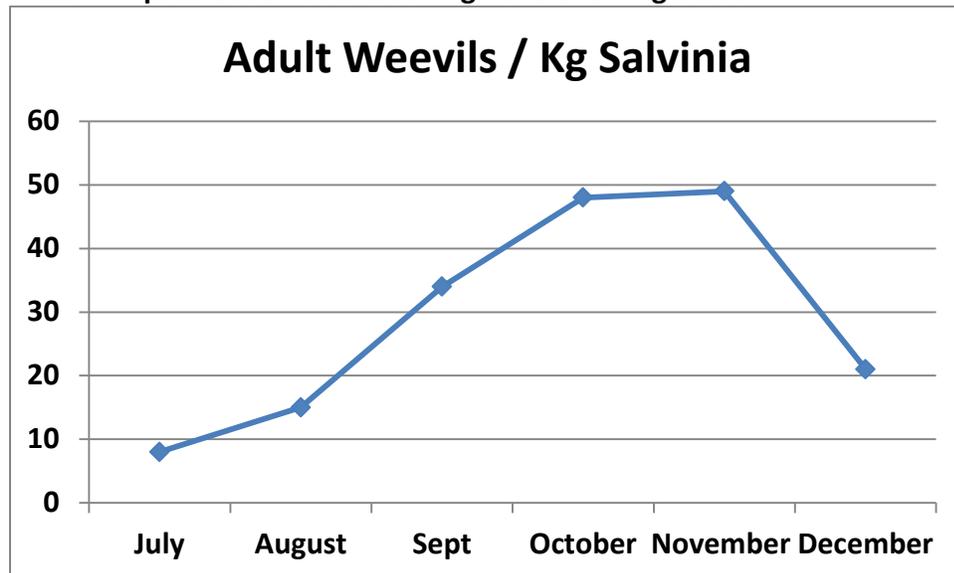
Copies of “Aquatic Vegetation Identification Cards,” Texas A&M AgriLife Extension Service publication B-6095 available online at the Texas A&M AgriLife Bookstore are being distributed to expand general knowledge on the ID and treatment of giant salvinia and other aquatic plants present in Texas. (see attached)

**Task 85% Complete**

**Planned Activities for Next Quarter:**

- distribute the “Guide to Mass-Rearing Salvinia Weevils for Biological Control of Salvinia” via online avenues
- continue to monitor weevil release sites and release additional weevils as they are available
- continue monitoring weevil population dynamics and distribution
- obtain weevils from South America and initiated cold tolerance and reproduction temperature threshold evaluations
- continue on lake chemical trials when weather and giant salvinia conditions permit
- continue trials to determine effectiveness of using biological and chemical treatment simultaneously

**Weevil Impact Observations during 2013 Growing Season**



### **Photo of Weevil Release Site**

Discussion regarding each of these photos has been recently posted on the CISE blog at: <http://caddosalvinia.blogspot.com/> The “open water” and brown salvinia are a sign of biological action at each of these sites.



**2013 Weevil Release Site**



**2012 Weevil Release Site**