

**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. 15 From: 1.01.2014 Through: 3.31.2014

Abstract:

The **Center for Invasive Species Eradication** (CISE) has continued operations this quarter. The focus of operations this quarter has been on conducting on-lake over wintering studies and securing funding to maintain center operations past July 27, 2014. On-lake weevil population surveys showed the rapid mortality of weevils in the cold temperatures seen in late 2013 and early 2014. High water conditions and abnormal cold resulted in an estimated 95 – 98 % reduction in salvinia on the lake thus making weevil discoveries difficult. Efforts to obtain weevils from South America continued but have been fruitless as of yet. GIS was used to evaluate the estimated area of salvinia control by weevils last year and conservatively showed that 23.4 acres were controlled.

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. Presentations regarding project progress were given at the Texas Invasive Plant and Pest Conference held in Port Aransas and the Southwestern Branch of the Entomological Society of America annual meeting in San Antonio. The project website, Facebook page and blog were all updated frequently this quarter and 3 YouTube videos were produced and posted as well. Supported with technical guidance from the Center, a local group called Caddo Bio Control Alliance formed and is leading a grass roots effort to expand weevil rearing capacity at the Lake.

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 February 4, 2013 a total of \$723,885 has been spent on the project.

Task 94% 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 96% 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 securing continued funding to support weevil rearing capacity at Caddo Lake NWR and continuing research on cold tolerance of weevils and their genetic adaptations, planning for the simultaneous application of chemical and biological controls.

Task 96% 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. Expansion of biocontrol production efforts at Caddo Lake is underway as the Caddo Bio-Control Alliance has begun constructing a new greenhouse to raise weevils. Extension personnel coordinated with USACE personnel at BA Steinhagen Reservoir regarding their use of biological controls to manage giant salvinia.

Task 96% Complete

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

Development of the project's final report began this quarter and will effectively describe the accomplishments of the project when complete.

Task 94% 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 winter drastically reduced giant salvinia levels on the lake. No new chemical only trials are planned. Task complete.

Task 100% 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 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 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 winter drastically reduced giant salvinia levels on the lake. Discussions continued regarding evaluating the use of an integrated pest management approach that uses both herbicides and weevils for control in the coming growing season. The anticipated start date for this evaluation is uncertain given the mass reduction in salvinia on the lake this past winter.

Task 90% 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)*

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 which continued until no live adult weevils were found in February and March. Similar results were observed in samples collected from the lake. The extended cold observed on Caddo Lake during the winter of 2013-2014 confirmed the importance of overwintering survival in maintaining effective weevil populations at Caddo Lake.

Task 96% 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 USACE and served as a supplement to the weevil population at the Caddo Lake NWR rearing facility.

Discussions with CLI and the Greater Caddo Lake Association continued regarding expansion of salvinia weevil production at Caddo Lake. The Caddo Bio Control Alliance, a new non-profit organization, is currently constructing a weevil rearing facility adjacent to the lake and has relied heavily upon input from the center's Extension Assistant.

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*

Extension personnel continue to maintain routine contact with LAERF personnel regarding weevil rearing and release methods. USACE personnel at BA Steinhagen were also engaged this quarter regarding their use of salvinia weevils to control giant salvinia.

Task 96% 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 and winter survival studies confirmed the importance of overwintering survival in maintaining effective weevil populations at Caddo Lake. 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. These local efforts have heeded this advice and are building their greenhouses within 100 yds of 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/> and provides a variety of information on various weevil production strategies utilized in the U.S.

Task complete.

Task 100% Complete

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

No new activity to report. The current state of knowledge on costs of weevils vs. chemical control will be discussed in the project final report. Task complete.

Task 100% 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.

The cold winter of 2013-2014, relative to the previous winter, confirmed the importance of overwintering survival in maintaining effective weevil populations at Caddo Lake. Earlier studies found that weevils could survive a single freeze event, suggesting that cold indirectly impacts weevil survival. Alternatively, when stocking weevils in an infested area, high density releases have proven more effective than low density releases as a weevil density of approximately 40 adult weevils per kilogram of salvinia is needed to achieve salvinia control.

Task complete; recommendations will be included in the project final report.

Task 100% Complete

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

No new treatments were made this quarter as winter drastically reduced giant salvinia levels on the lake. Discussions continued regarding evaluating the use of an integrated pest management approach that uses both herbicides and weevils for control in the coming growing season. The anticipated start date for this evaluation is uncertain given the mass reduction in salvinia on the lake this past winter.

Task 90% 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 additional evaluations have or are expected to occur and no feasible 'alternative treatment' options have materialized. This task is considered complete

Task 100% 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 local chapters of Master Gardeners, Master Naturalists, and the Natural Plant Society. Discussions focused on using biological control to manage the giant salvinia issue at hand. Approximately 100 people were in attendance in these meetings.

In addition, an estimated 20 visitors stopped by the Center where the Extension Assistant discussed the operation and use of weevils.

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.

A series of 3 videos were filmed this quarter at the CISE facility and describe the collaborations that have taken place, the local support for biological control, findings to date and future direction of biological control research. These videos can be found on the Caddo Lake Salvinia Eradication Blog (<http://caddosalvinia.blogspot.com/>) and YouTube (<http://www.youtube.com/watch?v=eL34JLKXHqM>).

Task 96% 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

The Caddo Bio Control Alliance has formed as a local non-profit group that is building a greenhouse to produce more weevils at Caddo Lake. This effort will widely spread the word about giant salvinia as it is collocated with a local marina on the banks of Caddo.

Task 80% 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 98% 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 local chapters of Master Gardeners, Master Naturalists, and the Natural Plant Society. Discussions focused on using biological control to manage the giant salvinia issue at hand. Approximately 100 people were in attendance in these meetings. In addition, an estimated 20 visitors stopped by the Center where the Extension Assistant discussed the operation and use of weevils.

A series of 3 videos were filmed this quarter at the CISE facility and describe the collaborations that have taken place, the local support for biological control, findings to date and future direction of biological control research. These videos can be found on the Caddo Lake Salvinia Eradication Blog (<http://caddosalvinia.blogspot.com/>) and YouTube (<http://www.youtube.com/watch?v=eL34JLKXHqM>).

Technical presentations were made this quarter at the Texas Invasive Plant and Pest Conference held in Port Aransas and the Southwestern Branch of the Entomological Society of America meeting in San Antonio covering the first establishment of salvinia weevils at Caddo Lake and the resulting biological control of giant salvinia at two sites.

Task 96% 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. Using GPS points collected this spring, the area of effective giant salvinia control observed in the fall of 2013 was estimated conservatively at 23.43 acres which is much bigger than the original estimate of 10 acres.

Task 95% 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.

No new activity this quarter.

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.

No new activity this quarter.

Task 95% 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 trials to determine effectiveness of using biological and chemical treatment simultaneously
- continue work to secure additional funding