

**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. 12 From: 4.01.2013 Through: 6.30.2013

**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. The first weevil release of the year was conducted and approximately 34,000 adult weevils were released into Lone Pine Stretch. On lake weevil population surveys continued this quarter and are showing a weevil density of 8 weevils per kilogram of salvinia. Efforts to obtain weevils from South America continued; however, no weevils have been received to date.

Education and outreach continues to be a focus of the project. The Extension Assistant at Caddo Lake spoke with four 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. A meeting of the Inter-Agency Giant Salvinia Control Team was also held and people from Texas and Louisiana discussed recent advancements in the battle against giant salvinia. Additionally, a manuscript describing the results of cold tolerance studies and weevil survival rates under varying cold weather treatment scenarios was submitted for publication this quarter.

**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 July 10, 2013 a total of \$634,326 has been spent on the project.

#### **Task 81% 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.

#### **Task 87% 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 enhancing weevil rearing at Caddo Lake NWR, expanding research on cold tolerance of weevils and their genetic adaptations, applying chemical and biological controls simultaneously and securing additional funding to continue needed research efforts.

#### **Task 87% 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 with entities engaged in giant salvinia control at Caddo Lake as well as other entities nationally. A manuscript reporting findings from cold tolerance was submitted for publication this quarter and will provide useful information to all involved in managing giant salvinia world-wide.

The Interagency Giant Salvinia Control Team met on June 17<sup>th</sup> in Bossier City, LA and provided an excellent opportunity to discuss and collaborate on giant salvinia control efforts with our Louisiana counterparts.

### **Task 87% 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 for publication this quarter in the *Journal Biological Control*.

### **Task 87% 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)***

Foliar applications of ten different herbicide combinations were made to a giant salvinia-infested canal that feeds into Caddo Lake. Evaluations conducted two and four weeks after application indicate that the inclusion of glyphosate (Aquamaster) is an important component of the herbicide combinations, resulting in control greater than or equal to 90% at the four week evaluation. However, no measureable salvinia fall-out (sinking) was seen at this date.

Evaluations will continue, and additional studies are planned employing integrated methods using herbicides and weevils for control.

### **Task 70% 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)*

Foliar applications of ten different herbicide combinations were made to a giant salvinia-infested canal that feeds into Caddo Lake. Evaluations conducted two and four weeks after application indicate that the inclusion of glyphosate (Aquamaster) is an important component of the herbicide combinations.

### **Task 87% Complete**

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

In evaluating the chemical trials implemented and discussed above, giant salvinia control greater than or equal to 90% at the four week evaluation was observed. However, no measureable salvinia fall-out (sinking) was seen at this date.

### **Task 50% Complete**

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

Plans have been completed for employing integrated methods using herbicides and weevils for control. Top performing chemical combinations from the above listed trials will be used here.

### **Task 78% 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)*

A research study was initiated on Caddo Lake to provide data on weevil population increase and impact on salvinia using one meter square frames.

A Research Collaboration has been set up with the Foundation for the Study of Invasive Species in Argentina. Through this effort, Argentinian colleagues will collect salvinia weevils along a north-south gradient in Argentina with a goal of collecting weevils from colder climes. Once collected, these weevils will be shipped to the Texas A&M Department of Entomology quarantine facility where their cold tolerance and low temperature reproduction ability will be evaluated. These weevils cannot and will not be released in Texas per USDA-APHIS guidelines.

#### **Task 90% 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*

Monitoring water chemistry to support rapid weevil population expansion in the green houses has been the primary focus of activities this quarter. Fertilizer has been periodically added to improve giant salvinia growth and subsequently salvinia weevil production.

An estimated 34,000 adult salvinia weevils were reared during the spring and released in late May at Caddo Lake. Adults were released at a new location within the Bird Roost area which again will not be treated with herbicides to allow the weevil population to increase. Rearing tanks from which weevils were collected for release were cleaned and restocked with salvinia and weevils to continue weevil production.

Discussions with CLI have also been initiated on ways to more closely involve the general public in expanding salvinia weevil production and application to infested waters.

#### **Task 95% 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 89% 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.

A research study was initiated on Caddo Lake to provide data on weevil population increase and impact on salvinia using one meter square frames.

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

Progress on biological control of giant salvinia at Caddo Lake was reported to the Giant Salvinia Task Force meeting held in Bossier City, LA.

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

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

Plans have been finalized to evaluate the weevil’s ability to move from dying plant material to living plant material following a chemical treatment. Small scale treatments indicated that this was possible and a large scale demonstration of this concept will be carried out utilizing top performing chemical combinations discussed in Task 3.2 and 3.3.

#### **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 Extension 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 83% 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 that focus on the giant salvinia issue at hand and treatment options available. These included:

Region 8 Education Service Specialists	12 individuals
College-bound High School Students from Hudson, TX	15 individuals
Karnack Independent High School	20 individuals
Local 4-H group	24 individuals

Two newspaper articles were published this quarter highlighting the giant salvinia problem at Caddo Lake, CISE efforts and other partner efforts.

### **Task 90% 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*

No new activity to report this quarter.

### **Task 20% 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 95% 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 that focus on the giant salvinia issue at hand and treatment options available. These included:



Region 8 Education Service Specialists	12 individuals
College-bound High School Students from Hudson, TX	15 individuals
Karnack Independent High School	20 individuals
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Two newspaper articles were published this quarter highlighting the giant salvinia problem at Caddo Lake, CISE efforts and other partner efforts.

### **Task 85% 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.

### **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 60% 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 75% 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