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# AQUATIC PLANTS OF MISSISSIPPI COASTAL RIVER SYSTEMS

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## ABSTRACT

Shallow waters in main river channels and adjoining bayous, streams, inlets, lagoons, and bays of the Pascagoula River, Back Bay of Biloxi, and Pearl River systems were surveyed for aquatic plants from May 2008 to May 2010. The location of species of submerged aquatic vegetation (SAV), floating aquatic plants, and the shore emergent plants are presented in this paper. Photos of most of the plants that are mentioned in this paper are available at the website, [jcho.masgc.org](http://jcho.masgc.org). The survey area for each system extended from the river mouth to upstream areas where stream width became narrow and shore vegetation became tall trees which restricted SAV growth due to canopy shading. This paper was prepared as a rapid response to requests to provide the SAV species and their locations in coastal river systems, particularly in relation to the current BP oil spill incident and disaster in Gulf of Mexico.

## INTRODUCTION

Aquatic plants, also called hydrophytes, refer to plants that are adapted to life in or on water. They can occur in a range of growing forms: free-floating on the water surface, rooted with floating leaves, completely submerged, or emergent with roots in standing water or permanently water logged soil (Cronk and Fennessy 2001). Aquatic vascular plants help improve water quality, stabilize sediment, and provide nursery habitats for aquatic life. On the other hand, fast growing aquatics especially freshwater submerged or floating plants can produce noxious conditions by forming surface canopies that interfere with gas exchange, light penetration, navigation, and commercial/recreational activities. In either case, identification and locating of the native, favorable species or the invasive, noxious species are: 1) required to understand species richness/dominance/diversity which can be used as an indicator of the habitat's health, complexity, stability, and status; and 2) the first

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step in habitat assessment for proper conservation and management.

Submerged aquatic vegetation (SAV) has received much less media, funding, and research attention compared to the other major coastal ecosystems. In addition, much of the SAV research and funding efforts have been focusing on locating, characterizing, and restoring marine seagrass habitats while it is well-known that the SAV beds in the brackish and intermediate coastal waters provide the equivalent ecosystem services as well as additional unique functions to those environments and the associated fisheries (Castellanos and Rozas 2001; Strayer and Malcom 2007).

The majority of publications on coastal Mississippi SAV also have focused on barrier islands and estuarine seagrass beds (Eleuterius 1971; Eleuterius 1973; Eleuterius 1975; Moncreiff et al. 1998; Moncreiff 2006; Cho and May 2008; Cho et al. 2009; Cho and Nica 2009); and there is almost a dearth of published information on brackish and freshwater species

that occur along the Mississippi mainland coast (Weiland 1994). This paper was prepared as a rapid response to numerous requests to provide the SAV species and their locations in coastal river systems, particularly in relation to the current BP oil spill incident and disaster in Gulf of Mexico.

Coastal Mississippi has various aquatic plant habitats along the four major river systems: Pearl River, St. Louis Bay, Biloxi Bay, and Pascagoula River, which empty into the coastal estuaries. According to Eleuterius (1975), the Pearl and Pascagoula Rivers drain part of the North Central Plateau, the Jackson Prairie Belt, and Long-leaf Pine Regions and the Coastal Pine Meadows, while the St. Louis Bay and the Biloxi Bay Systems drain only the Longleaf Pine and Coastal Pine Meadows. Information on SAV species and their locations that are presented in this paper is based on field surveys from spring 2008 through spring 2010 conducted in various areas in Pascagoula River, Pearl River, and Back Bay of Biloxi.

In addition to SAV species, we documented the free-floating and floating-leaved aquatic plants and also the dominant emergent plants along the surrounding shore. Photos of most of the plants that are mentioned in this paper are available at the website, [jcho.masgc.org](http://jcho.masgc.org). While we are confident that our list contains all significant SAV species that occur in the Mississippi coastal river systems, it should not be considered as an exhaustive list. More importantly, the SAV bed locations and their exact species compositions should not be used as an absolute guide because SAV species exhibit substantial seasonal and annual variations in their growth and extent.

## MATERIAL AND METHODS

We surveyed shallow waters in main river channels and adjoining bayous, streams, inlets, lagoons, and bays of the Pascagoula River, Back Bay of Biloxi, and Pearl River systems for aquatic plants from May 2008 to May 2010.

The survey area for each system extended from the river mouth to upstream areas where stream width became narrow and shore vegetation became tall trees which restricted SAV growth due to canopy shading. The survey locations were selected based on previous experiences of the authors, personal communication with JD Caldwell at Gulf Coast Research Lab, and careful topographic assessments of the candidate SAV habitat areas using 1:25,000 and 1:50,000 USGS topographic maps and the Google Earth™ mapping service. Survey methods included raking from a boat and wading in the water, after SAV were observed to occur in a given location. In addition to SAV species and bed location, dominant shore vegetation and GPS coordinates were recorded using a Trimble™ GeoXH handheld GPS unit and TerraSync™ software. The survey locations were added onto base GIS (Geographic Information System) maps as point data by National Center for Biodefense Communications of Jackson State University (JSU).

## RESULTS

The locations for the SAV beds and other information including site name, survey period, GPS coordinates, SAV species, other aquatic plants, and dominant shore vegetation are presented in Figs. 1, 2, 3, and 4 and in Tables 1, 2, and 3. Dominant SAV species included *Ruppia maritima* L (Wigeongrass), *Vallisneria americana* Michx (Wildcelery), *Najas guadalupensis* (Spreng.) Magnus (Southern Naiad), *Zannichellia palustris* L (Horned Pondweed), *Potamogeton pusillus* L (Small Pondweed), and *Ceratophyllum demersum* L (Coontail). Emergent plants that are often submerged were *Eleocharis parvula* Link (Dwarf Spikerush) and *Zizania aquatica* L (Annual Wildrice). Macrophytic algae that can easily be confused with vascular SAV were *Nitella* sp. (Brittlewort) and *Chara* sp (Muskgrass). Some species such as

*Myriophyllum aquaticum* (Vell.) Verdc (Parrot Feather), *Myriophyllum spicatum* L (Eurasian Watermilfoil), and *Callitriche heterophylla* Pursh (Water Starwort) were found in isolated locations. Submerged *Eleocharis* species included *E. baldwinii* (Torr.) Chapm (Baldwin's Spikerush) and *E. robbinsii* Oakes (Robbin's Spikerush). Floating leaved or free-floating

plants included *Nuphar lutea* (L.) Sibth. & Sm (Yellow Pondlily), *Nymphaea odorata* Soland ex Ait (American Waterlily), *Utricularia* sp. (Bladderwort), and *Eichhornia crassipes* (Mart.) Solms (Waterhyacinth).

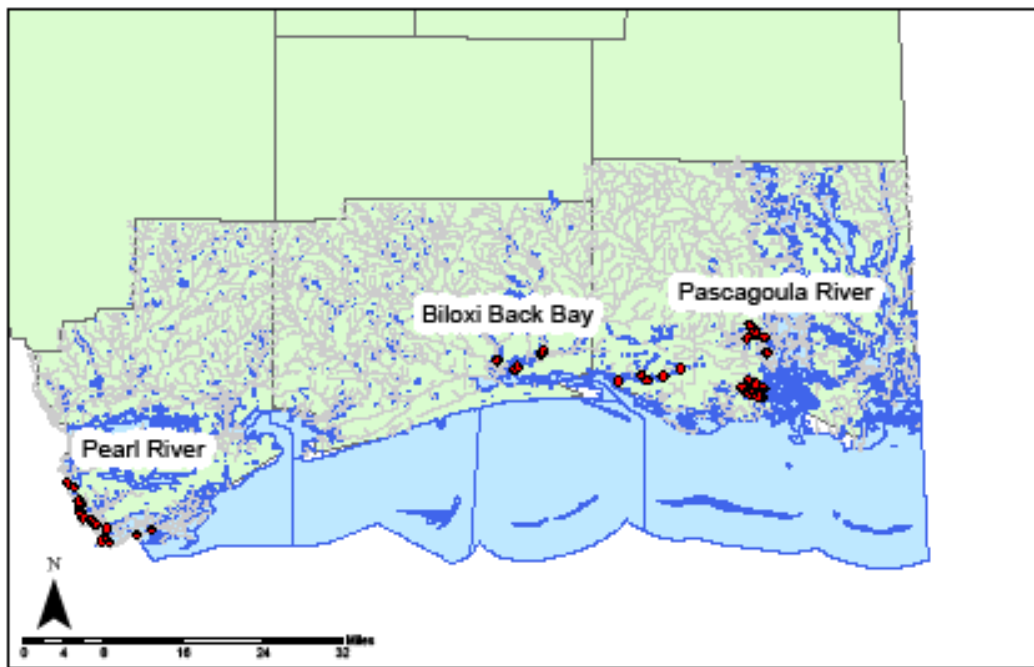


Figure 1. Survey locations along the Mississippi coast

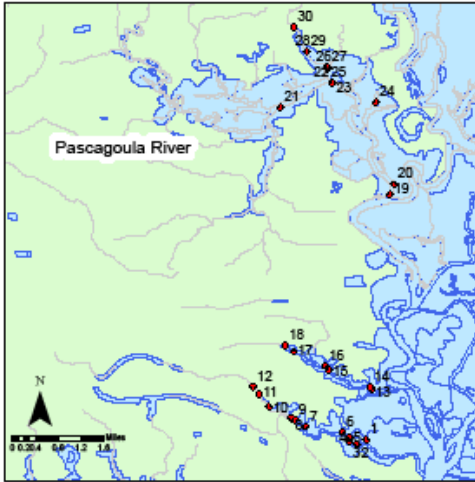


Figure 2. Survey locations in the Pascagoula River system

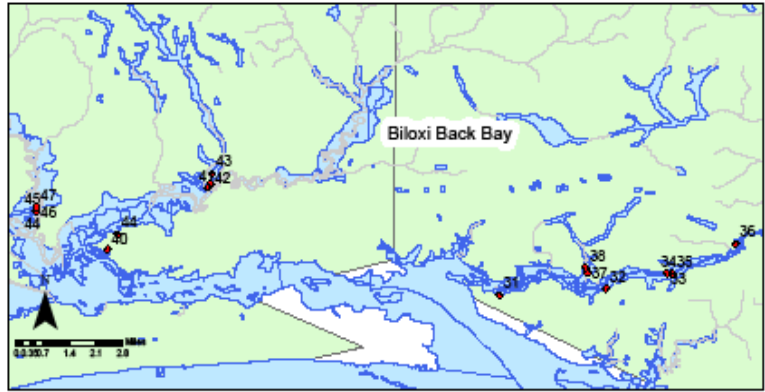


Figure 3. Survey locations in the Back Bay of Biloxi system

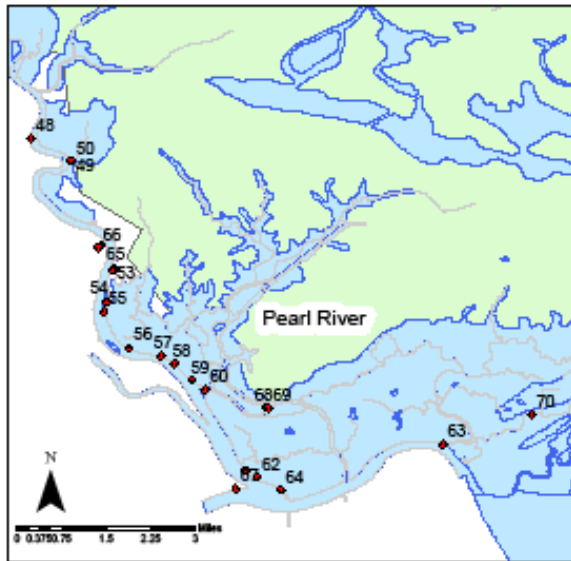


Figure 4. Survey locations in the Pearl River system

Table 1. The survey locations, survey periods, and aquatic plants found during study period (May 2008 – May 2010) in lower Pascagoula River, Mississippi.

PASCAGOULA RIVER SYSTEM

Location	Survey Period	Site ID	Latitude	Longitude	Plants Found Growing in and on Water	Dominant Shore Vegetation
Mary Walker Bayou	May-08	1	30°23'42"N	88°37'27"W	<i>Najas guadalupensis</i> , <i>Potamogeton pusillus</i>	<i>Juncus roemerianus</i> , <i>Sagittaria lancifolia</i> , <i>Spartina cynosuroides</i>
Mary Walker Bayou	May-08	2	30°23'37"N	88°37'36"W	<i>Vallisneria americana</i> , <i>Najas guadalupensis</i> , <i>Myriophyllum spicatum</i> , <i>Zannichellia palustris</i> , <i>Nitella</i> sp.	<i>Juncus roemerianus</i> , <i>Sagittaria lancifolia</i> , <i>Spartina cynosuroides</i>
Mary Walker Bayou	May-08	3	30°23'40"N	88°37'43"W	<i>Ruppia maritima</i>	<i>Juncus roemerianus</i> , <i>Sagittaria lancifolia</i> , <i>Spartina cynosuroides</i>
Mary Walker Bayou	Mar-10	4	30°23'43"N	88°37'42"W	<i>Ruppia maritima</i> , <i>Vallisneria americana</i>	<i>Juncus roemerianus</i> , <i>Sagittaria lancifolia</i> , <i>Spartina cynosuroides</i>
Mary Walker Bayou	May-10	5	30°23'44"N	88°37'42"W	<i>Najas guadalupensis</i> , <i>Zannichellia palustris</i> , <i>Vallisneria americana</i> , <i>Ruppia maritima</i>	<i>Juncus roemerianus</i> , <i>Schoenoplectus tabernaemontani</i> , <i>Schoenoplectus robustus</i>
Mary Walker Bayou	May-08	6	30°23'48"N	88°37'49"W	<i>Vallisneria americana</i> , <i>Zannichellia palustris</i>	<i>Juncus roemerianus</i> , <i>Schoenoplectus tabernaemontani</i> , <i>Schoenoplectus robustus</i>
Mary Walker Bayou	Mar-10	7	30°23'54"N	88°38'22"W	<i>Vallisneria americana</i>	<i>Juncus roemerianus</i>
Mary Walker Bayou	May-10	8	30°24'1"N	88°38'36"W	<i>Vallisneria americana</i> , <i>Najas guadalupensis</i>	<i>Juncus roemerianus</i> , <i>Sagittaria lancifolia</i>
Mary Walker Bayou	May-10	9	30°24'0"N	88°38'32"W	<i>Vallisneria americana</i> , <i>Najas guadalupensis</i>	<i>Juncus roemerianus</i> , <i>Sagittaria lancifolia</i>
Mary Walker Bayou	May-10	10	30°24'12"N	88°38'56"W	<i>Vallisneria americana</i> , <i>Najas guadalupensis</i> , <i>Nitella</i> sp.	<i>Sagittaria lancifolia</i> , <i>Juncus roemerianus</i> , <i>Cladium jamaicense</i>
Mary Walker Bayou	Mar-10	11	30°24'23"N	88°39'5"W	<i>Vallisneria americana</i>	<i>Cladium jamaicense</i>
Mary Walker Bayou	May-10	12	30°24'30"N	88°39'11"W	<i>Najas guadalupensis</i>	<i>Sagittaria lancifolia</i> , <i>Baccharis halimifolia</i> , <i>Ilex</i> sp., <i>Pontederia cordata</i> , <i>Acer rubrum</i> , <i>Juncus roemerianus</i>
Sioux Bayou	Mar-10	13	30°24'28"N	88°37'22"W	<i>Vallisneria americana</i> , <i>Ruppia maritima</i>	<i>Schoenoplectus tabernaemontani</i> , <i>Spartina cynosuroides</i> , <i>Sagittaria lancifolia</i> , <i>Cladium jamaicense</i>

						<i>Juncus roemerianus</i>
Sioux Bayou	May-10	14	30°24'30"N	88°37'23"W	<i>Vallisneria americana</i> , <i>Najas guadalupensis</i> , <i>Potamogeton pusillus</i> , <i>Zannichellia palustris</i> , <i>Nitella</i> sp.	<i>Schoenoplectus tabernaemontani</i> , <i>Spartina cynosuroides</i> , <i>Sagittaria lancifolia</i> , <i>Cladium jamaicense</i> , <i>Juncus roemerianus</i>
Sioux Bayou	Mar-10	15	30°24'45"N	88°38'1"W	<i>Vallisneria americana</i>	<i>Schoenoplectus tabernaemontani</i> , <i>Spartina cynosuroides</i> , <i>Sagittaria lancifolia</i> , <i>Cladium jamaicense</i> , <i>Juncus roemerianus</i>
Sioux Bayou	May-10	16	30°24'49"N	88°38'5"W	<i>Vallisneria americana</i> , <i>Zannichellia palustris</i>	<i>Juncus roemerianus</i> , <i>Sagittaria lancifolia</i> , <i>Anthemis</i> sp.
Sioux Bayou	Mar-10	17	30°25'2"N	88°38'33"W	<i>Vallisneria americana</i>	<i>Juncus roemerianus</i> , <i>Sagittaria lancifolia</i>
Sioux Bayou	May-10	18	30°25'7"N	88°38'41"W	<i>Najas guadalupensis</i> , <i>Zizania aquatica</i>	<i>Juncus effusus</i> , <i>Sagittaria lancifolia</i> , <i>Juncus roemerianus</i> , <i>Cladium jamaicense</i> , <i>Distichlis spicata</i>
Bluff Creek	May-10	19	30°27'25"N	88°37'5"W	<i>Potamogeton pusillus</i> , <i>Utricularia</i> sp.	<i>Phragmites australis</i> , <i>Schoenoplectus robustus</i> , <i>Sagittaria lancifolia</i>
Bluff Creek	May-08	20	30°27'35"N	88°37'2"W	<i>Nuphar lutea</i> , <i>Utricularia</i> sp., <i>Eichhornia crassipes</i> , <i>Alternanthera philoxeroides</i>	<i>Zizania aquatica</i> , <i>Taxodium distichum</i>
Bluff Creek	May-08	21	30°28'45"N	88°38'46"W	<i>Vallisneria americana</i> , <i>Nitella</i> sp., <i>Utricularia</i> sp., <i>Myriophyllum aquaticum</i> , <i>Eleocharis parvula</i>	<i>Taxodium distichum</i>
Bluff Creek	Mar-10	22	30°29'8"N	88°37'58"W	<i>Callitriche heterophylla</i>	<i>Juncus roemerianus</i> , <i>Spartina cynosuroides</i>
Bluff Creek	May-10	23	30°29'7"N	88°37'58"W	<i>Vallisneria americana</i>	<i>Campsis radicans</i> , <i>Sagittaria lancifolia</i> , <i>Peltandra virginica</i> , <i>Smilax</i> sp., <i>Osmunda regalis</i> , <i>Palmetto</i> sp., <i>Cladium jamaicense</i>
Catch-Um All Bayou	May-10	24	30°28'50"N	88°37'18"W	<i>Potamogeton pusillus</i> , <i>Nitella</i> sp., <i>Najas guadalupensis</i> , <i>Myriophyllum aquaticum</i>	<i>Cladium jamaicense</i>
John's Bayou	May-10	25	30°29'20"N	88°38'3"W	<i>Nitella</i> sp., <i>Najas guadalupensis</i> , <i>Ceratophyllum demersum</i> , <i>Potamogeton pusillus</i> , <i>Zannichellia palustris</i> , <i>Vallisneria americana</i> ,	<i>Sagittaria lancifolia</i> , <i>Smilax</i> sp., <i>Cladium jamaicense</i> , <i>Juncus roemerianus</i>

					<i>Utricularia</i> sp.	
John's Bayou	Mar-10	26	30°29'22"N	88°38'3"W	<i>Vallisneria americana</i> , <i>Callitriche heterophylla</i>	<i>Cladium jamaicense</i> , <i>Spartina patens</i> , <i>Juncus roemerianus</i>
John's Bayou	Mar-10	27	30°29'22"N	88°38'2"W	<i>Vallisneria americana</i> , <i>Callitriche heterophylla</i>	<i>Cladium jamaicense</i>
John's Bayou	Mar-10	28	30°29'36"N	88°38'21"W	<i>Vallisneria americana</i> , <i>Callitriche heterophylla</i>	<i>Cladium jamaicense</i> , <i>Juncus roemerianus</i>
John's Bayou	May-10	29	30°29'36"N	88°38'21"W	<i>Vallisneria americana</i>	<i>Juncus roemerianus</i> , <i>Cladium jamaicense</i> , <i>Sagittaria lancifolia</i> , <i>Hibiscous</i> sp., <i>Smilax</i> sp., <i>Peltandra virginica</i>
John's Bayou	May-10	30	30°29'58"N	88°38'33"W	<i>Eleocharis baldwinii</i>	<i>Juncus polycephalus</i> , <i>Zizania aquatica</i>

Table 2. The survey locations, survey periods, and aquatic plants found during study period (May 2008 – May 2010) in the Back Bay of Biloxi area, Mississippi.

BACK BAY of BILOXI AREA						
Location	Survey Period	Site ID	Latitude	Longitude	Plants Found Growing in and on Water	Dominant Shore Vegetation
Old Fort Bayou	Mar-10	31	30°25'1"N	88°50'0"W	<i>Vallisneria americana</i> , <i>Ruppia maritima</i>	<i>Juncus roemerianus</i> <i>Spartina alterniflora</i>
Old Fort Bayou	May-10	32	30°25'10" N	88°47'34" W	<i>Ruppia maritima</i> , <i>Zannichellia palustris</i> , <i>Vallisneria americana</i>	<i>Juncus roemerianus</i> <i>Spartina alterniflora</i> <i>Spartina patens</i> <i>Distichlis spicata</i>
Old Fort Bayou	May-10	33	30°25'29" N	88°46'10" W	<i>Zannichellia palustris</i> , <i>Chara</i> sp.	<i>Juncus roemerianus</i> <i>Cladium jamaicense</i> <i>Spartina patens</i>
Old Fort Bayou	Mar-10	34	30°25'29" N	88°46'3"W	<i>Zannichellia palustris</i>	<i>Juncus roemerianus</i> <i>Spartina cynosuroides</i>
Old Fort Bayou	Mar-10	35	30°25'29" N	88°46'2"W	<i>Zannichellia palustris</i>	<i>Juncus roemerianus</i> <i>Spartina cynosuroides</i>
Old Fort Bayou	May-10	36	30°26'8"N	88°44'36" W	<i>Vallisneria americana</i> , <i>Eleocharis parvula</i>	<i>Baccharis halimifolia</i> <i>Juncus roemerianus</i> <i>Pinus</i> sp.
Bayou Talla	May-10	37	30°25'30" N	88°47'59" W	<i>Najas guadalupensis</i> , <i>Zannichellia palustris</i> , <i>Chara</i> sp.	<i>Spartina patens</i> , <i>Juncus roemerianus</i> , <i>Pinus</i> sp.
Bayou Talla	May-10	38	30°25'37" N	88°48'2"W	<i>Zannichellia palustris</i>	<i>Juncus roemerianus</i>
Tchoutacabouffa River	Apr-10	39	30°26'21" N	88°58'45" W	<i>Zannichellia palustris</i>	<i>Juncus roemerianus</i>
Tchoutacabouffa River	Apr-10	40	30°26'1"N	88°58'58" W	<i>Zannichellia palustris</i>	<i>Juncus roemerianus</i>
Cedar Lake	May-	44	30°26'21"	88°58'45"	<i>Zannichellia</i>	<i>Sapium sebiferum</i> ,

	10		N	W	<i>palustris</i> , <i>Chara</i> sp., <i>Potamogeton</i> <i>pusillus</i>	<i>Sagittaria lancifolia</i> , <i>Juncus roemerianus</i> , <i>Smilax</i> sp.
Cedar Lake	Apr-10	41	30°27'22" N	88°56'40" W	<i>Vallisneria</i> <i>americana</i>	<i>Juncus roemerianus</i>
Cedar Lake	May-10	42	30°27'27" N	88°56'37" W	<i>Vallisneria</i> <i>americana</i> , <i>Eleocharis parvula</i>	<i>Juncus roemerianus</i> , <i>Peltandra virginica</i> , <i>Sagittaria lancifolia</i>
Cedar Lake	May-10	43	30°27'40" N	88°56'35" W	<i>Zannichellia</i> <i>palustris</i> , <i>Najas</i> <i>guadalupensis</i> , <i>Chara</i> sp., <i>Potamogeton</i> <i>pusillus</i> , <i>Vallisneria</i> <i>americana</i>	<i>Sagittaria lancifolia</i> , <i>Juncus roemerianus</i> , <i>Crinum thaianum</i>
Biloxi River	Apr-10	44	30°26'51" N	89° 0'38"W	<i>Zannichellia</i> <i>palustris</i> , <i>Najas</i> <i>guadalupensis</i> , <i>Vallisneria</i> <i>americana</i>	<i>Juncus roemerianus</i> , <i>Eleocharis</i> sp.
Biloxi River	May-10	45	30°26'51" N	89° 0'38"W	<i>Najas</i> <i>guadalupensis</i> , <i>Vallisneria</i> <i>americana</i> , <i>Eleocharis parvula</i>	<i>Sagittaria lancifolia</i> , <i>Juncus roemerianus</i> , <i>Silver Magnolia</i> , <i>Myrica cerifera</i> , <i>Acer rubrum</i> , <i>Peltandra virginica</i> , <i>Cladium jamaicense</i>
Biloxi River	Apr-10	46	30°26'56" N	89° 0'36"W	<i>Vallisneria</i> <i>americana</i> , <i>Zannichellia palustris</i>	<i>Eleocharis</i> sp.
Biloxi River	May-10	47	30°26'56" N	89° 0'36"W	<i>Vallisneria</i> <i>americana</i>	<i>Sagittaria lancifolia</i> , <i>Eleocharis</i> sp. <i>Pontederia cordata</i> , <i>Juncus roemerianus</i> , surrounded by trees

Table 3. The survey locations, survey periods, and aquatic plants found during study period (May 2008 – May 2010) in Pearl River, Mississippi.

PEARL RIVER						
Location	Survey Period	Site ID	Latitude	Longitude	Plants Found Growing in and on Water	Dominant Shore Vegetation
Pearl River	Mar-10	48	30°16'11"N	89°38'0"W	<i>Zizania aquatica</i>	<i>Zizania aquatica</i> , surrounded by woody bushes and trees
Pearl River	May-10	49	30°15'52"N	89°37'24"W	<i>Potamogeton</i> <i>pusillus</i> , <i>Najas</i>	<i>Schoenoplectus</i> <i>tabernaemontani</i> , <i>Juncus</i> <i>effusus</i>

					<i>guadalupensis</i> , <i>Zanichellia palustris</i> <i>Ceratophyllum demersum</i> , <i>Nuphar lutea</i> , <i>Zizania aquatica</i>	
Pearl River	Mar-10	50	30°15'52"N	89°37'24"W	<i>Zizania aquatica</i>	<i>Sable minor</i>
Pearl River	May-08	51	30°14'17"N	89°36'47"W	<i>Vallisneria americana</i> , <i>Ceratophyllum demersum</i> , <i>Najas guadalupensis</i> , <i>Lemna minor</i> , <i>Nuphar lutea</i>	
Pearl River	Mar-10	52	30°14'17"N	89°36'46"W	<i>Najas guadalupensis</i> , <i>Potamogeton pusillus</i>	<i>Phragmites australis</i> , <i>Baccharis halimifolia</i> , <i>Cladium jamaicense</i>
Pearl River	May-10	53	30°14'16"N	89°36'49"W	<i>Zizania aquatica</i> , <i>Potamogeton pusillus</i> <i>Ceratophyllum demersum</i>	<i>Sagittaria lancifolia</i> , <i>Schoenoplectus tabernaemontani</i> , <i>Sapium sebiferum</i>
Pearl River	May-10	54	30°13'48"N	89°36'53"W	<i>Eleocharis parvula</i> <i>Zanichellia aquatica</i> , <i>Potamogeton pusillus</i>	<i>Sagittaria lancifolia</i> , <i>Schoenoplectus tabernaemontani</i>
Pearl River	Mar-10	55	30°13'39"N	89°36'56"W	<i>Zannichellia palustris</i> , <i>Vallisneria americana</i> , <i>Nitella sp.</i>	<i>Eleocharis parvula</i> , <i>Phragmites australis</i>
Pearl River	May-08	56	30°13'7"N	89°36'34"W	<i>Nitella sp.</i>	
Pearl River	May-10	57	30°13'0"N	89°36'6"W	<i>Vallisneria americana</i>	<i>Spartina cynosuroides</i> , <i>Schoenoplectus tabernaemontani</i> , <i>Spartina alterniflora</i>
Pearl River	May-08	58	30°12'54"N	89°35'54"W	<i>Vallisneria americana</i> , <i>Potamogeton pusillus</i> , <i>Najas guadalupensis</i>	<i>Spartina cynosuroides</i> , <i>Schoenoplectus tabernaemontani</i> , <i>Spartina alterniflora</i>
Pearl River	Mar-10	59	30°12'39"N	89°35'38"W	<i>Vallisneria americana</i>	<i>Phragmites australis</i> , <i>Spartina alterniflora</i>
Pearl River	May-08	60	30°12'31"N	89°35'27"W	<i>Najas guadalupensis</i> , <i>Vallisneria americana</i> , <i>Zannichellia palustris</i> ,	<i>Phragmites australis</i> , <i>Spartina alterniflora</i>

					<i>Nitella sp.</i>	
Pearl River	May-08	61	30°11'20"N	89°34'51"W	<i>Vallisneria americana</i>	
Pearl River	May-08	62	30°11'14"N	89°34'41"W	<i>Ruppia maritima</i>	
Pearl River	May-08	63	30°11'43"N	89°31'58"W	<i>Ceratophyllum demersum</i>	
Pearl River	May-10	64	30°11'3"N	89°34'21"W	<i>Ceratophyllum demersum</i>	<i>Schoenoplectus tabernaemontani</i> , <i>Spartina alterniflora</i>
Poitevants Ditch	Mar-10	65	30°14'38"N	89°36'58"W	<i>Zannichellia palustris</i>	<i>Panicum virgatum</i> <i>Phragmites australis</i>
Poitevants Ditch	May-10	66	30°14'36"N	89°37'1"W	<i>Eleocharis parvula</i> , <i>Najas guadalupensis</i> , <i>Potamogeton pusillus</i> , <i>Vallisneria americana</i> , <i>Chara sp.</i>	<i>Sagittaria lancifolia</i> , <i>Juncus roemerianus</i>
Little Lake	May-10	67	30°11'4"N	89°35'0"W	<i>Ruppia maritima</i> , <i>Potamogeton pusillus</i> , <i>Zannichellia palustris</i>	<i>Phragmites australis</i> , <i>Juncus roemerianus</i> , <i>Spartina alterniflora</i>
Cross Bayou	May-10	68	30°12'16"N	89°34'34"W	<i>Zannichellia palustris</i> , <i>Vallisneria americana</i>	<i>Schoenoplectus tabernaemontani</i> , <i>Juncus roemerianus</i> , <i>Spartina alterniflora</i>
Mulato Bayou	May-08	69	30°12'15"N	89°34'31"W	<i>Myriophyllum spicatum</i> , <i>Ceratophyllum demersum</i> , <i>Zannichellia palustris</i> , <i>Najas guadalupensis</i>	<i>Phragmites australis</i> , <i>Spartina cynosuroides</i>

## DISCUSSION

The plant communities within the coastal river systems encompass tidal saltwater marshes, tidal oligohaline marshes, tidal freshwater marshes, and freshwater swamps (Wieland 1994). SAV habitat in the saltwater marsh areas near the Gulf such as Biloxi Bay and the lower regions of Pearl River are mainly vegetated by *R. maritima* that tolerates a wide range of salinities (Kantrud 1991); the *Ruppia* beds often occur along *Spartina alterniflora* Loisel (Smooth Cordgrass) shores. However, these areas

experience significant temporal fluctuations in presence and abundance of SAV since *R. maritima* growth and abundance is substantially influenced by the amount/timing of precipitation, winter/early spring temperatures, wind direction, and storms during a period precedent to the growing season.

The next most salt tolerant freshwater species that can live in brackish waters (mean salinity < 4 ppt) are *V. americana* and *M. spicatum*. In brackish areas along *Juncus roemerianus* Scheele (Black Needlerush), *Spartina cynosuroides* (L.) Roth (Big

Cordgrass), and *Schoenoplectus tabernaemontani* Gmelin (Softstem bulrush) marsh shores, *V. americana* often grows along with *R. maritima*. The size of *V. americana* in the rivers varies greatly with blade lengths ranging from 3 cm to longer than 1.2 m. *Myriophyllum spicatum*, known to be invasive in other Gulf states, did not appear to overgrow or be invasive in the Mississippi river systems.

Freshwater species that are easily confused with *R. maritima* such as *N. guadalupensis*, *P. pusillus*, and *Z. palustris* often grow together densely. We have observed that SAV tends to be abundant and diverse in brackish portions (mean salinities of 0.5 -3 ppt) of the coastal Mississippi river systems where the emergent vegetation in this salinity regime is characterized as brackish and intermediate marsh types (Eleuterius 1973). Relative abundance between *Ruppia/Vallisneria* and *Najas/Potamogeton/Zannichellia* in the same locations changes with season and also depends on the amount of freshwater inputs (i.e. rainfall). The freshwater species that tolerate mild brackish conditions occur primarily along the shores dominated by *Sagittaria lancifolia* L (Bulltongue Arrowhead), *Cladium jamaicense* Crantz (Sawgrass), *Schoenoplectus* spp. (Bulrushes) and *J. roemerianus*. While the dominant high marsh vegetation was *J. roemerianus* and *S. cynosuroides* in Pascagoula River and Back Bay of Biloxi, *Phragmites australis* (Cav.) Trin. ex Steud (Common Reed) was predominant in many areas in Pearl River.

*Callitriche heterophylla* occurred with *Vallisneria* in upstream areas where salinity is strictly fresh; *C. heterophylla* grew abundantly and formed thick surface canopies in cooler water during March, but disappeared by May as the water temperature increased. *Eleocharis baldwinii* was found in a highly colored, acidic, upstream black water system surrounded by trees.

## CONCLUSIONS

This study compared benthic communities of three Mississippi Gulf Coast bayous Casotte, Cumbest and Heron, located within Grand Bay NERR where residential, industrial, and recreational activities occur. Annelids were the dominant phylum consisting of 68% of the total abundance. On Average, the highest value of total invertebrate density was found in Bayou Cumbest (168.73m<sup>-2</sup>). For the entire study, the diversity of taxa as indicated by the Simpson Index varied between 1.00 and 2.1 bits. There was no significant difference in diversity between Bayou Heron (1.79 bits) and Bayou Cumbest (1.77 bits). Multiple regression analysis indicated that many water quality parameters could not be used in this study to explain the variations in the density and diversity of the macrobenthic communities. In order to better understand why macro benthic invertebrate counts differ among Bayous, Casotte, Heron, and Cumbest, physicochemical parameters alone cannot be used as they did little to distinguish one site from the other. A more exhaustive approach must be taken. A sediment analysis must be performed to determine the type and abundance of heavy metals, pollutants contaminants, and perhaps other xenobiotic substances that may have entered the Grand Bay NERR ecosystem. Regarding the density and diversity of macro benthic invertebrates, relative biomass measurements will need to accompany the samples.

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