The Invasive Status of Giant Salvinia and Hydrilla in Mississippi

Wilfredo Robles, John D. Madsen, Victor L. Maddox and Ryan M. Wersal
GeoResources Institute
Mississippi State University
Box 9952
Starkville, MS 39762
662-325-2311
E-mail: wr40@pss.msstate.edu

ABSTRACT

Giant salvinia (*Salvinia molesta* Mitchell) is a nuisance, free-floating aquatic fern that can double biomass in 10 days through vegetative reproduction. Hydrilla (*Hydrilla verticillata* (L.f.) Royle) is a perennial submersed aquatic plant that can propagate from stem fragments, turions, and subterranean tubers representing a triple threat for management methods. Both plants disrupt water bodies by affecting ecological interactions and halting boat traffic. Surveys were conducted during 2005-06 to detect the current status of giant salvinia and hydrilla in Mississippi. Giant salvinia was found at the Wedgeworth Creek located northeast of Leaf River near Petal in Forrest County. To date, giant salvinia has not escaped into the Leaf River. The bio-control agent *Cyrtobagous salviniae* has been released at this site; however, no suppression and damage was noticed on the giant salvinia population. Hydrilla has been found in Lake Aberdeen, Aliceville Lake, Columbus Lake, Ross Barnett Reservoir, and Loakfoma Lake on the Noxubee National Wildlife Refuge (NWR). Management practices have been addressed for hydrilla control in the Ross Barnett Reservoir and Noxubee NWR. However, Lake Aberdeen, Aliceville Lake, and Columbus Lake are not currently under active management. Further surveys should be conducted to track giant salvinia and hydrilla spread over the reported sites as well as examine their presence in other of Mississippi water bodies.

Keywords: Invasive species, Ecology, Wetlands

Introduction

Invasive aquatic plant species are a significant threat to the water resources and wetlands of the nation, including the state of Mississippi. For instance, invasive aquatic plants disrupt many bodies of water, affecting the ecological interactions, disrupting water supply, and impeding boat traffic. Two species in particular, hydrilla (*Hydrilla verticillata* (L.f.) Royle) and giant salvinia (*Salvinia molesta* Mitchell) are considered invasive aquatic plants worldwide. Giant salvinia is a free-floating aquatic fern that can double its biomass in ten days through vegetative reproduction. Hydrilla is a submersed aquatic plant that can propagate from stem fragments, turions, and subterranean tubers, representing a triple threat for management methods. Both plants are listed as noxious weeds on both the Federal Noxious Weed List and the Noxious Weed List for the state of Mississippi.

Both also are present in Mississippi (Madsen et al., 2006). However, little information exists on the number of water bodies impacted and threat, county records, and control methods to date for these two species.

Methods

An extensive survey was conducted in 2006 throughout Mississippi to detect the presence of giant salvinia and hydrilla. A total of 17 counties were surveyed including reservoirs, waterways and major rivers (Table 1). A handheld computer with Global Positioning System (GPS) capabilities was used to obtain geographic coordinates of surveyed locations.

Table 1. MS counties and water bodies surveyed in 2006 as depicted in Figure 1. (Positive location = +; Negative location = -)

County Name	Water Body	Hydrilla	Giant Salvinia
Attala	Yockanookany River	-	-
Clay	Lake Columbus	+	-
Forrest	Wedgeworth Creek	-	+
	Leaf River	-	-
George	Pascagoula River	-	-
Greene	Leaf River	-	-
	Chickasawhay River	-	-
Jackson	Pascagoula River	-	-
Leake	Yockanookany River	-	-
Leflore	Yazoo River	-	-
Lowndes	Lake Columbus	+	-
Madison	Ross Barnett Reservoir	+	-
Monroe	Lake Aberdeen	+	-
Noxubee	Noxubee National Wildlife Refeuge	+	-
	Lake Aliceville	+	-
Oktibbeha	Private Pond	-	-
Perry	Leaf River	-	-
Rankin	Ross Barnett Reservoir	+	-
Washington	Oxbow east of Mississippi River	-	-
Webster	Big Black River	-	-

Data were acquired and reported in latitude and longitude, datum Word Geodetic System (WGS 84). Once the GPS points were recorded, 2005 aerial photography at 2-meter resolution was used to make distribution maps and establish potential sites for the spread of hydrilla and giant salvinia (maps not shown). Maps were built in ArcGIS-ArcMap, v. 9.1 software (ESRI 2005). Aerial photography by county was downloaded from the Mississippi Automated Resource Information System (MARIS) (http://www.maris.state.ms.us) web page. In order to have information about control methods performed on these two plants in the surveyed water body, agencies managing the water body were contacted. Any control method performed in the water body was rated as achieving poor, fair, good, and excellent control at the time of the survey.

For hydrilla, we selected and extended potential survey sites by contacting natural resource agencies in the state, as well as encountering hydrilla infestations as part of our other research activities. For giant salvinia, surveys at known sites were performed including southern Mississippi counties after Hurricane Katrina. Current sites were widely surveyed to detect giant salvinia presence and its potential spread to connected water bodies.

Results and Discussion

Presence and absence of hydrilla and giant salvinia in Mississippi in the 2006 survey are presented in Table 1 and Figure 1. The status of each plant and description of known locations will be discussed as well as the performance of control methods used at each water body.

Hydrilla Status

Tennessee-Tombigbee Waterway

Hydrilla was found in the Tennessee Tombigbee Waterway at Lake Aberdeen, Lake Columbus, and Lake Aliceville (Table 1). Associated species growing with hydrilla include: waterhyacinth (*Eichhornia crassipes* (Mart.) Solms), coontail (C*eratophyllum demersum* L.), and Eurasian watermilfoil (*Myriophyllum spicatum* L.). At Lake Aberdeen and Lake Aliceville, hydrilla has been found localized at boat ramps and scattered along shorelines at depths of 2 feet. However, hydrilla populations have expanded in Lake Columbus since 2005, after control activities reduced waterhyacinth abundance. The Lake Columbus hydrilla population has been observed in the northern most part of the lake that intersects with Highway 50. The shade and light interception previously provided by waterhyacinth are no longer impeding hydrilla development and growth in this location. Therefore, hydrilla population expansion is likely at Lake Columbus. To date, no control methods have been implemented to manage hydrilla populations on these three water bodies along the Tennessee Tombigbee Waterway. Therefore, a "no action" method has been rated as poor because hydrilla has not been controlled (Table 2).

Noxubee National Wildlife Refuge

Hydrilla was found in the Noxubee National Wildlife Refuge at Lake Loakfoma (Table 1). Associated species growing with hydrilla include: American lotus (*Nelumbo lutea* Willd.) and coontail (C*eratophyllum demersum*). The only control method performed at this water body was drawdown and was rated as good at the time of the survey (Table 2). Drawdown may be useful as short-term control. However, asexual reproductive structures such as tubers and turions may remain in the sediment and sprout after the water body is refilled.

Ross Barnett Reservoir

Hydrilla was found in the upper lake of the Ross Barnett Reservoir (Table 1). Associated species growing with hydrilla include American lotus (*Nelumbo lutea*) and alligatorweed (*Alternanthera philoxeroides* (Mart.) Griseb.). To date, 124 acres have been sprayed for hydrilla control using the aquatic herbicide fluridone. This control method has been rated as excellent because hydrilla shoots have been controlled (Table 2). Also, asexual reproductive structures such as tubers and turions have not been found at locations where the herbicide was applied.

Table 2. Visual ratings at the time of survey for each known control method applied at known locations of hydrilla and giant salvinia in Mississippi.

Location	Plant	Method	Agent	Rating
Lake Aberdeen	hydrilla	None	None	Poor
Lake Columbus	hydrilla	None	None	Poor
Noxubee National Wildlife Refuge	hydrilla	Physical	Drawdown	Good
Lake Aliceville	hydrilla	None	None	Poor
Ross Barnett	hydrilla	Chemical	Fluridone	Excellent
Wedgeworth Creek	hydrilla	Biological	*Cyrtobagous salviniae*	Poor

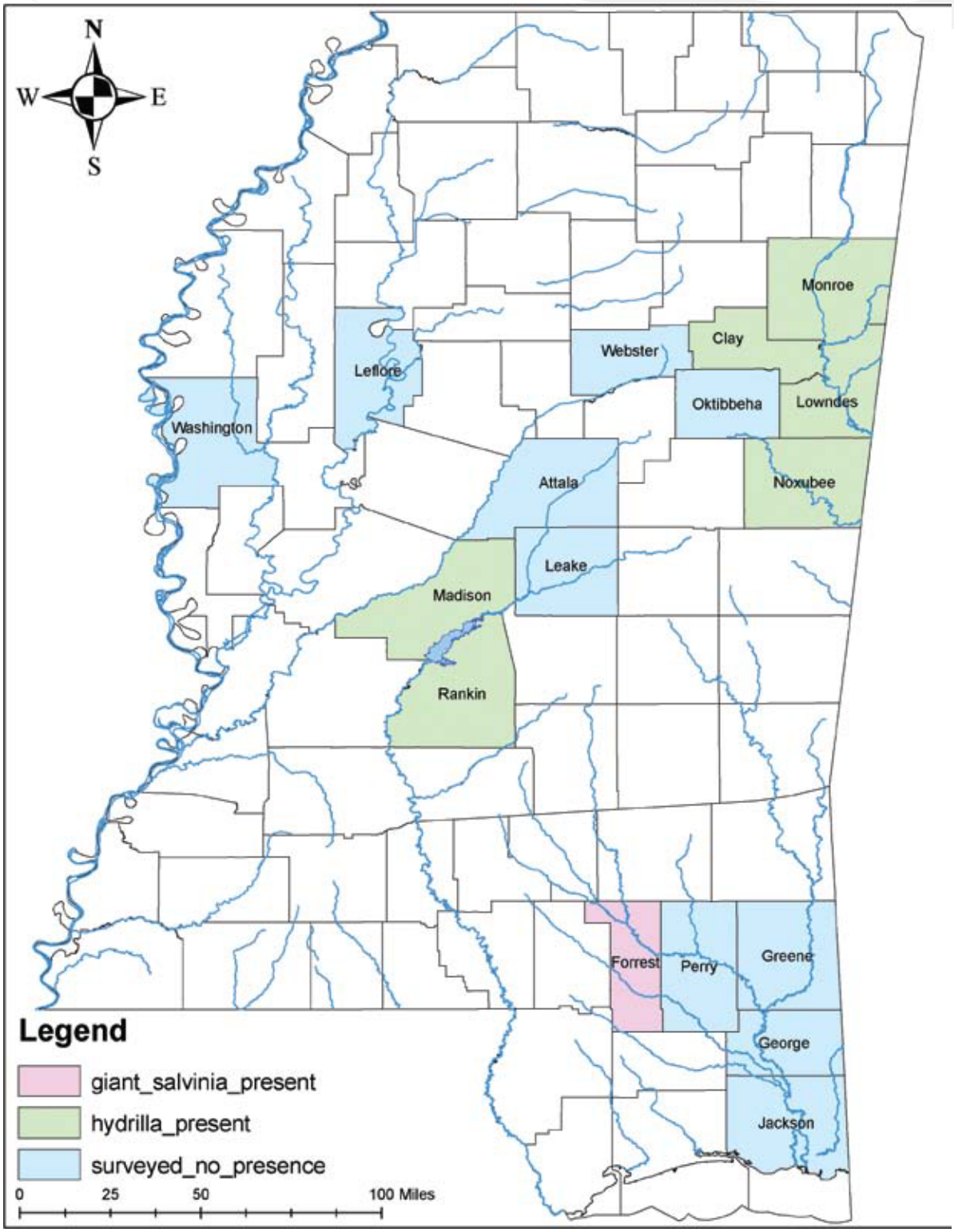

Figure 1. Status of hydrilla and giant salvinia in Mississippi according to the 2006 survey.

Giant Salvinia Status

Wedgeworth Creek

Giant salvinia was found in Wedgeworth Creek, a small creek that drains into the Leaf River (Table 1). Due to the heavy infestation of giant salvinia at this location and the potential to escape into a bigger water body, an extensive survey was performed at this location. Only the aquatic plant parrotfeather (*Myriophyllum aquaticum* (Vell.) Verdc.) was found as an associated species of giant salvinia at this location. In 2005, only the north portion of the creek was infested with giant salvinia. However, in 2006, giant salvinia has spread south, where it was found 124 meters from the Leaf River. At the time of the survey, 100% coverage of giant salvinia was reported under the bridge in Sims Road. Biological control has been performed in this area to suppress giant salvinia growth, but it still persists along Wedgeworth Creek. Therefore, this control method has been rated as poor because giant salvinia is still covering 100% of the water body surface (Table 2). An oxbow located west of Wedgeworth Creek was surveyed, but giant salvinia was not found.

Pascagoula River

In 2005, giant salvinia was found west of the Pascagoula River delta (Madsen et al., 2006). However, giant salvinia has not been found after hurricane Katrina in August 2005. An extensive survey was performed in 2006 east and west of the Pascagoula River, examining the north side of Bluff creek and other tributaries in this area. Apparently, the storm surge associated with Hurricane Katrina in August 2005 changed the water chemistry (salinity), limiting giant salvinia growth at this location.

Conclusions and Recommendations

Aggressive management of hydrilla and giant salvinia in Mississippi is highly recommended in order to prevent spread and heavy infestations in larger water bodies. For instance, hydrilla infestation in the Tennessee-Tombigbee Waterway currently does not limit boat traffic or cause a disruption in water supply. However, failure to manage known hydrilla infestations will result in future heavy infestations.

The implementation of other control methods, such as chemical control, to manage giant salvinia is highly recommended to prevent spread and escape into the Leaf River. Biological control alone will not adequately suppress the growth of giant salvinia.

Giant salvinia has not yet been eradicated in the Pascagoula River region, although the plant was not found during this survey. Bluff Creek, located north to the area surveyed and reported in 2005 with giant salvinia presence (Madsen et al., 2006), is a tributary that should be fully surveyed.

Acknowledgements

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