Pocosin

Mid-Atlantic Coastal Plain

Peatland communities of the Coastal Plain include low pocosin, high pocosin, pond pine woodlands, peatland Atlantic white cedar forest, bay forest, streamhead pocosin, and streamhead Atlantic white cedar forest. These communities occur on peatlands of poorly drained interstream flats, and peat-filled Carolina bay depressions and swales of the eastern coastal plain (Schafale and Weakley 1990). The streamhead communities occur primarily in the Sandhills along small headwater streams, either on flat bottoms or extending up adjacent seepage slopes.

Extremely acidic in nature due to organic soils, in general these habitats are nutrient poor and usually continuously saturated with water. Fires were historically associated with droughts, and fire frequency and intensity strongly influence vegetative structure dominance, composition, stature and diversity. All but the streamhead communities occur along a gradient of moisture, nutrients, and peat depth and typically occupy different locations with the domed peatlands of interstream flats and Carolina Bays and swales. The wettest sites (or the center of bays) may contain only low shrubs and stunted pond pine, with beds of sphagnum, pitcher plants, and cranberry. Higher, drier sites are characterized by an extremely dense shrub layer.

Both High and Low Pocosins are extremely nutrient poor, with little normal nutrient input other than rainfall. Under natural conditions, fire was an important component shaping the structural diversity of these communities. Low Pocosins are centrally located on peatlands on the deepest peat. They are the least productive and most stunted of all the pocosin habitats. True Low Pocosins are much rarer than High Pocosins or Pond Pine Woodlands and differ from the others by having a persistent low stature (<1.5m tall) of shrubby vegetation and sparse, stunted trees. High Pocosins are intermediate between Low Pocosins and Pond Pine Woodlands in terms of location, depth of peat, shrub height and density, and stature of trees. The shrub layer is typically 1.5-3 meters in height and trees still tend to be scattered and small in stature.

Pond Pine Woodlands occur on parts of domed peatlands on poorly drained interstream flats, peat-filled Carolina bays, and shallow swales and are found throughout the Coastal Plain (Schafale and Weakley 1990). Some stands occupy many thousands of acres, such as in Croatan National Forest, Holly Shelter Game Land, and Green Swamp. These communities are wet and nutrient poor, though less so than Low and High Pocosins, and fire played a role in shaping them historically. In areas where frequent fires have occurred over long periods of time, the understory is dominated by switch cane (Arundinaria) and in general the less frequent the fire regime the greater the dominance by pond pine (Schafale and Weakley 1990). Red-cockaded woodpeckers exist in some of these pond pine-dominated sites.

Another community that occurs within large peatland landscapes is the peatland Atlantic white cedar forest. Atlantic white cedar-dominated forests are found throughout the Coastal Plain but are most common in the outer Coastal Plain and usually exists as a mosaic with Pond Pine Woodlands, bay forests, nonriverine swamp forests and other communities (Schafale and Weakley 1990). Their occurrence is determined by fire history. They become established after a catastrophic fire removes all competing vegetation and, therefore, usually occur as even-aged

stands. Atlantic white cedar dominates in some remaining pocosins where fire is infrequent, but its overall abundance and distribution has been greatly reduced by lack of fire, logging and drainage (Schafale and Weakley 1990).

Bay forests occur throughout the outer and middle Coastal Plain and also typically exist as a mosaic with pond pine woodlands, Atlantic white cedar forests, and nonriverine swamp forests (Schafale and Weakley 1990). Bay forests occur on shallow organic soils and the canopy is dominated by loblolly bay, sweet bay, and red bay. Bay forests are believed to be a late-successional community that replaces pond pine woodlands and Atlantic white cedar after a long absence of fire. Bay forests may be solely a product of fire suppression, or there may be sites which naturally supported them (Schafale and Weakley 1990).

Streamhead pocosin communities resemble peatland pocosins but they are found in very different physical settings: ravines in permanently saturated Sandhill seeps. These habitats are subject to influence from fire on adjacent uplands and are characterized by an open canopy of pond pine, with potential for red maple, sourwood, swamp black gum, and tulip poplar. A dense shrub layer is usually present and herbs are sparse. There is a higher shrub and tree diversity in these communities due to nutrients released by burning in adjacent uplands and more frequent disturbance from fires that burn into the edges (Schafale and Weakley 1990).

Pocosins are particularly important for wintering birds because of the high amount of soft mast available. Greenbrier (*Smilax* spp.), red bay, sweet bay, and many ericaceous shrubs produce large quantities of berries that are persistent through much of the winter. Pocosin habitats are important for a variety of shrub-scrub birds though we are lacking status and distribution data, as well as detailed information, about the bird communities that utilize them (Karriker 1993). We also lack detailed information about populations of small mammals, bats, reptiles and amphibians in pocosin habitats, in part because of the very dense (often impenetrable) nature of most pocosin habitats (Mitchell 1994). Table 1 provides a list of priority species associated with this habitat for which there is conservation concern.

Table 1. Priority species associated with coastal plain pocosin habitat.

Group	Scientific name	Common name	State status* (Federal status)
Birds	*Colaptes auratus*	Northern Flicker	
	Dendroica discolor	Prairie Warbler	
	Dendroica virens waynei	Wayne's Black-throated Green Warbler	
	Helmitheros vermivorous	Worm-eating Warbler	
	Limnothlypis swainsonii	Swainson's Warbler	
	Melanerpes erythrocephalus	Red-headed Woodpecker	
	Picoides borealis	Red-cockaded Woodpecker	E (E)
	Wilsonia citrina	Hooded Warbler	
Mammals	*Condylura cristata*	Star-nosed Mole	SC
	Mustela frenata	Long-tailed Weasel	
	Peromyscus gossypinus	Cotton Mouse	
	Sylvilagus palustris	Marsh Rabbit	

	Synaptomys cooperi helaletes	Southern Bog Lemming	SR
Amphibians	*Bufo quercicus*	Oak Toad	SR
	Desmognathus auriculatus	Southern Dusky Salamander	
	Hyla andersonii	Pine Barrens Treefrog	
	Stereochilus marginatus	Many-lined Salamander	

*Abbreviations
E Endangered
SC Special Concern
SR Significantly Rare

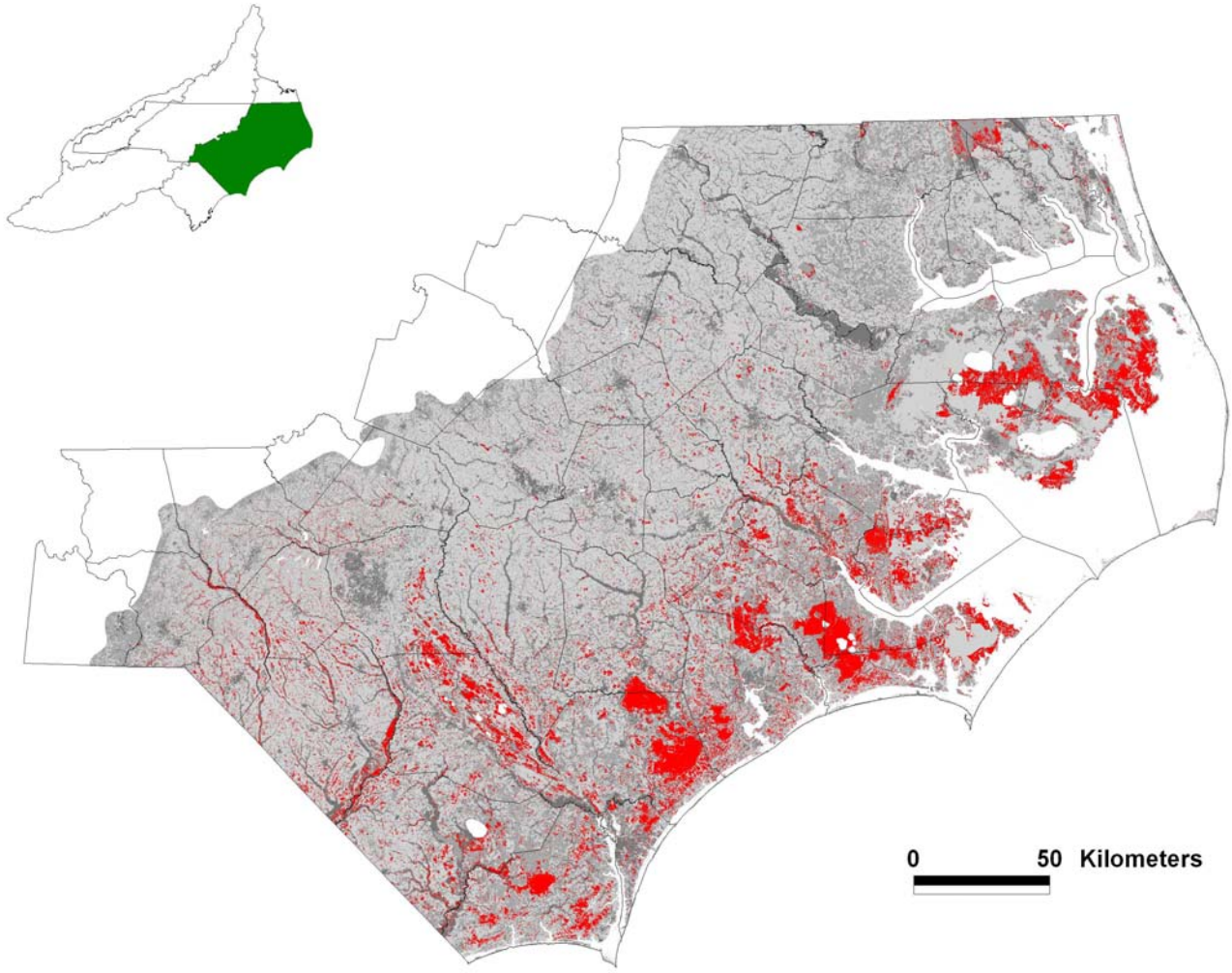
Location And Condition Of Habitat

Pocosin habitats are found throughout the outer coastal plain; in the inner coastal plain they are found mainly in the Sandhills region or in Carolina bays. The condition of pocosin habitats in much of the coastal plain is poor due to fire suppression, changes in hydrology, intensive silviculture, and conversion of forest types. Extensive examples of low and especially high pocosins still exist in the Green Swamp, Croatan National Forest, Holly Shelter Game Land, Camp Lejeune, much of the Albermarle-Pamlico peninsula and many other places as well. The Croatan National Forest, Dare Bombing Range, Camp Lejeune, and Holly Shelter Game Land do conduct some pocosin burns, but all other fire introduced into pocosin habitats tends to be on small acreages (< 100 acres). Map 1 depicts locations of pocosins habitats in the Mid-Atlantic Coastal Plain ecoregion.

Extensive examples of Pond Pine Woodlands exist in the Green Swamp, at Alligator River Natianal Wildlife Refuge, Pocosin Lakes National Wildlife Refuges and in Dare County at the Dare Bombing Range. Atlantic White cedar dominates in some remaining pocosins where fire is infrequent, but its overall abundance has been greatly reduced by lack of fire, logging, and drainage (Schafale and Weakley 1990). Atlantic white cedar-dominated communities still exist at Alligator River and Pocosin Lakes National Wildlife Refuges, and in the Great Dismal Swamp.

Public lands hold the highest concentrations of pocosin and peatland communities in the Coastal Plain. Pocosins on private land have largely been ditched and converted to loblolly pine plantations by the forest products industry. Pond pine is a very long-lived tree and is very tolerant to fire, so under natural conditions pond pine woodlands and high pocosin habitats would have a very old component. That is to say that many of the trees in these habitats would normally by over 100 years old. Although much of the pond pine dominated sites are still very old, fire suppression is causing a large build-up of fuel. Concerns are that once these stands burn under wildfire conditions, the fire will be so intense that the ground will burn, thus killing the entire stand.

Map 1. Pocosin habitats in the Mid-Atlantic Coastal Plain ecoregion of North Carolina (in red).



Data source: NC GAP, 1992.

Problems Affecting Species And Habitats

Fire suppression is an important factor threatening many remaining pocosin, peatland, and streamhead communities due to the strong influence fire has on their vegetative structure, composition, and diversity. Fire-suppressed stands may be invaded by species such as red maple; maples are reaching the canopies of some cedar stands in the long absence of fire. Many managers and landowners are wary of introducing fire to long fire-suppressed peatland communities due to the volatile nature of these communities and to smoke management concerns. When fire is introduced, firelines are often placed directly in the transition zone between uplands and pocosins destroying the species-rich ecotone and preventing fire from burning into pocosins.

Conversion of habitat also threatens pocosin habitats; ditching and draining of these sites leads to alteration of hydrology. When done in preparation for conversion to another land use, these

activities ultimately lead to destruction of pocosin vegetation. Conversions for development, agricultural and forestry interests are the major contributors. However, conversion to industrial pine plantations has slowed in recent years. Sedimentation due to clearing of adjacent uplands is also a problem for some streamhead communities.

Habitat fragmentation (as a result of habitat conversion and urbanization) threatens the integrity of pocosin and peatland communities since these communities typically occur as mosaics on the landscape and fire plays an important role in determining the structure of that landscape. As the landscape becomes fragmented, prescribed fire becomes more difficult to use as a management tool because of smoke management concerns and safety issues around urban areas.

In general, little detailed information exists for many species of wildlife that use pocosin habitats because of the impenetrable nature of these habitats. Few surveys have been done on a long-term basis, which makes land management decisions difficult. Pocosin habitats are important for a variety of shrub-scrub birds yet we are lacking status and distribution data, as well as detailed information, about the bird communities that utilize them (Karriker 1993). We also lack detailed information about populations of small mammals, bats, reptiles and amphibians in pocosin habitats (Mitchell 1994)

Species And Habitat Conservation Actions and Priorities For Implementation

The increased use of prescribed fire where possible is one conservation action that can be used to increase heterogeneity in some pocosin habitats related to vegetative dominance, stature and diversity. Fire will increase vegetation structural diversity and should help promote establishment of an herbaceous ground cover such as switchgrass in pond pine dominated woodlands over time. Fire cycles may be important at certain stages in the life cycle of Atlantic white cedar stands; this needs to be explored.

Burning can often be accomplished on uplands without the use of fire-lines in transition zones between upland sites and pocosin habitats (especially in winter). This promotes a healthy transition zone between the two habitats that is critical for many plant species and allows for nutrient flow to some pocosin habitats

Though extensive amounts of pocosin lands are already protected, some specialized types require more protection, such as Carolina bays (Bladen Lakes area) and white cedar stands. Acquisition partnerships via land trusts and The Nature Conservancy will be important. Opportunities exist to take advantage of initiatives and programs that promote pocosin restoration (Forest Landbird Legacy Program, Partners for Wildlife, North American Wetland Conservation Act). Identified funding sources for acquisition include the Clean Water Management Trust Fund, Coastal Wetlands Grants, Natural Heritage Trust Fund, Forest Legacy, and Recovery Land Acquisition Grants.

Finally, land managers and planners need to address management issues related to pocosin habitats in conservation and land-use planning efforts and also work to understand what the public wants and is willing to accept regarding the management of pocosin habitats and the wildlife associated with these habitats (Thompson and DeGraaf 2001).

Priority Research, Survey, And Monitoring

Surveys are needed to document the distribution, relative abundance and status of many wildlife species associated with pocosin habitats. Priorities for conducting surveys need to focus on species believed to be declining, at risk or mainly dependent on pocosin communities. Secondary priority for surveys should be for species for which current distribution information is already available or for species that are considered common. Many pocosin-associated bird species have experienced significant declines across North America over the past four decades according to BBS trend data.

Monitoring systems need to be expanded and/or targeted to be able to assess current population status and trend information for all wildlife species associated with pocosin habitats. Many North Carolina pocosin bird species require specialized monitoring attention, since BBS (nor standard point counts) does not adequately sample for species like Wayne's black-throated green warbler, worm-eating warbler, Swainson's warbler, black-billed cuckoo and red-headed woodpecker. Long-term monitoring for amphibians and reptiles needs to be developed or enhanced (Taylor II and Jones 2002) and there is a decided lack of long-term monitoring information on most small mammals, and for bat species foraging in pocosins (Ellis *et al*. 2002).

- **Surveys**
  - Determine status and distribution for Wayne's black-throated green warbler, worm-eating warbler, Swainson's warbler, black-billed cuckoo (may warrant further documentation) and other neotropical migrants, including shrub-scrub specialists like prairie warbler, common yellowthroat and yellow-breasted chat.
  - Conduct helicopter surveys for red-cockaded woodpeckers.
  - Initiate surveys for priority small mammals and investigate bat use of pocosin habitats.
  - Initiate amphibian surveys, especially for the oak toad, southern dusky salamander, pine barrens treefrog, and many-lined salamander.
  - Initiate surveys for reptiles using pocosin habitats.
  - Establish frog call survey stations in pocosin habitats.
- **Monitoring**
  - Establish MAPS and migration bird banding stations in pocosin habitats.
  - Initiate long-term monitoring of breeding and wintering birds in pocosin habitats on public lands and industrial forestland (Karriker 1993 and Watts 2002).
  - Initiate long-term monitoring for mammal populations (including bats) in pocosin habitats on public lands and industrial forestland (Mitchell 1994).
  - Initiate long-term monitoring of reptiles and amphibians in pocosin habitats on public lands and industrial forestland.

- **Research**

  Genetics

  - Determine the genetic relationships of pocosin habitat small mammals (e.g. shrews and rodents).
  - Examine the possibility of a sub-species for the coastal worm-eating warbler.

  Habitat use

  - Examine the relationship between habitat patch size and nesting success of shrubland birds (Burhans and Thompson 1999) and habitat use by small mammals (Litvaitis 2001).
  - Measure soft mast (berry) production in pocosins and wintering bird use of these areas.
  - Determine breeding bird habitat use in Atlantic white cedar stands.

  Population demographics

  - Conduct studies to obtain basic demographics information on priority birds, small mammals, amphibians and reptiles.

  Predator effects

  - Study predator effects on bird nest success and productivity, as well as other productivity or behavioral studies such as nest-searching and spot-mapping, on public lands and industrial forestland (Mamo and Bolen 1999, Karriker 1993).

  Management practices

  - Determine the best ways to burn these sites, or alternative management that will mimic the effects of fire at sites where birds, mammals, reptiles and amphibians are being monitored.
  - Determine how the use of chipping (using a hydro-ax or other heavy chipping machinery) midstory and understory vegetation affects the plant and animal communities. This practice is becoming more common, particularly in areas where red-cockaded woodpeckers are present.

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