

13360

Southwest Florida Coastal Strand and Maritime Hammock

BpS Model/Description Version: Aug. 2020

Update: 4/24/2018

Modelers		Reviewers	
Heather Summer	heather_summer@naturereserve.org	Chris Szell	cszell@tnc.org
None	None	Keith Fisher	kfisher@tnc.org
None	None	Ann Johnson	ajohnson@fnai.org

Vegetation Type

Forest and Woodland

Map Zones

56

Geographic Range

This Biophysical Setting (BpS) occurs as a narrow band of hardwood forest and shrublands lying just inland of the coastal dune system along the Gulf Coast of southwestern Florida (NatureServe 2006). It is distinguished from maritime hammocks further north which contain temperate species including *Persea borbonia*, *Quercus virginiana*, *Magnolia grandiflora* and *Juniperus virginiana* var. *silicicola* (Johnson and Muller 1993a).

Biophysical Site Description

This BpS is found on stabilized, old coastal dunes, often with substantial shell components. Coastal strand communities are considered to be ecotonal between beach dunes and more inland maritime hammocks, and occur immediately inland of dunes (FNAI 1990, Johnson & Mueller 1993).

Vegetation Description

The maritime hammock vegetation is characterized by hardwood species with tropical affinities. The northern extent of this type is dominated by live oak (*Quercus virginiana*) and cabbage palmetto (*Sabal palmetto*), and is limited by periodic freezes and cold tolerance of tropical constituent species, such as *Piscidia piscipula* and *Eugenia axillaris* (Johnson and Muller 1993, NatureServe 2006). Other species include *Bursera simaruba*, *Ficus aurea*, *Coccoloba uvifera*, *Sideroxylon foetidissimum*, *Ardisia escallonioides*, *Rapanea punctata*, *Zanthoxylum fagara*, and *Psychotria nervosa*.

Additionally, maritime hammocks on the Gulf coast of Florida have more spiny species, such as *Yucca aloifolia*, *Opuntia stricta*, and *Agave decipiens*, than do hammocks on the Atlantic coast. *Sabal palmetto* is an important component throughout the range of this community (Johnson and Barbour 1990, Johnson and Muller 1993a and b).

The shrubby coastal strand vegetation of the Gulf Coast lacks *Serenoa repens*, but includes many of the same species found on the Atlantic coast, including *Rapanea punctata*, *Ardisia escallonioides*, *Coccoloba uvifera*, and *Chiococca alba*. Additionally, the coastal strand in this system often occurs as "islands" in a matrix of coastal grasslands and interdunal swales. In the southern portion of this range, the coastal strand communities may also include tropical species

such as *Eugenia foetida* and *Pithecellobium keyense* (Johnson & Barbour 1990, Johnson & Mueller 1993a and b). Sabal palmetto is a dominant component of both coastal strand and maritime hammocks along the Gulf Coast of Florida.

This system may be distinguished from Southeast Florida Coastal Strand and Maritime Hammock (BpS 1337) by geographic location, presence of certain indicator species lacking from the southeast type (*Piscidia piscipula*, *Jacquinia keyensis*) and relatively less harsh coastal exposure (NatureServe 2006). It is distinguished from coastal strand and maritime hammocks further north which contain temperate species including *Persea borbonia*, *Magnolia grandiflora* and *Juniperus virginiana* var. *silicicola* (Johnson and Muller 1993, NatureServe 2006).

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
QUVI	<i>Quercus virginiana</i>	Live oak
SAPA	<i>Sabal palmetto</i>	Cabbage palmetto
CHAL8	<i>Chiococca alba</i>	West indian milkberry
COUV	<i>Coccoloba uvifera</i>	Seagrape
PIPI3	<i>Piscidia piscipula</i>	Florida fishpoison tree
EUAX	<i>Eugenia axillaris</i>	White stopper
YUAL	<i>Yucca aloifolia</i>	Aloe yucca
MUCA2	<i>Muhlenbergia capillaris</i>	Hairawn muhly

Species names are from the NRCS PLANTS database. Check species codes at <http://plants.usda.gov>.

Disturbance Description

Maritime hammock communities experienced relatively infrequent, light surface fires, with a fire return interval generally no more than 26-100yrs. The major source of disturbance in southwest Florida maritime hammocks is hurricanes and associated wind/weather events (FNAI 1990).

Maritime hammocks are relatively stable communities, as long as the canopy remains intact and the underlying landform is stable (FNAI 1990). Surface fires may help to maintain the open understory, and although *Serenoa* is flammable, its short stature generally prevents fire from being carried into the crown. Thus, crown fires are extremely rare, if not non-existent (Davison and Bratton 1988).

Evidence indicates that other factors such as salt spray and storm overwash may control successional dynamics.

Coastal strand communities are considered ecotonal, and historically burned more frequently than maritime hammocks, possibly every 4-5yrs (Austin and Coleman-Marais 1977). However, there is some disagreement on this point. The low stature of strand is due to its being a recovery stage after storm destruction and salt spray pruning. Fire is not needed to explain coastal strands. On the east coast where the 1977 Austin and Coleman-Marais study was done, fire would have to come from the mainland (i.e., through a maritime hammock) and fight a strong headwind off the ocean (i.e., the prevailing easterlies) in order to burn strand which doesn't seem as though it would have happened very frequently (Johnson, pers. comm.).

In the absence of fire, it is likely that coastal strand communities will eventually succeed to maritime hammock, although it has been suggested that maritime influences alone are enough to prevent this succession (FNAI 1990).

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement				
Moderate (Mixed)	455	2	100	500
Low (Surface)	10	98	10	50
All Fires	10	100		

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is the central tendency modeled. Percent of all fires is the percent of all fires modeled in that severity class. Minimum and Maximum FIs show the relative range of fire intervals as estimated by model contributors, if known.

Scale Description

Most original stands of maritime hammock were <1,000ac. They occurred as one element in a much more extensive coastal complex consisting of marshes, dune grasslands and coastal strand.

Adjacency or Identification Concerns

This BpS is closely related to southeast Florida maritime hammocks (BpS 1337), and may share some species overlap. LANDFIRE VDDT models are very similar for both, although fire frequency values differ slightly.

Others disagree: Coastal areas subject to more frequent storm disturbance and less frequent fire than inland communities, given their landscape context. That is, fire can only reach coastal areas from 180 degrees of the compass, not 360 degrees.

Issues or Problems

This model assumes that the coastline is accreting over time; however, the time scale used in this model may not accurately represent the rate of accretion (which may occur much slower than modeled). Further revisions may be necessary to accommodate a more accurate timeline or a non-accreting coastline.

Coastal strand and maritime hammock are some of, if not the, most rapidly disappearing communities in Florida. The close proximity to the beach, as well as being slightly elevated and protected, makes these communities prime targets for development. In addition, they may be replaced by pure stands of the exotic Australian pine (*Casuarina equisetifolia*) which is a faster colonizer of beaches cleared by storm overwash than the native species (Johnson 1994)

Native Uncharacteristic Conditions

Comments

This model was based on Rapid Assessment model # R9MARF, by Cecil Frost. Suggested reviewer is Ann Johnson (FNAI). This model was reviewed during a model review workshop held 09/19/2006 Tallahassee, Florida, and also reviewed by Ann Johnson 12/12/2006.

Succession Classes

Mapping Rules

Upper Layer Lifeform	Height (m)	Canopy Cover (%)									
		0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
Herb	0-0.5	A	A	A	B	B	B	B	B	B	B
Herb	0.5-1.0	A	A	A	B	B	B	B	B	B	B
Herb	>1.0	A	A	A	B	B	B	B	B	B	B
Shrub	0-0.5	C	C	C	C	C	C	C	C	C	C
Shrub	0.5-1.0	C	C	C	C	C	C	C	C	C	C
Shrub	1.0-3.0	C	C	C	C	C	C	C	C	C	C
Shrub	>3.0	C	C	C	C	C	C	C	C	C	C
Tree	0-5	D	D	D	D	D	D	D	D	D	D
Tree	5-10	D	D	D	D	D	D	D	D	D	D
Tree	10-25	E	E	E	E	E	E	E	E	E	E
Tree	25-50	E	E	E	E	E	E	E	E	E	E
Tree	>50	E	E	E	E	E	E	E	E	E	E

Succession class letters A-E are described in the Succession Class Description section. Some classes use a leafform distinction where a qualifier is added to the class letter: Brdl (broadleaf), Con (conifer), or Mix (mixed conifer and broadleaf). UN refers to uncharacteristic native or a combination of height and cover that would not be expected under the reference condition. NP refers to not possible or a combination of height and cover which is not physiologically possible for the species in the BpS.

Description

Class A 5 Early Development 1 - All Structures

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
IPPE	<i>Ipomoea pes-caprae</i>	Bayhops	All
CARO26	<i>Canavalia rosea</i>	Baybean	All
IPIM	<i>Ipomoea imperati</i>	Beach morning-glory	All

Description

Class A represents the exposed upper beach and bare sand dunes with extensive areas of sparse vegetative cover. This stage primarily results from storm/hurricane events, as well as formation of new dunes by wind or wave driven sand accretion. This is an unstable environment that is often disturbed, and also maintained, by waves from storms and high tides. Early colonizers may include *Ipomoea pes-caprae* and *Canavalia rosea*.

Maximum Tree Size Class

None

Class B 13 Mid Development 1 - Open

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
UNPA	<i>Uniola paniculata</i>	Seaoats	All
SEPO2	<i>Sesuvium portulacastrum</i>	Shoreline seapurslane	All
SCPL	<i>Scaevola plumieri</i>	Gullfeed	All
IVIM	<i>Iva imbricata</i>	Seacoast marshelder	All

Description

Class B represents a foredune, created as plants colonize the exposed sand dunes and windblown sand accumulates around them. Plant species are continually growing upward as they are constantly buried by windblown sand from the beach. Plants include salt-tolerant herbs, succulents, and shrubs and may include *Sesuvium portulacastrum*, *Scaevola plumieri*, *Sporobolus virginicus*, *Uniola paniculata*, *Iva imbricata*, *Distichlis spicata*, *Canavalia rosea*, and *Spartina patens*. Disturbances that affect this class include hurricanes and storms of varying severity and frequency. Fire is absent.

Maximum Tree Size Class

None

Class C	38	Mid Development 2 - Closed
----------------	-----------	-----------------------------------

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
MUCA2	<i>Muhlenbergia capillaris</i>	Hairawn muhly	All
SPPA	<i>Spartina patens</i>	Saltmeadow cordgrass	All
UNPA	<i>Uniola paniculata</i>	Seaoats	All
BOHI2	<i>Bouteloua hirsuta</i>	Hairy grama	All

Description

Class C represents a coastal grassland (cover 61-100% and height 0->1m), dominated by a variety of tall grasses, including *Muhlenbergia capillaris*, *Spartina patens*, *Andropogon glomeratus*, with occasional patches of *Uniola paniculata* and *Paspalum vaginatum*. This grassland may also include dense stands of *Bouteloua hirsuta*. This class also represents grassy, interdunal swales. There may be small tiny patches of bare sand.

This coastal grassland transition zone will develop as the foredunes become more well developed and provide some protection for species less tolerant of sand burial to survive. Disturbances that affect this class include hurricanes and storms of varying severity and frequency. Fire may or may not be frequent, however, any fire will likely keep a community in class C.

Maximum Tree Size Class

Seedling <4.5ft

Class D	19	Late Development 1 - Closed
----------------	-----------	------------------------------------

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
SAPA	<i>Sabal palmetto</i>	Cabbage palmetto	All
CHAL8	<i>Chiococca alba</i>	West indian milkberry	All
COUV	<i>Coccoloba uvifera</i>	Seagrape	All
PIPI3	<i>Piscidia piscipula</i>	Florida fishpoison tree	All

Description

Class D represents a coastal strand community, which may or may not be mixed with patches of coastal grassland. Although there may be saplings or small trees, the shrub layer is still the dominant lifeform. Canopy closure of the shrub layer would be ~50-100%, with occasional gaps due to storm events or patches of severe fire, as well as mixed patches of coastal grassland. The height of the shrub layer would be ~1-3 m. Like the southeastern Florida coastal strand, the Gulf Coast coastal strand is composed of dense shrubs (tropical and temperate), generally of a low stature, with scattered seedlings, saplings and small trees (particularly *Sabal palmetto*). Common species include *Forestiera segregata*, *Rapanea punctata*, *Chiococca alba*, *Coccoloba uvifera*, and *Lantana involucrata*. Other shrubs, such as *Piscidia piscipula* and *Jacquinia keyensis*, are only found on the Gulf Coast. *Serenoa repens* does not occur in coastal strand communities on the Gulf coast.

Often these southwest Florida coastal strand communities occur as "islands" in a matrix of coastal grasslands and interdunal swales. Disturbances that affect this class include hurricanes and storms of varying severity and frequency. Fire may or may not be frequent.

Maximum Tree Size Class

Pole 5-9" DBH

Class E 25 Late Development 2 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QUVI	<i>Quercus virginiana</i>	Live oak	All
SAPA	<i>Sabal palmetto</i>	Cabbage palmetto	All
EUAX	<i>Eugenia axillaris</i>	White stopper	All

Description

Class E represents the old-growth maritime hammock community, characterized by a closed canopy of temperate and tropical tree species and an open-to-dense understory of shrubs, tree saplings, and vines. In the northern range of this system, typical canopy species include *Quercus virginiana*, *Sabal palmetto*, and *Persea borbonia*; whereas, in the southern range of this system, the canopy is dominated by tropical species such as *Piscidia piscipula*, *Bursera simarouba*, *Ficus aurea*, *Coccoloba uvifera*, and *Sideroxylon foetidissimum*. Other species include *Ardisia escallonioides*, *Rapanea punctata*, *Zanthoxylum fagara*, *Eugenia axillaris*, and *Psychotria nervosa*. Additionally, maritime hammocks on the Gulf Coast of Florida also seem to have more spiny species, such as *Yucca aloifolia*, *Opuntia stricta*, and *Agave decipiens*, than do hammocks on the Atlantic coast.

Maritime hammocks form on old coastal dunes that have become stabilized over time, and have allowed for the establishment of tree seedlings. Maritime hammocks generally start as isolated strips of trees that gradually join together to become a continuous forest. Natural fire is rare in the maritime hammock, probably occurring no more than once every 26-100yrs. However, maritime hammocks are relatively stable, and as long as the canopy remains intact and the underlying landform is not disturbed, fire will not severely impact the hammock. The main disturbances that affect this community are hurricanes and storms of varying severity and frequency.

Maximum Tree Size Class

Very Large >33"DBH

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:ALL	0	Mid1:OPN	7
Mid1:OPN	8	Mid2:CLS	19
Mid2:CLS	20	Late1:CLS	59
Late1:CLS	60	Late2:CLS	99
Late2:CLS	100	Late2:CLS	999

Probabilistic Transitions

Disturbance Type	Disturbance occurs In	Moves vegetation to	Disturbance Probability	Return Interval (yrs)	Reset Age to New Class Start Age After Disturbance?	Years Since Last Disturbance
Wind or Weather or Stress	Early1:ALL	Early1:ALL	0.1	10	Yes	0
Wind or Weather or Stress	Mid1:OPN	Early1:ALL	0.01	100	Yes	0
Wind or Weather or Stress	Mid1:OPN	Mid1:OPN	0.05	20	No	0
Wind or Weather or Stress	Mid2:CLS	Early1:ALL	0.005	200	Yes	0
Wind or Weather or Stress	Mid2:CLS	Mid1:OPN	0.02	50	Yes	0
Surface Fire	Mid2:CLS	Mid2:CLS	0.2	5	No	0
Mixed Fire	Late1:CLS	Mid2:CLS	0.005	200	Yes	0
Wind or Weather or Stress	Late1:CLS	Early1:ALL	0.005	200	Yes	0
Wind or Weather or Stress	Late1:CLS	Mid2:CLS	0.01	100	Yes	0
Surface Fire	Late1:CLS	Late1:CLS	0.1	10	No	0

Wind or Weather or Stress	Late2:CLS	Early1:ALL	0.002	500	Yes	0
Mixed Fire	Late2:CLS	Mid2:CLS	0.005	200	Yes	0
Wind or Weather or Stress	Late2:CLS	Late1:CLS	0.005	200	Yes	0
Surface Fire	Late2:CLS	Late2:CLS	0.02	50	No	0

References

- Austin, D.F. and K. Coleman-Marois. 1977. Vegetation of southeastern Florida. II. Boca Raton hammock site. *Florida Scientist* 40: 331-338.
- Davison, K.L. and S.P. Bratton. 1988. Vegetation response and regrowth after fire on Cumberland Island National Seashore, Georgia. *Castanea* 53(1): 47-65.
- Duever, L.C. 1983. Natural communities of Florida's Coastal Dunes. Palmetto, November 1983: 8-11.
- FNAI [Florida Natural Areas Inventory]. 1990. Guide to the natural communities of Florida. Florida Natural Areas Inventory and Florida Department of Natural Resources, Tallahassee. 111 pp.
- Johnson, A.F. 1994. Coastal impacts of non-indigenous species. Chapter 3.1 in: (D.C. Schmitz and T. C. Brown, eds) *An assessment of invasive non-indigenous species in Florida's public lands*. Technical Report No. TSS-94-100, Bureau of Aquatic Plant Management, Division of Environmental Resource Permitting, Florida Department of Environmental Protection, Tallahassee, FL.
- Johnson, A.F. and M.G. Barbour. 1990. Dunes and maritime forests. Pages 429-480 in: R.L. Myers and J.J. Ewel, editors. *Ecosystems of Florida*. University of Central Florida Press, Orlando, FL.
- Johnson, A.F. and J.W. Muller. 1993a. An assessment of Florida's remaining coastal upland natural communities: Final summary report. The Nature Conservancy, Florida Natural Areas Inventory, Tallahassee, FL. 37 pp.
- Johnson, A.F. and J.W. Muller. 1993b. An assessment of Florida's remaining coastal upland communities: southwest Florida. The nature Conservancy, Florida Natural Areas Inventory, Tallahassee, FL.
- NatureServe. 2006. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA, U.S.A. Data current as of 18 July 2006.

NatureServe. 2007. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA. Data current as of 10 February 2007.

US Fish & Wildlife Service. 1999. South Florida multi-species recovery plan. Atlanta, GA. 2172 pp.