

Ecosystem Description

Woody vegetation on the barrier islands includes well-developed forests with canopies typically dominated by live oak, sand laurel oak, and loblolly pine; cabbage palms are a distinctive component in the Cape Fear area. It also includes the distinctive scrubby woody growth of stabilized sand dunes, dune swales, and sand flats. A few areas on the mainland shore of the sounds share the characteristic species of the barrier island maritime forests. The much rare maritime deciduous forests are dominated by beech, American holly, loblolly pine and hickory on the northern barrier islands.

Maritime forests have relatively low species richness, but a number of species are largely confined to these communities, at least in North Carolina. Such specialized species include yaupon, Carolina laurel cherry, and devilwood. Salt spray is a major ecological influence on these communities. Where the vegetation is frequently exposed to salt spray, it is significantly stunted. The forest cannot persist in areas with the most severe salt spray and are dependent on the shelter of dunes for their occurrence. Maritime forests are also subject to the catastrophic disturbances of coastal storms, including high winds, erosion, and salt water flooding from storm tides and overwash.

The 2005 Wildlife Action Plan describes the Mid-Atlantic Coastal Plain Maritime Forest/Shrub community as a component of this community and a priority habitat (see Chapter 5A) (NCWRC 2005). Only one good example of maritime deciduous forest remains at Nags Head Woods in Dare County; an additional example occurs in nearby Kitty Hawk Woods. Maritime evergreen forest is found throughout the barrier islands and good examples can be found at Buxton Woods, Theodore Roosevelt State Natural Area on Bogue Banks, Brown’s Island, and Bald Head Island. Maritime shrub is found throughout the barrier islands, but good examples are rare. Some examples exist at Cape Hatteras National Seashore, Shackleford and Core Banks, Brown’s Island, Bear Island in Onslow County, Fort Macon State Park, Bogue Banks, and Fort Fisher (NCWRC 2005).

Table 1 at the end of this report provides of summary of expected climate change impacts to these natural communities.

Predicted Effects to Wildlife Species

Tables 2 through 6 at the end of this report identify the species of conservation concern and priority species that use habitats in this ecosystem.

The presence of dense canopies are a key habitat element in maritime forests; many maritime forest-associated herpetofauna, and their prey, are adapted to survive under particular sun and shade regimes (Bailey *et al.* 2004, NCWRC 2005).

These habitats are important breeding and migration stopover points for many migratory birds, and key breeding areas for populations of the eastern painted bunting (Hunter *et al.* 2000, Johns 2004). These communities are also important for some snake species for which we have little status, distribution, or demographic information (NCWRC 2005).

Climate Change Compared to Other Threats

Unprotected examples are likely to be destroyed by development before climate change effects become drastic. However, with most unprotected areas already destroyed, climate change effects are the greatest threats for most remaining examples.

Table 7 compares climate change with other existing threats.

Table 7. Comparison Of Climate Change With Other Threats		
Threat	Rank Order	Comments
Climate Change	1	While most Maritime Upland Forests are elevated enough that they are not subject to direct inundation under moderate sea level rise scenarios, associated effects of climate change are a major threat to them. For sites in conservation status, it is the greatest threat.
Development	1	For areas not in conservation status, land development and conversion is the greatest threat and is likely to destroy all before climate change effects become substantial.
Fire suppression	2	A lack of fire to maintain some variants of these habitats is also leading to successional changes in many of these sites. Burning is almost impossible to conduct in areas surrounded by homes. Almost all fire maintained examples have disappeared with the exception of some shrub scrub on National Wildlife Refuge lands.
Invasive feral livestock	3	There are also feral animal impacts (horses, goats, cows, cats) on some of the barrier islands (<i>e.g.</i> , Shackleford Banks). In addition, egg predators such as raccoons and foxes that typically did not inhabit most of the Outer Banks are now widespread because of the increased amount of food available now that people inhabit the area. (NCWRC 2005). A problem on some Brunswick County dredge islands, Brown's Island, Rachel Carson NERR, and parts of Currituck Banks.

Summary and Recommendations

Though coastal uplands are essentially the most costly areas to acquire in the state, it is essential to acquire remaining undeveloped maritime forests, both on barrier islands and on the mainland. In fact, maritime (coastal fringe) forests on the mainland are grossly under-protected (NCWRC 2005). Protecting remaining examples will allow ecosystem processes related to climate change to gradually influence natural community composition and structure, and reduce the amount of catastrophic change resulting in outright destruction.

Recommended Actions

- Surveys
- Conduct surveys of migrant land birds to quantify the importance of this habitat for migrants.
 - Conduct migration surveys to determine bird use, especially during the fall.
 - Conduct surveys on barrier island systems to verify species status, distribution, and community composition for all priority species in maritime communities.
- Monitoring
- Continue monitoring Eastern Painted Buntings every 5 to 10 years to monitor these populations.
 - Continue long-term monitoring and banding work (currently being done by the US Geological Survey) on eastern painted buntings and support the goals and objectives of the Painted Bunting Working Group that involves Florida, Georgia, South and North Carolina.
 - Continue monitoring heronries that nest with shrub/scrub habitat.
 - Establish MAPS and migration banding stations in this habitat type.
 - Establish long-term monitoring of amphibians and reptiles, once survey data has been established.
- Research
- Evaluate effects of sea level rise.
 - Conduct cooperative research with western states to determine the genetic relationships between eastern and western painted buntings.
 - Maritime forests in the far southeastern portion of the state historically supported eastern woodrats; consider those habitats as potential reintroduction sites.
 - Conduct studies of demographics and population dynamics, habitat selection, and competition factors for all priority species in this habitat.
- Management Practices
- Re-establishment of maritime forest habitats should be pursued, including initiation of prescribed burning of appropriate maritime habitats, where possible (NCWRC 2005).

Land
Protection

- Work with local governments to develop laws or ordinances that require certain amounts of native vegetation be retained, and buffers of vegetation be left along the sounds (NCWRC 2005).
- Remaining coastal maritime habitats must be a priority for land acquisition efforts.

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Climate Change Factor	Comments
Coastal Erosion	Coastal erosion will likely reduce their extent. Erosion of dunes may remove salt spray protection.
Wind Damage	Increased hurricane activity, with storm surge into the lower portions, heavy salt spray, and wind throw, will increase mortality of trees and other components. Increased frequency will result in younger canopies, more time spent in recovery stages, and shifts toward the most tolerant species.
Storm Surge	Increased hurricane activity, with storm surge into the lower portions, heavy salt spray, and wind throw, will increase mortality of trees and other components. Increased frequency will result in younger canopies, more time spent in recovery stages, and shifts toward the most tolerant species.
Sea Level Rise -- Inundation	Most maritime upland forest sites are more than 1 meter above sea level and are unlikely to be directly inundated. Most occur on the widest, oldest, and most stable parts of the barrier islands. They are in the least likely places to be affected by new inlets. Riggs (presentation to the Sea Level Rise symposium and personal communication 2010) indicates that even if the Outer Banks collapses and most of it is lost, the wide areas that support most of the maritime forests will remain as islands.
Latitudinal Change	There may be substantial movement of communities on barrier islands, with those nearest the foredunes destroyed by erosion and storms and new ones appearing in the most exposed portions. Inland communities They may possibly spread inland with warmer temperatures, displacing longleaf pine communities or other hardwood forests, to the extent that land is available to them. Some of North Carolina's species and community types may extend their ranges northward in Virginia. Many maritime plants disperse readily, but the naturally and artificially fragmented distribution of maritime forests may limit such latitudinal migration.
Acreage Change	There will be net loss of some communities due to loss of protection from salt spray and other natural disturbances. The acreage completely lost from this system by community shifts and destruction is very uncertain. It most likely will be moderate rather than catastrophic, but any loss will be very significant for these already-rare communities.
Structural Change	Much uncertainty about magnitude of effect. Warmer temperatures and milder winters may allow some species to migrate into these communities from the south. Species that reach their northern range limits in North Carolina, such as cabbage palm, rain lily, and coralbean, may appear in new sites. Species not now native here, such as slash pine, could potentially enter the state first in maritime forests. The arrival of new species native to these communities farther south should not be regarded as a negative effect.

Table 2. Bird Species Utilizing Maritime Upland Forest

Species	Common Name	Element Rank	Endemic	Major Disjunct	Extinction/Extirpation Prone	US/NC/WAP*	Comments
BIRDS							
<i>Chordeiles minor</i>	Common Nighthawk						
<i>Egretta caerulea</i>	Little Blue Heron	G5/S3B, S3N				/SC/P	
<i>Egretta thula</i>	Snowy Egret	G5/S3B, S3N				/SC/P	
<i>Egretta tricolor</i>	Tricolored Heron	G5/S3B, S3N				/SC/P	
<i>Hylocichla mustelina</i>	Wood Thrush						
<i>Passerina ciris ciris</i>	Eastern Painted Bunting	G5T3T4/S3B				FSC/SR/P	
<i>Plegadis falcinellus</i>	Glossy Ibis	G5/S2B, SZN				/SC/P	

Table 3. Mammal Species Utilizing Maritime Upland Forest

Species	Common Name	Element Rank:	Endemic	Major Disjunct	Extinction/Extirpation Prone	US/NC/WAP*	Comments
MAMMALS							
<i>Peromyscus leucopus easti</i>	White-footed Mouse					/SC/P	

Table 4. Reptile Species Utilizing Maritime Upland Forest

Species	Common Name	Element Rank	Endemic	Major Disjunct	Extinction/Extirpation Prone	US/NC/WAP*	Comments
REPTILES							
<i>Cemophora coccinea copei</i>	Northern Scarletsnake					/ /P	
<i>Heterodon simus</i>	Southern Hog-nosed Snake					/SC/P	
<i>Lampropeltis getula getula</i>	Eastern Kingsnake					/ /P	
<i>Lampropeltis getula sticticeps</i>	Outer Banks Kingsnake					/SC/P	
<i>Masticophis flagellum</i>	Eastern Coachwhip					/SR/P	
<i>Micrurus fulvius</i>	Eastern Coral Snake					/E/P	

Table 5. Amphibian Species Utilizing Maritime Upland Forest

Species	Common Name	Element Rank:	Endemic	Major Disjunct	Extinction/Extirpation Prone	US/NC/WAP*	Comments
AMPHIBIANS							
<i>Bufo quercicus</i>	Oak Toad					/SR/P	
<i>Desmognathus auriculatus</i>	Southern Dusky Salamander					/ /P	
<i>Scaphiopus holbrookii</i>	Eastern Spadefoot					/ /P	

Table 6. Invertebrate Species Utilizing Maritime Upland Forest

Species	Common Name	Element Rank	Endemic	Major Disjunct	Extinction/Extirpation Prone	US/NC/WAP*	Comments
INVERTEBRATES							
<i>Catocala messalina</i>	Messaline underwing (moth)	G4/S2?				/SR/	
<i>Drasteria graphica</i>	Graphic moth	G4/S2S3				/SR/	A single population is known from the state at Carolina Beach State Park. The taxonomic status of this species needs work.
<i>Litoprosopus futilis</i>	Palmetto borer (moth)	G4/SU				/W3/	May spread northward with expansion of its host plant, cabbage palmetto.
<i>Papilio cresphontes</i>	Giant swallowtail	G5/S2				/SR/	
<i>Zale declarans</i>	An owlet moth	G5/S2S3				/SR/	

*** US/ NC/ WAP Abbreviations (species are subject to reclassification by USFWS, NHP, or WRC).**

E	Endangered	SC	Special Concern	P	WAP Priority Species
T	Threatened	SR	Significantly Rare		
FSC	Federal Species of Concern	W	Watch Category		
T(S/A)	Threatened due to Similarity of Appearance				

NatureServe Element Rank: <http://www.natureserve.org/explorer/ranking.htm>

USFWS Endangered Species Listing Status: http://www.fws.gov/raleigh/es_tes.html

NC Natural Heritage Program Status:
<http://www.ncnhp.org/Images/2010%20Rare%20Animal%20List.pdf>

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