THE VASCULAR FLORA OF COASTAL INDIAN CLAM SHELL MIDDENS IN SOUTH CAROLINA, U.S.A.

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ABSTRACT

The vascular plant species of Native American clam shell middens were sampled during the 2009–2013 growing seasons. The 15 middens selected in this study include Sewee midden north of Charleston, 6 at Hobcaw Barony in North Inlet-Winyah Bay Natural Research Preserve in North Inlet, and a cluster of 8 middens at Murrells Inlet, South Carolina. The vascular flora consists of 129 species within 114 genera in 48 families. The Poaceae (30 species), Asteraceae (12 species), and Fabaceae (12 species) are the largest families. *Sporobolus* (5 species) and *Cyperus* (3 species) are the largest genera in the flora. Species diversity was highest at the Sewee midden, and at the large Allston House midden on private property at Murrells Inlet. All middens in this study border on, or are islands within, salt marshes. Soil salinity and tidal flooding influence the distribution of salt marsh vascular plant species at South Carolina tidal marsh clam shell middens.

Key Words: vascular flora, clam shell middens, South Carolina

ABSTRACT

Las especies vasculares de plantas de acúmulos nativos americanos de cascaras de moluscos se muestrearon durante las estaciones de crecimiento de 2009–2013. Los 15 acúmulos seleccionados en este estudio incluyen uno, Sewee midden, al norte de Charleston, 6 en Hobcaw Barony en North Inlet-Winyah Bay Natural Research Preserve, y un conjunto de 8 en Murrells Inlet, en Carolina del sur. La flora vascular consistió en 129 especies de 114 géneros pertenecientes a 48 familias. Poaceae (30 especies), Asteraceae (12 especies), y Fabaceae (12 especies) fueron las familias más grandes. *Sporobolus* (5 especies) y *Cyperus* (3 especies) fueron los géneros más grandes de la flora. La diversidad de especies más alta fue en Sewee midden, y en el gran Allston House midden en una propiedad privada en Murrells Inlet. Todos los acúmulos en este estudio bordeaban, o son islas dentro de, marismas saladas. La salinidad del suelo y la influencia de la inundación mareal influencian la distribución de las especies de plantas vasculares de los acúmulos de marismas saladas en Carolina del Sur.

INTRODUCTION

Shell middens of coastal South Carolina are made of shell fish remains deposited by prehistoric Native Americans (Stalter et al. 1999). The middens selected in this study, located in coastal Georgetown and Charleston Counties, are composed primarily of clam shells. All of them are isolated in marshes with the exception of a small midden bordering a salt marsh near the better known and larger Sewee shell ring and the Allston House midden bordering a salt marsh at Murrells Inlet on private property (Fig. 1). Radio carbon dating revealed that the oldest midden was constructed 4,900 years ago, older than the oyster shell rings and middens in South Carolina that date from 3,100 to 3,900 years ago (Stalter et al. 1999). The 15 middens of this study are the largest of the 28 known clam shell middens in South Carolina. Several clam shell middens at Murrells Inlet, populated exclusively by salt marsh vegetation, were not included in our study. The 8 shell middens we selected at Murrells Inlet extend above the normal high tide and range in diameter from 17 m to 95 m. Elevation at the highest midden is 1.5 m above the upper limit of *Sporobolus alterniflorus,* the most tidal flooding tolerant species. The sides of the tidal middens are populated with salt marsh species influenced by tidal flooding and soil salinity. The rarely flooded tops of salt marsh clam shell middens are inhabited by calciphiles, though the rare *Foresteria godfreyi,* a candidate for federal listing from coastal middens, and the rare

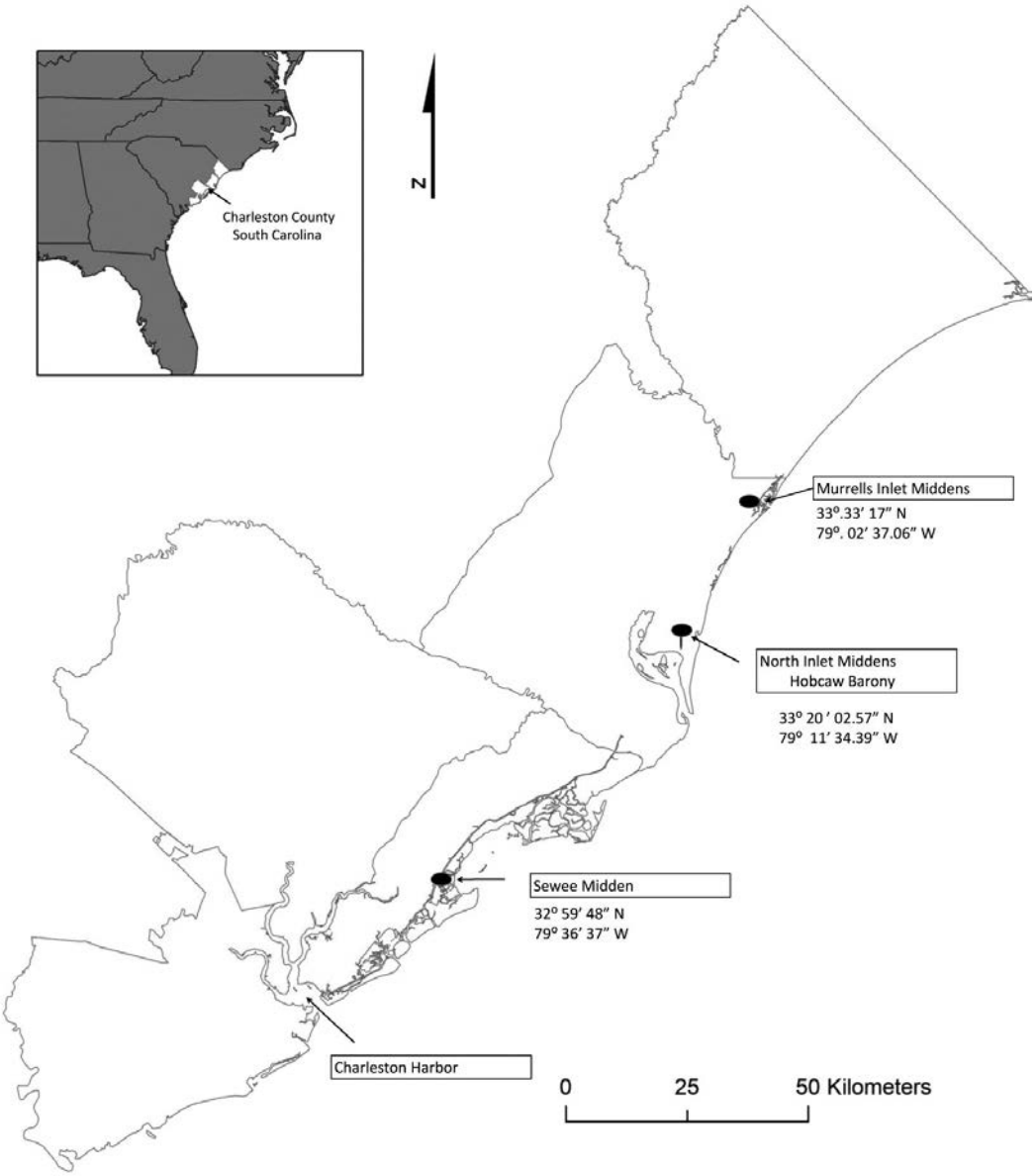

Fig. 1. Map showing the location of 15 clam shell middens in coastal South Carolina, 8 at Murrells Inlet 6 on Hobcaw Barony and one at Sewee. Map by Jennifer Plunket.

Sagaretia minutiflora (Radford et al. 1971), reported at South Carolina's oyster shell rings by Stalter et al. (1999), were not observed.

Middens composed primarily of clam (*Mercenaria mercenaria*) shells are rare when compared to those composed primarily of oyster (*Crassostrea virginica*) shells. Similar to the shell rings described by Stalter et al. (1999), the clam shell middens in this study are located on estuaries or tidal creeks. Two occupy high ground immediately bordering salt marshes while the remainder are located in salt marshes ranging from 100 m to 500 m offshore (Fig. 2).

Fig. 2. A typical clam shell midden surrounded by salt marsh vegetation at the North Inlet-Winyah Bay Natural Estuarine Research Reserve on Hobcaw Barony. Red cedar here survived Hurricane Hugo's storm surge September, 1989. Picture by Paul Kenney 2013

Middens in this study are composed primarily of clam shells, although shells of oysters, mussels (*Geukensia demissa*), periwinkle (*Littorina littorea*), and knobbed whelks (*Busycon carica*) are present in reduced amounts. The salinity range for successful *Mercenaria* growth and survival is narrower than that of the American oyster. Eggs of *M. mercenaria* develop normally when salinity ranges from 20ppt to 32.5ppt. Maximum growth of their larvae occurs when salinity is between 21ppt and 30ppt. Below 15ppt, growth ceases and mortality is high. Moreover, their pre-larval state requires a salinity level of at least 20ppt to successfully complete metamorphosis to the juvenile stage. *Crassostrea virginica*'s optimal salinity range for growth and reproduction is from 10ppt to 28ppt (Wilson et al. 2005). Their larvae will not settle and metamorphose into spat when salinity is less than 6ppt. Adult *C. virginica* can live in salinities up to 35ppt (Buroker 1983). Heavy rainfall (lowering salinity) and drought (raising water salinity) are common in South Carolina estuaries and may explain the relative scarcity of the hard-shell clam in shell middens.

The earliest account of shell midden flora in South Carolina is that of William Bartram who botanized the shell middens near Hilton Head, South Carolina in 1773 (Stalter et al. 1999). Bartram recorded the following taxa: *Magnolia grandiflora, Pinus taeda, Laurus borbonia* (*Persea borbonia*), *Quercus sempervirens* (*Q. virginiana*), *Corypha palma* (*Sabal palmetto*), *Prunus laurocerasus* (*Prunus caroliniana*), *Ilex aquifolium* (*I. opaca*), and *Juniperus americana* (*J. virginiana* var. *silicicola*).

Dorroh's (1971) vascular plant survey of 9 shell rings and 11 shell mounds, a total of 20 Indian shell middens in South Carolina, was the most comprehensive shell midden study in that state. She identified vascular

plant species within 3.6 m wide (12 ft) transects laid out along north, south, east, and west compass lines. Dorroh identified a total of 136 species in 59 families. Stalter et al. (1999) collected vascular plant species at 9 shell rings and one shell mound from South Carolina to north Florida from April 1993 to October 1994, yielding 241 species in 182 genera in 80 families. Two hundred and eight species, 86%, were native.

Stalter et al. (1999) provide a detailed survey of historical floristic inventories on coastal shell middens. These studies are described in the earlier paper we list but they do not describe in detail the studies of those who have contributed to our understanding of the flora, ecology, and archeology of these intriguing sites. Moore (1897), Gregorie (1925), Flannery (1943), Edwards (1965), Calmes (1967), Hemmings (1970), Dorroh (1971), DePratter (1974), and Trinkley (1980, 1985) provided useful information on the flora, composition, and origins of native shell middens in South Carolina. Moore (1897), Ford (1966), Cameron (1976), and Waring and Larson (1968) are noted for their midden studies in Georgia. Calmes (1967) includes the archeological work of William McKinley who described 3 shell rings at Sapelo Island, Georgia in 1872. Laessle (1942) and Griffen (1948) provided information on Florida's shell middens. Brown (1936) reported on the common plants found on Louisiana's shell middens. Eleuterius and Otvos (1979) surveyed the flora of a shell midden at Cedar Island, Mississippi, reporting only 62 species. More recently, McAvoy and Harrison (2012) examined plant communities and flora of Native American shell middens on the Delmarva Peninsula. They identified 202 native taxa including 21 that were new additions. This carefully researched paper includes a number of shell midden studies on the Delmarva, including those of Ducatel and Alexander (1834) and Moorehead et al. (1938).

In September 1989, Hurricane Hugo, a category 4 hurricane and storm of the century, had a debilitating effect on the vascular flora occupying shell middens north of Charleston, South Carolina, based on Stalter's et al. 1999 study. The hurricane surge reached 6 m at McClellenville, 50 km northeast of Charleston, and was at least 4 m at Georgetown, seriously impacting all vascular plant species at clam shell midden sites. Historical records include *Liriodendron tulipifera* and *Podophyllum peltatum* at the Auld shell ring north of Charleston (Gregorie 1925; Dorroh 1971). These species were not observed by Stalter in 1993/1994. Stalter et al. (1999) speculated that *Liriodendron* was toppled by Hugo's winds while salt water inundation may have killed *Podophyllum*. Other coastal species may weather hurricanes. *Quercus virginiana, J. virginiana* var. *silicicola, Morella cerifera,* and *Ilex vomitoria* near Clambank Landing, the site of one of our middens, survived Hugo's winds and storm surge while the University of South Carolina's boat shed nearby was destroyed.

CLIMATE

Two weather stations near the middens, Georgetown and Brookgreen Gardens, South Carolina, were selected to provide climate data for the study areas (Anonymous 1996). Climates for both sites are similar. January is the coldest month with a mean at Georgetown of 8.8°C and a daily range of 14.8°C to 2.56°C while Brookgreen Gardens, which is slightly inland and to the north, has a January mean of 7.9°C with an average low of 1.8°C and an average high mean of 14.1°C. July is the hottest month for both sites averaging 27.1°C at Georgetown and 26.9°C at Brookgreen. The high and low temperatures are 32.4°C and 21.8°C at Georgetown and 32.4°C and 21.4°C at Brookgreen. Annual rainfall averages 1368 mm at Georgetown, while an average of 1343 mm falls at Brookgreen Gardens. April is the driest month at both sites averaging 64.5 mm at Georgetown and 67.6 mm Brookgreen. July is the wettest month at both sites averaging 180.1 mm at Georgetown and 176.5 mm Brookgreen. Thirty-four days of 0°C can be expected during an average Georgetown winter while 45 days of below 0°C are normal for Brookgreen. The average temperature at the coastal midden sites might be slightly warmer in the winter with fewer frost free days and cooler in the summer. The weather station at Sullivan's island, 70km south of Georgetown has but 20 days below 0°C while Brookgreen located approximately 5km from the ocean has over twice as many days, 45, with frost.

METHODS

Fifteen clam shell middens were selected for the present study. These included 6 clam shell middens at Hobcaw Barony in North Inlet-Winyah Bay Natural Estuarine Research Reserve in North Inlet, Georgetown County

(33°20'02.57"N, 79°11' 4.39"W) and the clam shell midden near the larger, better known Sewee shell ring (32°59'48"N, 79°36'37"W), Charleston County, whose flora was described by Stalter et al. (1999). Eight additional middens were sampled at Murrells Inlet (33°33'17"N, 79°2'6"W); this coordinate is approximate to protect the sites from "pot hunters." All shell middens in this study were either surrounded by salt marsh or bordered salt marshes. Sites selected for the study were accessible by foot and boat. Three middens, Clambank Landing and Oyster Landing at Hobcaw Barony in North Inlet-Winyah Bay Natural Estuarine Research Reserve in North Inlet and Allston House midden at Murrells Inlet experience human disturbance.

The study was initiated in June 2009 and was terminated October, 2013. Each midden was sampled a minimum of six times during the growing season from March through November for a total of 36 field days. Vouchers of each vascular plant species were collected, prepared, and deposited at the AC Moore Herbarium, University of South Carolina (USCH). The Cyperaceae are housed at Northern Illinois University (NIH) while some Asteraceae are located in Eric Lamont's private herbarium. Nomenclature follows Weakley (2015).

RESULTS AND DISCUSSION

The vascular flora at the 15 clam shell middens consists of 129 species within 114 genera in 48 families (Table 1). Poaceae (30 species), Asteraceae (12 species), and Fabaceae (12 species) were the most represented families (Table 2) comprising 43% of the flora. *Sporobolus* (5 species) and *Cyperus* (3 species) were the most numerous genera (Table 2). Twenty-six vascular plant species, 20% of the flora, were not native to the region. Middens supporting the greatest number of non-native species were Alston House midden, Murrells Inlet, and Oyster Landing and Clambank middens at Hobcaw Barony in North Inlet-Winyah Bay Natural Estuarine Research Preserve in North Inlet. The percent of native species, 80%, was slightly lower than that reported in a more inclusive study of oyster shell ring midden species, 86%, from the Sewee shell ring north of Charleston, South Carolina, to north central coastal Florida (Stalter et al. 1999).

Five floristic studies at Native American shell middens, including the present study, are presented in Table 3. Dorroh (1971) reported 136 vascular plant species in 20 shell middens in South Carolina. Eleuterius and Otvos (1979) reported 62 vascular plant species in a shell midden at Cat Island, Mississippi. McAvoy and Harrison (2012) found 202 native species including 21 new additions to the flora of the Delmarva Peninsula. Stalter et al. (1999) reported 241 vascular plant species on 9 shell rings and one shell mound from central coastal South Carolina to central coastal Florida while the present study in north central coastal South Carolina included 129.

Tidal flooding and water and soil salinity play an important role in habitat selection and species zonation at shell middens (Fig. 1). *Sporobolus alterniflorus* occupies the lowest zone in the salt marsh and tolerates the greatest amount of tidal flooding (Kurz & Wagner 1957; Stalter 1968). Additional salt marsh vegetation, notably *Limonium, Sporobolus pumilus,* and *Sporobolus virginicus,* are narrowly distributed as a function of their tolerance to tidal flooding, soil salinity, and competition with neighbors (Stalter 1968). *Solidago sempervirens* var. *mexicana* typically occupies land just above the salt marsh and can tolerate tidal flooding. Stalter has observed this species thriving on salted roadsides on the Grand Central Parkway near Jamaica, New York, where he teaches at nearby St. John's University. Additional midden flora can be found approximately 1 m above *Sporobolus alterniflorus*. While these species are common at the coast they also grow at inland sites many meters above the upper limit of *Sporobolus alterniflorus*.

Data on distribution of clam midden vascular plant species at Allston House is similar to that reported at Oyster Landing. *Borrichia* occupies a narrower band of habitat above *S. alterniflorus* at Allston House than at Oyster Landing while *Q. virginiana* occupies land slightly less than 0.8 m above *S. alterniflorus*. *Muhlenbergia capillaris,* "sweet grass," used in Charleston's Gulluh baskets, occupies land 0.70 m above *S. alterniflorus* but has been reported from South Carolina's piedmont and coastal plain (Radford et al. 1971).

The clam shell middens in the present study were not as floristically rich as the flora of the Stalter et al. (1999) study of 9 shell ring middens and one shell mound midden from Charleston, South Carolina, to St. Augustine, Florida, where 241 vascular plant species were identified. The disparity in species was expected

Table 1. Summary of the vascular flora at 15 clam shell middens, South Carolina.

Ferns	Cryptogams	Gymnosperms	Dicots	Monocots	Total
Families	1	2	36	9	48
Genera	1	2	77	36	116
Species	1	2	83	43	129
Native Species	1	2	61	37	103
Non-Native Species	0	0	20	6	26

Table 2. Largest families and genera of the flora of Native American clam shell middens in South Carolina.

Family	No. of Species	Genera	No. of Species
Poaceae	30	*Sporobolus*	5
Asteraceae	12	*Cyperus*	3
Fabaceae	12		
Chenopodiaceae	6		
Cyperaceae	5		
Brassicaceae	4		
Caryophyllaceae	4		
Euphorbiaceae	4		
Lamiaceae	4		

Table 3. Investigator, location, and number of vascular plant species at Native American shell middens. NOTE: McAvoy and Harrison (2012) only included native species in their study.

Investigator	Location	No. of Species
Dorroh (1971)	South Carolina	136
Euleuterius & Otvos (1979	Mississippi	62
McAvoy & Harrison (2012)	Delmarva Peninsula	202
Stalter et al. (1999)	South Carolina-Florida	241
Stalter et al. (2017)	South Carolina	129

since the present clam shell midden study included 15 middens of narrower climate and latitudinal range from the Sewee shell ring north of Charleston (32°59'48"N) to Murrells Inlet south of Myrtle Beach (33°33'17"N). Moreover, 15 clam shell middens in the present study were smaller in size and less than 1.5 m above the surrounding salt marsh. All but 3 middens in the present study, Alston House, Sewee, and one un-named midden on Hobcaw Barony in North Inlet-Winyah Bay Natural Estuarine Research Reserve in North Inlet were less than l.5 m above normal high tide, limiting the vegetation colonizing them. All the clam shell middens were occupied by typical salt marsh vegetation, notably *Sporobolus alterniflorus, Borrichia frutescens, Salicornia virginica,* and *Sporobolus pumilus. Batis maritima,* which was common at the southern shell midden sites south of Charleston, was not observed at the clam shell middens nor was *Heliotropium currasavicum,* which was collected once at the larger Sewee oyster shell ring adjacent to the Sewee clam midden (Stalter et al. 1999). Notably absent from the clam shell middens was the rare calciphile, *Sageretia minutiflora. Arisaema drocontium, A. triphyllum, Corallorhiza wisteriana,* and *Hexalectris spicata* were present in the South Carolina to Florida shell ring study (Stalter et al 1999) but not observed in this survey. Three subtropical species, *Bidens alba* var. *radiata, Peperomia humilis,* and *Psychotria nervosa,* absent in the present study, were noted exclusively at the Florida shell rings (Stalter et al. 1999).

Common woody species were *Juniperus virginica* var. *silicicola, Quercus virginiana, Ilex vomitoria, Sideroxylon tenax,* and *S. lycioides.* Dead *Juniperus virginiana* var. *silicicola* occupied 3 middens at the Baruch Institute northeast of Clambank, victims of Hurricane Hugo's storm surge. *Opuntia drummondii* was a

conspicuous member of clam midden flora as well as *Melilotus officinalis* and *Yucca aloifolia*. *Aesculus pavia* and *Morus rubra* were identified exclusively at Alston House midden. Oyster and clam shell middens are ideal for calciphiles (McAvoy & Harrison 2012). In an earlier study by Stalter et al. (1999) at 6 oyster shell ring middens from South Carolina to Florida, available calcium values were high, ranging from 1497 ppm to 29706 ppm as determined by Cornell University soil scientists.

In summary, South Carolina clam shell middens contained 129 vascular plant species (see Appendix) with Poaceae, Asteraceae, and Fabaceae best represented in the flora. All middens in this study either border salt marshes or were "islands" in salt marshes. Species diversity was greatest at two of the largest middens, the Sewee midden and the large Allston House midden, on private property at Murrells Inlet. Most vascular plant species, 80%, were native to the region.

APPENDIX: ANNOTATED CHECKLIST OF SPECIES

The vascular plant taxa found at 15 shell midden sites have been arranged according to the following categories: vascular cryptogams, gymnosperms, dicots, and monocots. Within each category, families and lower taxa are arranged alphabetically. Nomenclature follows Weakley (2015).

Each entry includes the following information sequence: scientific name, pertinent synonyms [enclosed in brackets], and frequency relative to the clam shell middens using categories: rare (scarce, 1 to 2 middens), infreq. (uncommon occasional, 3 to 8 middens) and freq. (9 or more middens). Species found exclusively on only one shell midden are noted.

PTERIDOPHYTA

Polypodiaceae
Pleopeltis polypodioides (L.) E.G. Andrews & Windham [*Polypodium polypodioides* (L.) Watt]; infreq.

PINOPHYTA

Cupressaceae
Juniperus virginiana L. var. *silicicola* (Small) E. Murray [*Juniperus silicicola* (Small) Bailey]; infreq.

Pinaceae
Pinus taeda L.; infreq.

MAGNOLIOPHYTA - MAGNOLIOPSIDA (DICOTS)

Acanthaceae
Ruellia caroliniensis (J.F. Gmel.) Steud.; infreq.

Amaranthaceae
**Amaranthus viridis* L.; Boat Landing midden, Murrells Inlet; rare

Anacardiaceae
Toxicodendron radicans (L.) Kuntze var. *radicans*; freq.

Araliaceae
Hydrocotyle umbellata L.; freq.

Apiaceae
Sanicula canadensis L.; infreq.

Aquifoliaceae
Ilex vomitoria Aiton; infreq.

Asclepiadaceae
Pattalias palustre (Pursh) Fishbein; rare

Asteraceae
Ambrosia artmemisiifolia L.; rare
Baccharis halimifolia L.; freq.
Borrichia frutescens (L.) DC.; freq.
Conyza canadensis (L.) Cronquist var. *pusila* (Nutt.) Cronquist; infreq.
Erigeron quercifolius (Lam.); freq.
Eupatorium capillifolium (Lam.) Small; freq.
Gamochaeta purpurea (L.) Cabrera; infreq.
Iva frutescens L. var. *frutescens*; infreq.
**Lactuca floridana* (L.) Gaertn.; infreq.
Solidago mexicana L.; freq.
**Sonchus asper* (L.) Hill; freq.
Symphyotrichum tenuifolium (L.) G.L. Nesom; freq.

Bignoniaceae
Campsis radicans (L.) Seem. ex Bureau; infreq.

Brassicaceae
**Arabidopsis thaliana* (L.) Heynold; freq.
Cakile edentula (Bigelow) Hook.; infreq.
**Cardamine hirsuta* L.; infreq.
Lepidum virginicum L.; freq.

Cactaceae
Opuntia drummondii Graham; freq.
Opuntia humifusa (Raf.) Raf.; infreq.

Campanulaceae
Triodanis perfoliata (L.) Nieuwl.; freq.

Caprifoliaceae
Lonicera sempervirens L. Allston House midden, Murrells Inlet; rare

Caryophyllaceae
**Arenaria serpyllifolia* L.; infreq.
**Cerastium velutinum* Raf.; freq.
Silene antirrhina L.; freq.
Spergularia marina (L.) Besser; freq.

Chenopodiaceae
**Atriplex patula* L.; infreq.
Atriplex pentandra (Jacq.) Standl.; infreq.
Chenopodium album L.; infreq.
Salicornia virginica L.; single plant at a small mound, Baruch Institute; rare
Sarcocornia ambigua (Michx.) M.A. Alonco & M.B. Crespo; freq.
Suaeda linearis (Elliott) Moq.; infreq.

Euphorbiaceae
Acalypha gracilens A. Gray; infreq.
Cnidoscolus stimulosus (Michx.) Engelm. & A. Gray; freq.

Euphorbia maculata L.; infreq.
**Triadica sebifera* (L.) Small [*Sapium sebiferum* (L.) Roxb.]; freq.

Fabaceae
Chamaecrista nictitans (L.) Moench var. *nictitans*; infreq.
Clitoria mariana L. var. *mariana* Allston; House midden, Murrells Inlet; rare
Crotalaria rotundifolia Walt. ex J.F. Gmel. [*C. angulata* auct. non P. Mill]; Allston House midden, Murrells Inlet; rare
Desmodium paniculatum (L.) DC. var. *paniculatum;* freq.
Erythrina herbacea L.; freq.
Galactia regularis (L.) BSP.; infreq.
**Lespedeza stuevei* Nutt.; infreq.
**Medicago lupulina* L.; infreq.
**Melilotus officinalis* (L.) Lam.; infreq.
**Trifolium pratense* L.; freq.
**Trifolium repens* L.; freq.
**Vicia sativa* L. ssp. *sativa;* Clambank midden, Baruch Institute; rare

Fagaceae
Quercus laurifolia Michx.; Allston House midden; rare
Quercus virginiana P. Miller; infreq.

Geraniaceae
Geranium carolinianum L.; Allston House midden; rare

Hippocastanaceae
Aesculus pavia L.; infreq.

Juglandaceae
Carya glabra (P. Mill.) Sweet; infreq.

Lamiaceae
**Lamium amplexicaule* L.; freq.
Salvia lyrata L.; freq.
Teucrium canadense L.; freq.
Trichostema dichotomum L.; Allston House midden; rare.

Moraceae
Morus rubra L.; freq.

Phytolaccaceae
Phytolacca americana L.; freq.

Plantaginaceae
Nuttallanthus canadensis (L.) D.A. Sutton [*Linaria canadensis* L.]; freq.
**Plantago lanceolata* L.; infreq.

Plumbaginaceae
Limonium carolinianum (Walt.) Britt. [*L. nashii* Small]; infreq.

Portulacaceae
**Portulaca oleracea* L.; infreq.
Portulaca pilosa L.; Boat Landing midden, Murrells Inlet; rare

Rosaceae
Rubus trivialis Michx.; freq.

Rubiaceae
Galium pilosum Aiton; infreq.

Rutaceae
Zanthoxylum clava-herculis L.; freq.

Sapotaceae
Sideroxylon lycioides L. [*Bumelia lycioides* (L.) Pers.]; infreq.
Sideroxylon tenax L. [*Bumelia tenax* (L.) Willd.]; infreq.

Scrophulariaceae
**Verbascum thapsus* L.; freq.
**Veronica arvensis* L.; freq.

Solanaceae
Physalis walteri Nutt. [*P. viscosa* L. subsp. *maritima* (M.A. Curtis) Waterf.]; infreq.

Ulmaceae
Celtis laevigata Willd.; infreq.

Verbenaceae
Callicarpa americana L.; infreq.

Vitaceae
Muscadinia rotundifolia (Michx.) Small [*Vitis rotundifolia* Michx.]; infreq.
Nekemias arborea L. [*Ampelopsis arborea* (L.) Koehne]; infreq.
Parthenocissus quinquefolia L.; rare

MAGNOLIOPHYTA - LILIOPSIDA

Agavaceae
Yucca aloifolia L.; infreq.

Arecaceae
Sabal palmetto (Walt.) Lodd. ex. Schultes; infreq.

Bromeliaceae
Tillandsia usneoides (L.) L.; infreq.

Commelinaceae
Commelina erecta L.; Allston House midden; rare
Tradescantia ohiensis Raf.; infreq.

Cyperaceae
Bolboschoenus robustus Pursh [*Schoenoplectus robustus* Pursh M.T. Strong, *Scirpus robustus* Pursh.]; infreq.
Cyperus croceus L.; freq.
Cyperus polystachyos L.; freq.
Cyperus retrorsus Chapm.; infreq.
Fimbristylis castanea (Michx.) Vahl; infreq.

Iridaceae
Sisyrinchium rosulatum E.P Bicknell; Allston House midden; rare

Juncaceae
Juncus roemerianus Scheele; infreq.

Poaceae
Andropogon glomeratus (Walt.) BSP. Sewee Indian mound; rare
Andropogon virginicus L.; freq.
**Bromus catharticus* Vahl [*Bromus willdenowii* Kunth]; infreq.
**Bromus tectorum* L.; infreq.
Cenchrus tribuloides L.; freq.
**Coleataenia anceps* Michx. [*Panicum anceps* (L.) Michx.]; freq.
Dactyloctenium aegyptium (L.) Willd.; infreq.
Dichanthelium aciculare (Desv. ex Poir.) Gould & Clark; freq.
Distichlis spicata (L.) Greene; infreq.
Eustachys petraea (Swartz) Desv. [*Chloris petraea* Sw.]; infreq.
Hordeum pusillum Nutt.; infreq.
**Lolium perenne* L. [*L. multiflorum* Lam.]; infreq.
Melica mutica L.; freq.
Muhlenbergia capillaris (Lam.) Trin.; infreq.
Panicum virgatum L.; infreq.
Paspalum distichum L.; infreq.
Paspalum praecox (L.) Walt.; freq.
Phalaris caroliniana Walt.; freq.
**Poa annua* L.; infreq.
Schizachyrium scoparium (Michx.) Nash var. *littorale* (Nash) Gould; Allston House midden; rare
Sphenopholis obtusata (Michx.) Scribn.; infreq
Sporobolus alterniflorus (Loisel.) P.M. Peterson & Saarela [*Spartina alterniflora* Loisel.]; freq.

Sporobolus indicus (L.) R. Brown. [*Sporobolus poiretii* (R. & S.) Hitchc.]; freq.
Sporobolus pumilus (Roth) P.M. Peterson & Saarela [*Spartina patens* (Aiton) Muhl.]; freq.
Sporobolus vaginiflorus L.; freq.
Sporobolus virginicus (Walt.) Kuntze; infreq.
Stenotaphrum secundatum (L.) Kunth; infreq.
Piptochaetium avenaceum L. [*Stipa avenacea* L.]; freq.
Tridens chapmanii Small. [*Tridens flavus* (L.) Hitchc. Allston House midden]; rare
Vulpia octoflora Walt. [*Festuca octoflora* (Walt.) Rydb.]; infreq.

Smilacaceae
Smilax bona-nox L.; infreq.

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