

**STATEMENT OF DR. RANDY WESTBROOKS**  
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**DEPARTMENT OF THE INTERIOR**  
**BEFORE THE HOUSE COMMITTEE ON NATURAL RESOURCES**  
**SUBCOMMITTEE ON FISHERIES, WILDLIFE, OCEANS AND INSULAR AFFAIRS**  
**OVERSIGHT HEARING ON EFFORTS TO CONTROL AND ERADICATE GIANT SALVINIA**  
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Thank you, Chairman Fleming, for the opportunity to testify about current efforts to control and eradicate Giant salvinia in the MidSouth Region of the United States. My name is Randy Westbrooks, and I am an Invasive Species Prevention Specialist with the U.S. Geological Survey, National Wetlands Research Center, based in Whiteville, North Carolina.

The USGS, which is a bureau of the Department of the Interior, conducts research to understand the interrelationships between biological systems, Earth processes, and human activities. One of our roles is to provide biological, geological, and hydrological expertise and research to assist State and Federal land managers in managing invasive species that pose a threat to natural ecosystems, particularly in our public parks and refuges. My statement will include background information on Giant salvinia (*Salvinia molesta* D.S. Mitchell), which is considered one of the world's worst weeds, and proven strategies for controlling and minimizing its spread in the waterways of the southern United States.

**What is Giant Salvinia?** Giant salvinia is a small, free-floating aquatic fern that is native to southeastern Brazil and northeastern Argentina. It is somewhat similar in appearance to our native duckweed (*Lemna minor*), but bigger. Its most notable feature is the rows of "hairs" with 4 branches that join in a cage-like tip. The tip traps air that helps the plant float on the water surface. Giant salvinia prefers tropical, sub-tropical, or warm temperatures and grows best in nutrient-rich, slow-moving waters such as ditches, canals, ponds, and lakes. It is a freshwater plant but can tolerate salinity levels in estuaries up to levels of about 10% that of seawater.

**Why is it a Problem?** It is no exaggeration to say that Giant salvinia is one of the world's worst weeds. It takes only a fragment of a single plant to multiply vegetatively and produce a thick floating mat of plants (called a "sudd") on the surface of standing water (Holm and others, 1977). The mats clog waterways and block sunlight from reaching other aquatic plants below the surface, reducing the amount of oxygen in the water. As these plants die and sink to the bottom, decomposer organisms use up even more oxygen in the water. The mats also impede the natural exchange of gases between the water and the atmosphere, which can lead to stagnation of the water body. Ultimately, these processes will kill all plants, aquatic insects, and fish living below the mats. The mats also provide ideal conditions for mosquitoes to breed, block access to boat docks and boat ramps, and interfere with navigation.

**How was it Introduced and Spread?** It is presumed that Giant salvinia was first introduced into the United States as a novelty aquarium and water garden plant and/or as a contaminant of aquarium and water garden plants, that were imported, before it was listed as a Federal Noxious Weed in 1981. Since then, it has escaped into the wild, where it has been identified in a number of States across the southern United States, including Louisiana and Texas. Once it infests a waterway, Giant salvinia is spread to new areas by flowing water and by boats, trailers, and other recreational watercraft.

In 1995, the South Carolina Department of Natural Resources (SC-DNR) identified the first sustained infestation of Giant salvinia in the United States in a small private pond near Walterboro, South Carolina. It was summarily eradicated from that pond by SC-DNR and the Plant Protection and Quarantine (PPQ) program within the USDA Animal and Plant Health Inspection Service (APHIS).

In 1998, Giant salvinia was detected in Toledo Bend Reservoir on the Louisiana-Texas border. By the time it was identified and reported in Toledo Bend, Giant salvinia had already formed large mats of sudd that were interfering with recreational boating and fishing. Since then, it has been detected in 34 other water bodies in the State of Louisiana. Giant salvinia was likely introduced to Lake Bistineau on one or more boat trailers during the lake drawdown in 2005 (Louisiana Department of Wildlife and Fisheries). It was first reported in Caddo Lake in 2006.

Giant salvinia was first detected in Pender County, in southeastern North Carolina, in 2002. In response, the North Carolina Giant Salvinia Task Force was formed and started working to eradicate Giant salvinia from five sites in the North Carolina Coastal Plain. Owing to their efforts, Giant salvinia has been conditionally eradicated from North Carolina. This year, the task force is conducting appraisal surveys at River Bend Swamp in Pender County, North Carolina, to make sure that it has been totally eradicated from the site.

**General Management Strategies.** Preventing infestations is clearly the most effective strategy for managing Giant salvinia. Once it becomes established and widespread in a large water body it is very difficult to control. Under ideal conditions, Giant salvinia can double its mass and coverage area in 5-7 days. In areas where Giant salvinia has become established, setting up local monitoring programs that involve local residents and boaters, to make sure that new infestations are detected early and addressed quickly before it becomes widespread, has been effective. The Caddo Lake Shoreline Watch Program that is being organized by the Caddo Lake Institute and its partners is a good example of local stakeholders working together to address this problem.

**Manual, Mechanical Control** - If an infestation grows too large to be easily eradicated, mechanical harvesters are sometimes used to open up boat lanes in public lakes until other means of control can be implemented. Infestations in small water bodies can be removed by hand or by draining the water and allowing the plants to desiccate on exposed lake bottoms.

**Chemical Control** - A number of herbicides are effective in controlling Giant salvinia. Examples include diquat (Reward<sup>®</sup> – a contact herbicide) and fluridone (Sonar<sup>®</sup> – a systemic herbicide that is taken up from the water column). It is important to remember that a contact herbicide such as diquat will only control the plants that it touches. It will not kill all of the plants in a thick mat of Giant salvinia. On the other hand, systemic herbicides such as fluridone are ideal for controlling Giant salvinia in small, contained water bodies with standing water. All of the plants with submerged leaves will take up the chemical from the water and be killed. However, systemic herbicides will not stay adequately concentrated in large water bodies and flowing waterways, reducing their effectiveness.

**Biological Control** - In some locations, biological control has been an effective method for managing Giant salvinia. The most successful example is the introduction of South American Salvinia weevils (*Cyrtobagous salviniae*), which demonstrated excellent results in

controlling Giant salvinia on Lake Moondarra in Queensland, Australia, and other countries in the early 1980s.

In 2009, the Louisiana State University (LSU) AgCenter and the Louisiana Department of Wildlife and Fisheries introduced 30 tons of Giant salvinia, which was infested with 2.3 million *Salvinia* weevils, into Lake Bistineau and four other north Louisiana lakes. As a result of this application of weevils, in conjunction with two consecutive cold winters, the Giant salvinia infestation in Lake Bistineau has been reduced by 90%, according to Dr. Dearl Sanders, with the LSU AgCenter (Bossier-Press Tribune, May 11, 2011).

Despite the success of using weevils to control Giant salvinia in some regions, the *Salvinia* weevil is not a fully effective control method in every case because it is less tolerant of cold temperatures than Giant salvinia. For this reason, the *Salvinia* weevil was unsuccessful controlling Giant salvinia in Kakadu National Park in the Northern Territory of Australia. In 2005, *Salvinia* weevils that were released into the River Bend Swamp of Pender County, North Carolina, also did not overwinter while the Giant salvinia plants survived.

On the basis of work by LSU and the Louisiana Department of Wildlife and Fisheries, as well as other work done by the U.S. Army Corps of Engineers and the Texas Parks and Wildlife Department, it is clear that biological control can be an effective strategy for reducing infestations of Giant salvinia in northern parts of the MidSouth Region (e.g., Caddo Lake and Lake Bistineau). However, the weevils must be released on infested waterways annually, since they are unlikely to overwinter in northern parts of Louisiana and Texas. The *Salvinia* Weevil Rearing Facility was recently established at the Caddo Lake National Wildlife Refuge to provide the *Salvinia* weevils that will be needed each year for Giant salvinia control projects in north Louisiana and Texas.

**Regulatory Status.** USDA APHIS first listed Giant salvinia as a Federal Noxious Weed in 1981. As a listed Federal Noxious Weed, Giant salvinia cannot be imported into the United States or transported across State lines without a Federal permit from APHIS. Under the U.S. Plant Protection Act of 2000, USDA APHIS can also cooperate with State and local agencies to eradicate infestations of listed Federal Noxious Weeds such as Giant salvinia.

Giant salvinia is also listed as a regulated State Noxious Weed in a number of U.S. states and territories. These include Alabama, Arkansas, Arizona, California, Colorado, Connecticut, Florida, Idaho, Louisiana, Massachusetts, Maryland, Michigan, Mississippi, Nevada, North Carolina, Oklahoma, Oregon, Puerto Rico, South Carolina, Tennessee, Texas, Vermont, and West Virginia.

In Louisiana, Giant salvinia is listed as an Invasive Noxious Aquatic Plant under Louisiana Revised Statutes Title 76, Section 1101. In Texas, Giant salvinia is listed as a Noxious and Invasive Plant under Texas Administrative Code – Title 4 – Agriculture - Rule 19.300.

Under most State noxious aquatic weed laws, a listed species cannot be imported (into), transported (through), or possessed in the State without a permit from the plant regulatory agency of that State. Based on a strict interpretation of the Louisiana state law in 2006, homeowners, boaters and fishermen were discouraged from assisting in the Giant salvinia

removal effort in Caddo Lake. However, as the infestation has become much more pervasive over the past several years, the Louisiana Department of Wildlife and Fisheries has begun encouraging homeowners to control Giant salvinia around their boat docks and to remove small populations of the plant from the water to help control further expansion of the infestation. Community participation, in cooperation with State and local agencies, is a critical component of a successful Giant salvinia removal and control effort.

**Proven Strategies for Managing Giant Salvinia and other New Invasive Plants in the Southern United States.** There are a number of proven strategies that have been successfully used to manage invasive plants across the southern United States and could be employed to minimize further establishment and spread of Giant salvinia in waterways of the MidSouth Region. Here is a summary of these strategies.

- I. Interagency Partnering to Address Giant Salvinia.** Successful eradication efforts will require that all impacted and potential stakeholders get involved with the Giant salvinia control effort in Louisiana and Texas.
  - A. A number of State Invasive Species Councils have been established across the United States (the Maryland Invasive Species Council, the Delaware Invasive Species Council, etc.). Such interagency groups provide an effective mechanism for interagency coordination and stakeholder input for addressing new invaders such as Giant salvinia. Such councils often form interagency task forces to address new invaders that cannot be addressed by a single agency.
  - B. The Beach Vitex Task Force ([www.beachvitex.org](http://www.beachvitex.org)) is a good example of this new trend in interagency partnering in action. This task force, which was first established in 2003, has eliminated all but a few of the 230 known infestations of Beach vitex from coastal dunes along the South Carolina coast. The task force is now working to eradicate Beach vitex from coastal communities in North Carolina and Virginia. The Interagency Giant Salvinia Team (LA/TX) is making similar progress in managing Giant salvinia in Louisiana and Texas.
- II. Survey and Detection.** Survey and detection is the first line of defense against Giant salvinia.
  - A. One reason for the tremendous success of the Beach Vitex Task Force effort has been the involvement of sea turtle volunteers who are working to protect sea turtle nesting habitat along the Carolina coast. In searching for sea turtle nests among primary and secondary ocean dunes, volunteers have been instrumental in detecting and reporting incipient infestations of Beach vitex to task force coordinators for action. Likewise, development of local shoreline watch programs at public lakes such as Caddo Lake and Lake Bistineau could be very helpful to the Interagency Giant Salvinia Control Team and local contractors in managing new outbreaks of Giant salvinia.
  - B. Another possible approach for early detection of Giant salvinia infestations would be through detection and delimiting surveys, to determine the extent of the infestation, on public waterways under the APHIS Cooperative Agricultural Pest

Survey Program in Texas and Louisiana. As a listed Federal Noxious Weed, Giant salvinia is already a high-priority target species for USDA APHIS and State plant regulatory agencies, especially in states where it is also listed as a State Noxious Weed.

- C. As previously mentioned, early infestations of Giant salvinia in the southern United States escaped from water gardens stocked with imported aquatic plants. Periodic inspection of commercial pond and water garden suppliers for the presence of Giant salvinia and other aquatic weeds of concern in Louisiana and Texas could reduce unintentional distribution of these species.

**III. Outreach and Education.** Ensuring that every person participating in water sports and recreation across the MidSouth is aware of Giant salvinia and know what they can do to help control the problem is also key to successful eradication.

- A. Ongoing public outreach through newspaper, magazine, radio, and television news stories, features, and public service announcements can be helpful to inform the boating public about the problem.
- B. Posting Giant salvinia warning signs at public boat ramps, gas stations, and marinas by the Texas Parks and Wildlife Department has been very effective in raising awareness of the problem. The signs, which encourage the boating public to clean their boats and trailers, are important in the effort to prevent further spread and establishment of this unwanted plant.

**IV. Regulatory Containment, Control, and Eradication.**

- A. **Steps to Prevent Interstate Movement on Boats and Trailers.** As noted earlier, the Federal Plant Protection Act of 2000 provides authority to regulate the interstate movement of listed Federal Noxious Weeds such as Giant salvinia. One way to accomplish this would be to inspect boats and trailers for Giant salvinia at highway rest stops and vehicle inspection areas. State DOT personnel and Highway patrol personnel could include Giant salvinia in their routine inspections of boats and trailers at highway rest stops and vehicle inspection areas near the Louisiana and Texas state borders.
- B. **Control of Large Infestations by Interagency Control Teams.** A great deal of work to control Giant salvinia in Louisiana and Texas is being done by the Interagency Giant Salvinia Control Team. Long-term success of the Giant salvinia control effort in these states depends on this team. Left unchecked, a Giant salvinia infestation can establish at high levels in a very short time.
- C. **Adoption of a Three-Tier Management Strategy.** A three-tier management strategy that includes stakeholder involvement has proven to be effective in managing large, small, and micro-sized infestations of high-priority invasive plants such as Beach vitex and Giant salvinia in the Carolinas. Such a strategy for managing Giant salvinia would include control and eradication of large infestations by an Interagency Control Team, eradication of small infestations by local task-force contractors, and control of micro-infestations (e.g., around boat

docks, boat ramps, and elsewhere) by impacted homeowners and the boating public. The Louisiana Department of Wildlife and Fisheries has already implemented this kind of approach in southwestern Louisiana, where lake residents at Toledo Bend Reservoir are encouraged to remove Giant salvinia around their boat docks and boat ramps. The landowner would normally manage infestations detected in private ponds with advice from a State Aquatic or Extension Weed Specialist.

**Summary and Conclusion.** Since the Caddo Lake Giant Salvinia Field Tour was held in August 2007, tremendous strides have been made in getting organized to address Giant salvinia in Texas and Louisiana. The most significant achievement has been establishment of the Interagency Giant Salvinia Control Team. Fortunately, over the past two years, colder winter weather has killed a significant amount of Giant salvinia across the northern parts of the MidSouth Region, making the present a favorable time to treat existing infestations and to take steps to prevent it from becoming more widely established in this region. Adoption of a three-tier management strategy for control and eradication of large, small, and micro-sized infestations has proven to be effective in managing new and emerging invasive plants such as Beach vitex and Giant salvinia in the Carolinas. Another valuable component of any effort to address Giant salvinia in the MidSouth Region is to stimulate public awareness and engagement to ensure that Giant salvinia is not spread to new waterways via boats, trailers, and fishing gear. This is one invasive species problem that cannot be solved by public agencies alone. However, with public help and support, Giant salvinia can be eliminated as a serious threat to the MidSouth Region.

This concludes my statement. I will be happy to answer any questions you may have.

For more information:

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Westbrooks, R. 1984. Federal Noxious Weeds: Kariba Weed (*Salvinia molesta* D.S. Mitchell). *Weeds Today* 15:8-10.

## Online Resources:

Giant Salvinia Image - U-GA Bugwood Image Gallery.

URL: <http://www.invasive.org/species/subject.cfm?sub=2785>

Giant Salvinia Profile – ISSG Global Invasive Species Database.

URL: <http://www.issg.org/database/species/ecology.asp?si=569&fr=1&sts=sss>

Giant Salvinia Profile - USDA Plants Database.

URL: <http://plants.usda.gov/java/profile?symbol=SAMO5>

Giant Salvinia Control Plan. 2009 Texas-Louisiana Interagency Giant Salvinia Control Team.

URL: <http://salvinia.org/Docs/InteragencyGiantSalviniaControlDRAFT6.pdf>

Giant Salvinia Control Recommendations. Practical Guidebook to the Control of Invasive Aquatic Plants of the San Francisco-Bay Delta Region.

URL: <http://www.sfei.org/nis/salvinia.html>

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URL: <http://salvinia.er.usgs.gov/>