

Mountain Bog

What is a mountain bog?

Mountain bogs are generally small (typically less than 5 acres), sometimes shrubby wetlands with saturated soils blanketed with hummocks of sphagnum moss. Many mountain bogs are open and fern covered, and their spongy sphagnum layers make them look like the quaking bogs of the northern states. Other bogs are more densely populated with shrub thickets of rhododendron, alder and meadowsweet. Bogs occur sporadically throughout the Mountains, although they may have once been larger and more common. They are fed by groundwater, whereas fens, a bog variation, are fed by surface water seeping into them from above. Humans have drained many bogs over the years, but many bogs may also be drying out naturally as a result of thousands of years of changing climate.

How are mountain bogs created?

Mountain bogs are created when more water enters low areas than exits. Flatland below slopes is likely bog territory. Beavers may well have played an important role in forming mountain bogs, although fire, grazing by native herd animals and clearing by Native Americans may have also been factors. In the water-logged and oxygen-deprived environment of a bog, decomposition slows down. Leaves, branches and other partially decayed organic matter build up over time, resulting in accumulating layers of peat. Sphagnum grows wherever drainage is poor, providing a physical base on which other plants can grow and also maintaining the wetness by absorbing great quantities of water.

What unique species are found in mountain bogs?

Mountain bogs host colorful displays of many native plants, including such rare and showy species as Gray's lily and several types of wild orchids. In some bogs, you can find the federally endangered mountain sweet pitcher plant, known from only a few counties in North Carolina.

Among the wildlife found in mountain bogs, the diminutive bog turtle is most closely tied to this habitat. This rare turtle with orange blotches on each side of its head is North Carolina's smallest turtle, which partially accounts for its popularity in the pet trade both here and abroad. It is listed by the state as a threatened species. Three other wildlife species—the four-toed salamander, bog lemming and water shrew—are also associated with these habitats.

Why are mountain bogs important?

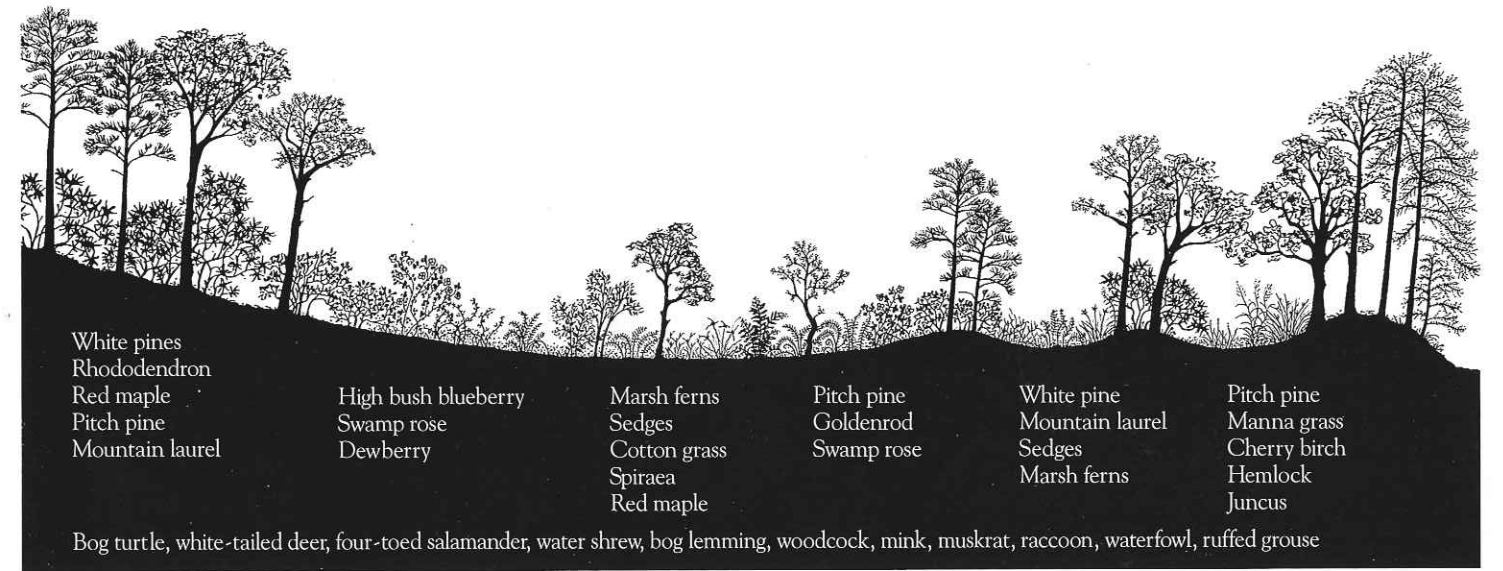
Like many wetlands, bogs act as a filter system, helping to purify water supplies by absorbing pollutants from runoff. Floodwaters may also be slowed by some bogs, helping to control flooding. But it's mostly as habitat for a variety of plants and animals, both common and rare, that mountain bogs find their chief function. Many common wildlife species such as mink, muskrat, raccoon and beaver are found here. So are game birds such as rails, woodcock and even waterfowl. Migrating songbirds use these bogs extensively, and in spring they are important breeding habitat for many birds.

Visit a mountain bog

- Nantahala National Forest, Nantahala River Wetlands. From Franklin, drive west on U.S. Highway 64. Turn south on USFS 67. Between 67 and the Nantahala River immediately upstream and downstream of Standing Indian Campground and in Whiteoak Bottoms. Telephone: (704) 524-6441.
- Pisgah National Forest, Pink Bed Bogs. From Brevard, drive north on U.S. 276 past the Cradle of Forestry in America. Turn east on USFS 1206. East and south of 1206. Telephone: (704) 877-3350.

The bog turtle is the smallest of the state's turtle species.

ILLUSTRATION BY JEANNE BEURY



Landscape note: Mountain bogs are small, wet and shrubby depressions often found just below a slope.

GRAPHIC BY ANNE RUNYON



KEN TAYLOR

This mountain bog at the Nature Conservancy's Panther-town Preserve is larger than many bogs. Most are small, and the number is declining. There may be fewer than 500 total acres of mountain bogs.

JACK DERMID



Rare orchids like this dragon's mouth (*Arethusa bulbosa*) can be found in many mountain bogs. The wet, acidic soils host a variety of rare plants.

Freshwater Marsh

What is a freshwater marsh?

When you see an open pond fringed by cattail plants with their brown seed heads, you know you're looking at a freshwater marsh. Cattails and sedges are some of the indicator species for this wetland type, which occurs wherever there is standing water nearly year-round, typically behind beaver dams and where streams enter ponds and reservoirs. Some freshwater marshes are quite small, while others occupy many acres. They occur throughout the state, although they are rare in the Mountains.

How are freshwater marshes created?

Low spots on the landscape are the secret to the formation of freshwater marshes. They fill with water, encouraging the growth of various plants that tolerate wet soils. Beavers are also architects of freshwater marshes, cutting down trees and building dams to raise the water level. The high water level kills the trees, giving the marsh its characteristic open look. Typically freshwater marshes are temporary wetlands. Depending on where they occur and how large they are, these marshes may gradually fill as sediments are imported by upstream creeks. In the course of a few years, some may disappear, while others may persist longer.

What unique species are found in freshwater marshes?

Generally speaking, freshwater marshes are not well known for their unique plant or wildlife species. One interesting plant is the cattail, whose seed head contains hundreds of thousands of seeds and is sometimes called a "punk." The seeds are dispersed by the wind or become attached to the feathers and feet of ducks and other wildlife and dropped away from the parent plant. Water lilies, duckweed, dewberries, alligator weeds and a variety of bulrushes and sedges also occur in these marshes.

Probably the most unique wildlife species to occur in freshwater marshes is the American alligator, often a common resident of marshes south of Dare County. Trees killed by the ponded water become condominiums for woodpeckers and owls, and the marsh water shelters a menagerie of fish, reptiles and amphibians, fur-bearing creatures such as muskrats and minks, and many types of waterfowl. In winter especially, marshes shelter ducks by the hundreds. Muskrats build their houses by harvesting stacks of marsh grasses and sedges and piling them on a mud foundation. Waterfowl especially need freshwater marshes as winter habitat.

Why are freshwater marshes important?

When freshwater marshes are permanently flooded, many plants and animals feed and shelter in them. But they also store excess waters in times of flooding and filter out sediments and nutrients. As polluted sediments from upstream enter the marsh, they settle to the bottom as the water slows down. Physical and biotic mechanisms remove nutrients from the water, thus reducing the growth of oxygen-robbing algae in our estuaries and lakes.

Visit a freshwater marsh

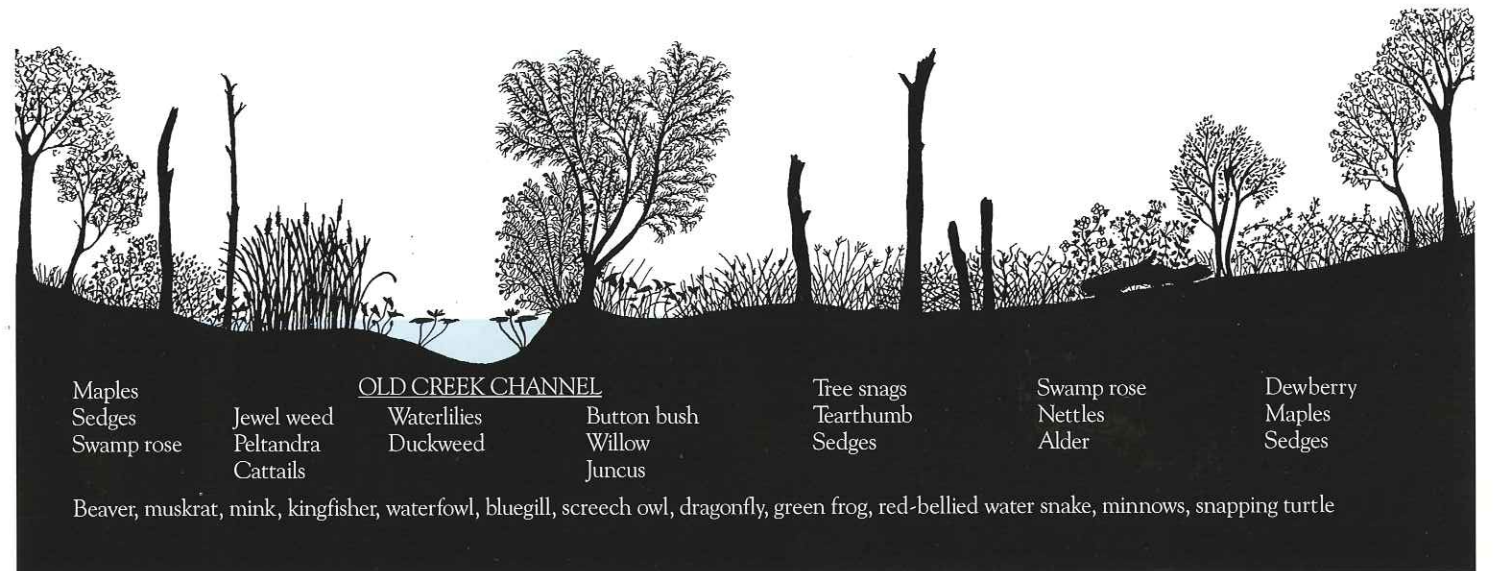
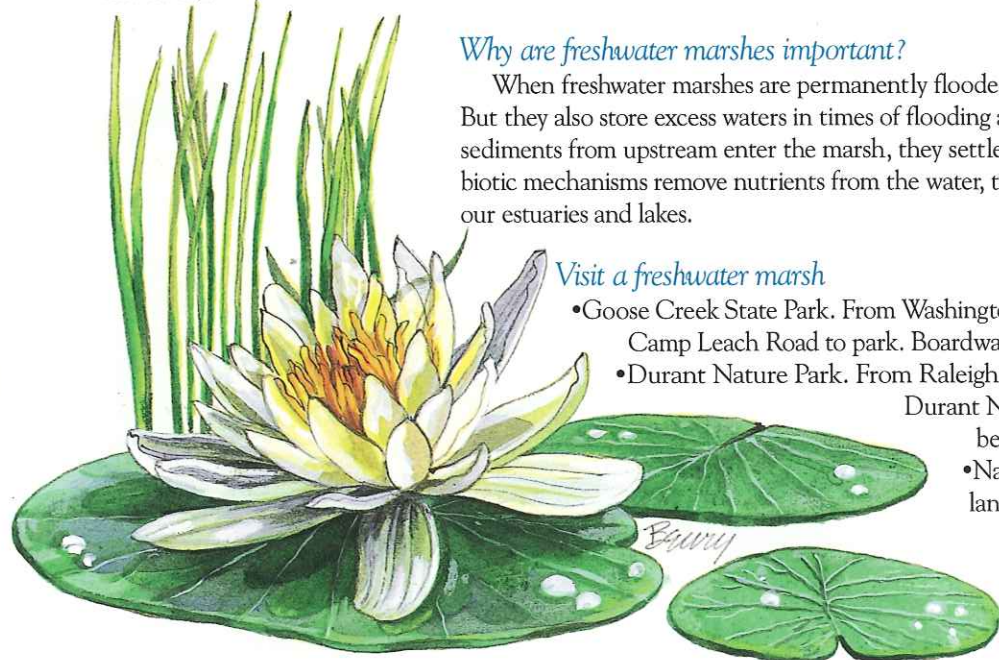
- Goose Creek State Park. From Washington, drive east on U.S. Highway 264. Turn south on Camp Leach Road to park. Boardwalks and trail. Telephone: (919) 923-2191.
- Durant Nature Park. From Raleigh, drive US 1 north about 6 miles. Follow signs to Durant Nature Park. Use north entrance. Follow trail map to beaver pond, about 1 mile. Telephone: (919) 831-6640
- Nantahala National Forest, Nantahala River Wetlands, Macon County. From Franklin drive west on U.S. Highway 64. Turn south on USFS 67. Between 67 and the Nantahala River immediately upstream and downstream of Standing Indian Campground.



JACK DERMID

A least bittern tries to blend in among the cattails of a freshwater marsh (above). Water lilies (below) are common in the deeper portions of a freshwater marsh.

ILLUSTRATION BY JEANNE BEURY



- | | | | | | |
|------------|-------------------|-------------|------------|------------|----------|
| Maples | OLD CREEK CHANNEL | | Tree snags | Swamp rose | Dewberry |
| Sedges | Jewel weed | Waterlilies | Tearthumb | Nettles | Maples |
| Swamp rose | Peltandra | Duckweed | Sedges | Alder | Sedges |
| | Cattails | | | | |
| | | Button bush | | | |
| | | Willow | | | |
| | | Juncus | | | |
- Beaver, muskrat, mink, kingfisher, waterfowl, bluegill, screech owl, dragonfly, green frog, red-bellied water snake, minnows, snapping turtle

Landscape note: Freshwater marshes are open wetlands, often with dead trees, formed by ponded water.

GRAPHIC BY ANNE RUNYON



EUGENE HESTER

A cattail marsh is a familiar type of freshwater marsh, formed in low depressions on the landscape where water gathers. Most marshes are open and treeless.

Headwater Forests

What is a headwater forest?

A headwater forest wetland develops in the upper portions of drainage basins where streams first begin to form. In some parts of the state, it may look like a bottomland hardwood forest, with rich and diverse layers of trees, shrubs and wildflowers. Many headwater areas, however, are small and nondescript and have few of the picturesque qualities of other wetland types. Headwater forests are most numerous in the Coastal Plain, but they are also common in the Piedmont and Mountains, where few other wetlands remain.

How are headwater forests created?

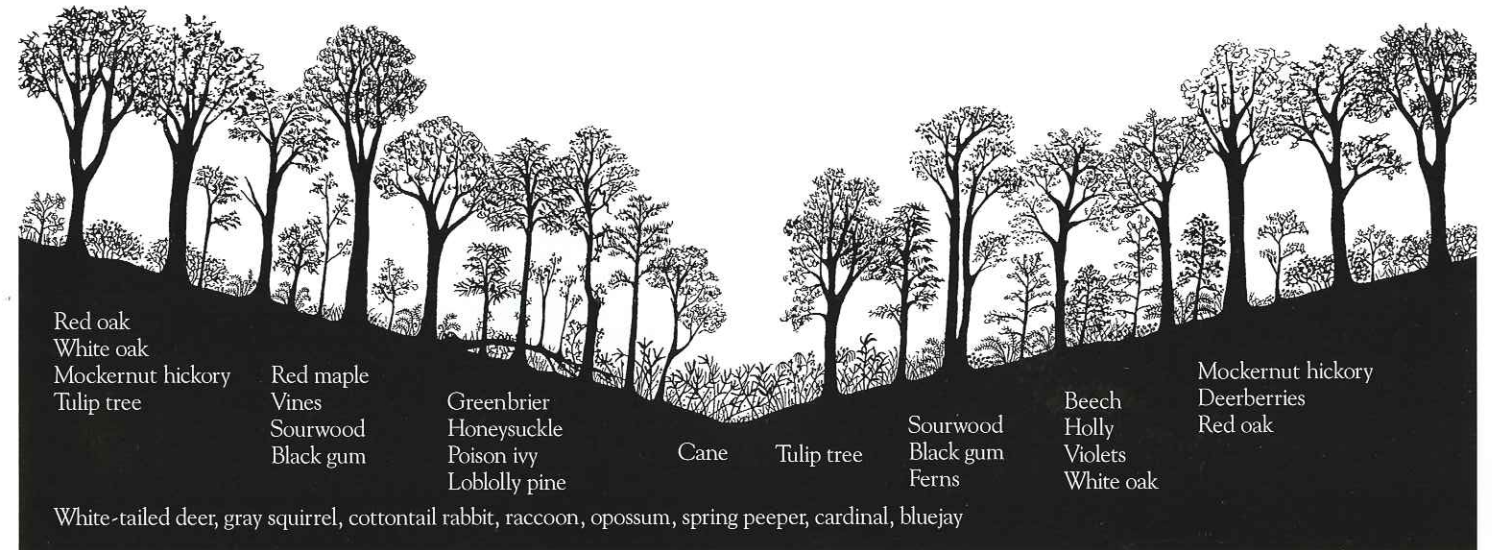
Headwater forests show up wherever streams and creeks begin, and with thousands of streams and creeks in North Carolina, this wetland is one of our most numerous—and least understood—types. These wetlands are formed by rainfall and by water that runs down the surface of upland slopes. The surface flow is not large enough to form a distinct channel but is enough to make the soils wet and host a spirited tangle of wetland vegetation. The difference between a bottomland hardwood forest and a headwater forest lies in where each wetland gets its water. Bottomlands are formed by flooding rivers. Headwater forests are saturated by rainfall and by water running down the slopes from surrounding areas.

What unique species are found in headwater forests?

Headwater forests are not particularly rich in rare or endangered plant or wildlife species, but in heavily developed areas of the state they provide badly needed food and water for dispersed wildlife populations.

A heavy growth of cane grows in the wat areas of a headwater forest. Rainfall and water trickling down innumerable slopes saturate the soil below. These nondescript wetlands trap sediments and filter out many pollutants before they enter rivers and streams.

LAWRENCE S. EARLEY



Landscape note: Headwater forests are formed by runoff from slopes lying in the upper reaches of creeks and river systems.

GRAPHIC BY ANNE RUNYON

Many of the mast-bearing trees provide acorns for deer, and other fruit- and nut-bearing plants also offer food for a wide variety of animals. These wetlands are important travel corridors for many species. Common animals such as songbirds, gray squirrels, rabbits, raccoons, opossums and deer use these headwater forests, and in some of these headwater areas, seasonal ponds provide important habitat for breeding adults and larval forms of amphibians.

Atamasco lilies bloom in the wet soils of a headwater forest. These wetlands are not valued for their biological diversity as much as for their effects on water quality. They filter pollutants and sediment from waterways.



KEN TAYLOR

Why are headwater forests important?

Wetlands in the upper reaches of drainage systems have the greatest effect on water quality of all wetlands. And since small streams comprise most of the total stream length within a watershed, these areas intercept the greatest proportion of eroded sediments from uplands before they reach waters downstream.

The key characteristic of the headwater forests is the slow movement of water down the slopes, enabling certain microbial activities to take place on the sediments. Ironically, the more development there is in the headwater areas of our streams, the more we need forests as water purifiers. But housing projects and other developments often reach into the headwaters, concentrating runoff from paved surfaces and hindering water purification. The position of these forests in the upper reaches of watersheds, their length within a watershed, the dense vegetation that grows there and the fluctuating hydrology enable these wetlands to retain sediments and filter out nutrients and other pollutants before they are carried into larger bodies of water.

The white-tailed deer (below) is one of many wildlife species that uses headwater forests as travel corridors.

ILLUSTRATION BY JEANNE BEURY



Visit a headwater forest

- Bladen Lakes State Forest, Turnbull Creek Swamp. From Elizabethtown, drive north on U.S. 701/41/242. Continue straight on Bladen County 242. Bear left to Bladen County 5. Road runs parallel to Turnbull Creek, with USFS roads extending toward creek. Telephone: (910) 588-4964.

Savanna and Pocosin

What are savannas and pocosins?

Savannas and pocosins are two very different kinds of wetlands that are often found adjacent to each other. Savannas are grassy, herb-rich and flat lands with a sparse cover of mostly longleaf pine trees. Their open and parklike terrain makes them relatively easy to walk through, and their mineral soils are more fertile than pocosins. Pocosins are vast areas densely vegetated with a low-growing jungle of evergreen shrubs and vines under a few stunted pond pines. Their soils are organic and acidic. Savannas and pocosins are found only in the Coastal Plain.

How are savannas and pocosins created?

The origins of pocosins are poorly understood. Pocosins are today found between major rivers in the Coastal Plain, prompting some to theorize that as the seas began to rise 8,000 to 10,000 years ago, the fast-moving rivers slowed, spread out and deposited loads of sediment in these interstream areas. Aquatic vegetation began to grow and organic debris accumulated and blocked drainage. The wet soils prevented rapid decomposition, and thick layers of peat developed.

The open savannas originated in the fires that were a natural and frequent part of Coastal Plain life. The plentiful grasses and pine needles fueled lightning-ignited fires that the longleaf pines not only could tolerate but even required for their survival. Fire, though at different intervals, is necessary today to maintain both savanna and pocosin.

What unique species occur in savannas and pocosins?

Pocosins are not important repositories of rare or endangered species, although many songbirds are found in nonalluvial swamp forests. One interesting species found here is the pond pine, whose serotinous cone releases its seeds generally only in the presence of a fire's heat. That is the pond pine's way of ensuring that its seed finds a cleared bed. Black bears find cover and food in the extensive pocosins of the Coastal Plain.

Savannas are most important for their plant and wildlife diversity. They host many common wildlife species, such as bobwhite and white-tailed deer, and several rare animal species are found here as well, including the red-cockaded woodpecker, the fox squirrel, the mimic glass lizard and the Carolina gopher frog.

About 50 plant species have been found in a square meter of a longleaf pine savanna, making it the most diverse plant community in North America at that scale.

The edge, or "ecotone," between the savannas and the pocosins is where the most plant and animal rarities are found. Here's where the curious Venus's-flytrap lives, and the endangered rough-leaf loosestrife, both of which are endemic to small areas of North and South Carolina. The pine barrens tree frog is found here and so is the eastern glass lizard.

Why are savannas and pocosins important?

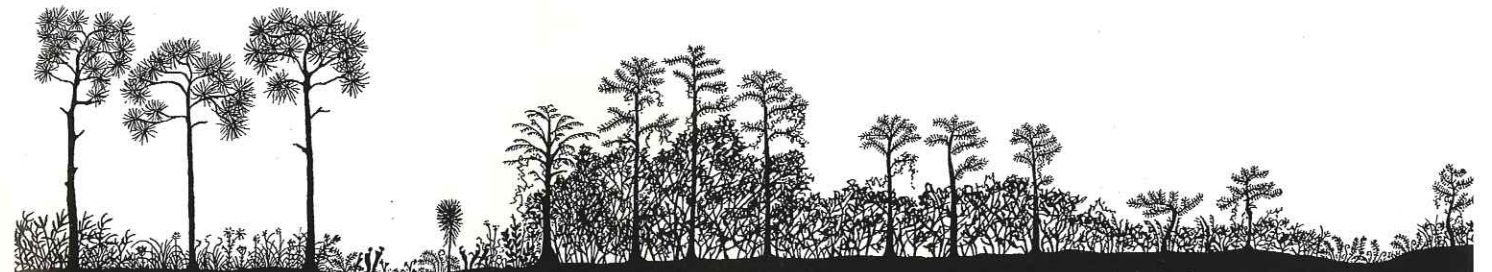
Both pocosins and savannas have been heavily modified by human needs. Both are critical parts of the state's natural heritage, for different reasons. Savannas are important for their diversity of plants and wildlife species. Though pocosins offer wildlife seasonally important food, their chief function is to absorb excess rainwater. By releasing it slowly, especially in areas that are adjacent to estuaries, pocosins maintain healthy proportions of salt and fresh water in the sounds that are so necessary for young fish and shellfish.

Visit a savanna and pocosin

- Croatan National Forest. From Pollocksville, follow 58S to Cape Carteret. Turn left on Highway 24E, 4 miles to Forest Service Road 123 (Pringle Rd.). Turn left and follow to intersection with Millis Road. Millis Road Savanna is on right. Telephone: (919) 638-5628.

The dense evergreen growth of pocosins offers shelter and seasonal food supplies for black bears.

ILLUSTRATION BY JEANNE BEURY



SAVANNA

Longleaf pine
Toothache grass
Carolina dropseed
Meadow beauty
Coreopsis

ECOTONE

Sphagnum moss
Cinnamon fern
Venus' fly-trap
Pitcher plants
Rough-leaf loosestrife

POCOSIN

Pond cypress
Loblolly bay
Gallberry
Pond pine
Red bay
Titi
Fetterbush
Sphagnum moss
Virginia chain fern

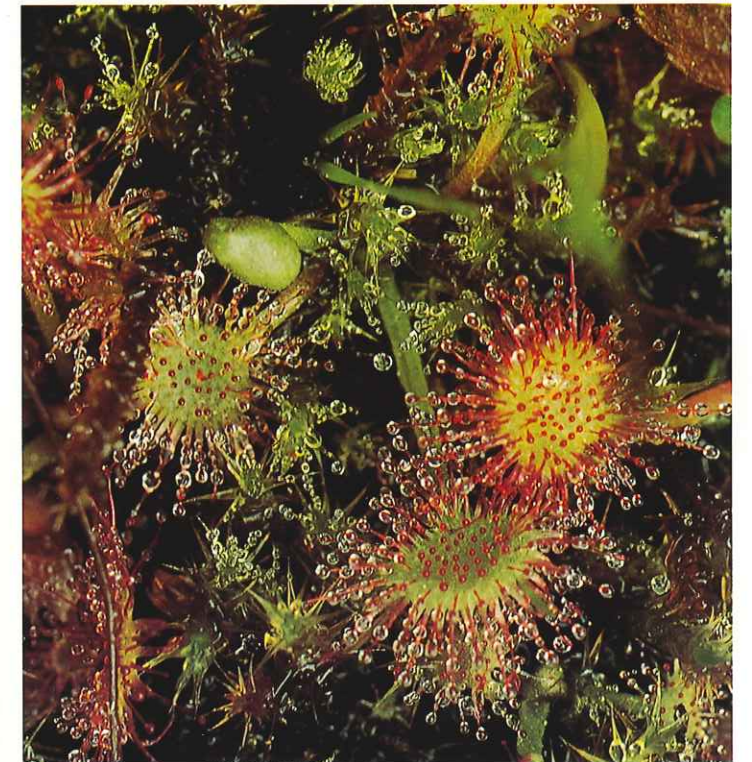
Savanna: Bobwhite quail, dragonfly, red-cockaded woodpecker, fox squirrel, brown-headed nuthatch, diamondback rattlesnake; Ecotone: Eastern glass lizard, eastern king snake, pine barrens treefrog; Pocosin: Black bear, white-tailed deer, marsh rabbit, bobcat, American woodcock

Landscape note: On the flat Coastal Plain, open savannas occasionally lie adjacent to shrubby pocosins (both high and low).

GRAPHIC BY ANNE RUNYON



JEFF LEPORE



KEN TAYLOR

This open, pitcher plant-strewn savanna adjoins the thickly vegetated pocosin (left). The edge or ecotone between these two wetlands is particularly rich in rare plants such as the rough-leaf loosestrife and a variety of insectivorous plants like the sundew (top). Savannas are better known for their biological diversity, while the vast pocosins absorb rainwater like giant sponges.

Seasonal Wetland

What is a seasonal wetland?

A seasonal wetland is generally a small depression that is wet for only a limited time and whose plants and animal inhabitants are adapted to the fluctuating water levels. These wetlands are not as well known as others. They include floodplain pools, sinkhole ponds, depression meadows, interdunal ponds, clay-based Carolina bays and even some man-made wetlands: failed farm ponds, borrow pits and road-dammed pools. Temporary wetlands are often no more than a foot deep and an acre wide and thus disappear during the growing season as evaporation and transpiration draw down the water.



The tiger salamander is one of many amphibians that depend on seasonally wet wetlands for breeding habitat.

ILLUSTRATION BY JEANNE BEURY

How are seasonal wetlands created?

Most seasonal wetlands were formed because of their position on the landscape. Small depressions are quickly filled with winter rains and runoff from surrounding uplands. Among the larger depressions are Carolina bays. When scientists first saw aerial photographs of thousands of these overlapping oval forms, they hypothesized that the bays were formed by a prehistoric meteor shower. But despite investigations, no remnants of meteorites have ever been found. Though the origins of the bays are still mysterious, most scientists today believe they were formed about 40,000 years ago when the Coastal Plain was covered with shallow ponds. Prevailing winds may have shaped the ponds into the elliptical shapes we find today.

What unique species are found in seasonal wetlands?

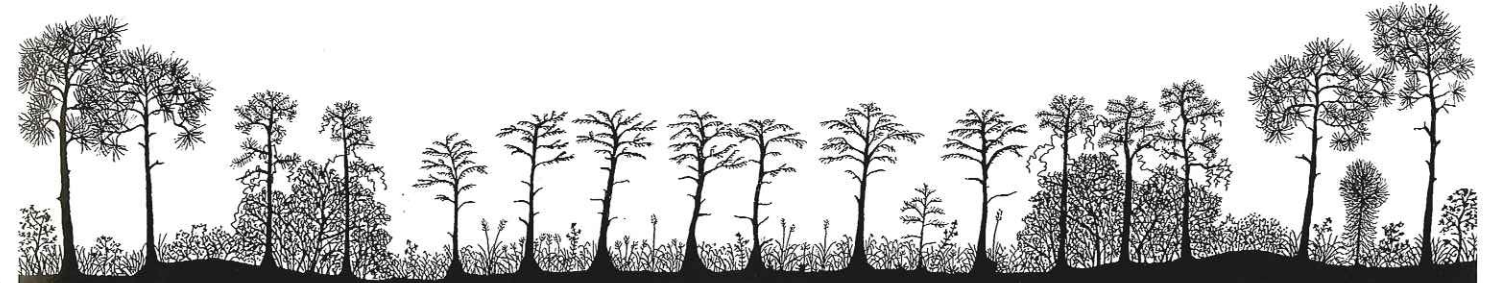
Not many rare plant species are found in seasonal wetlands, although pond cypress savannas may contain the awned meadow beauty, pine barrens smokegrass, coastal beakrush, pondspice and other rarities. But these wetlands are critical to the survival of many amphibians. Pond-breeding frogs and salamanders such as the rare tiger salamander and gopher frog breed in Coastal Plain depressions because they are fishless and thus not subject to large-scale predation. By breeding in winter, these amphibians produce young that develop before the ponds dry out. Various mammals take advantage of the high productivity of some of the larger ephemeral wetlands like Carolina Bays. Wintering waterfowl use them and so do wading birds such as the great blue heron.

Why are seasonal wetlands important?

As a class, seasonal wetlands have experienced great losses. Some of the smallest of our wetlands—they are sometimes no larger than 2 meters in diameter!—seasonal wetlands are easily drained or filled and their disappearance from the landscape is lightly regarded. At least half the Carolina bays and many other temporary wetlands have been drained over the years, depriving amphibian and reptile populations of breeding habitat and making the ones that remain all the more valuable. Seasonal wetlands may not look like classic wetlands such as marshes or swamps, but many rare species occur there. Most amphibians dependent on them are in decline, and continued loss of this type of wetland will reduce many populations.

Visit a seasonal wetland

- Morrow Mountain State Park. From Badin, drive south on Valley Drive and turn left on Morrow Mountain Road. Ephemeral pool on right about one mile within park, near the junction of the road with the mountain and the camping area. Telephone: (704) 982-4402.
- Uwharrie National Forest, Baden Upland Depression Swamps. From Troy, drive west on SR 109. Turn left on Forest Road 576 and follow to Baden Dam. Depressions on hilltop about a half mile east of dam. Telephone: (910) 576-6391.



- | | | | | | |
|--------------------|------------|--------------|---------------------|------------|--------------------|
| Longleaf pine | Pond pine | Beakrush | Red root | Pond pine | Longleaf pine |
| Turkey oak | Titi | Pond cypress | Awned meadow beauty | Titi | Turkey oak |
| Wiregrass | Gallberry | Plume grass | Hat pins | Gallberry | Wiregrass |
| Creeping blueberry | Fetterbush | Panic grass | | Fetterbush | Creeping blueberry |
| Greenbrier | Red bay | | | Red bay | Greenbrier |
| | Greenbrier | | | Greenbrier | |

Great blue heron, tiger salamander, Mabey's salamander, dragonflies, crayfish, spring peeper, gopher frog, Eastern newts

GRAPHIC BY ANNE RUNYON

Landscape note: Carolina bays are seasonally wet depressions, often with longleaf pine-covered sandy ridges on the southeastern rim.

Seasonal wetlands include Carolina bays like Antioch Bay (below), a Nature Conservancy preserve in Hoke County. Though dry at the time the photograph was taken, this bay is generally filled with water from winter until mid-summer. The green tree frog (right) and other amphibians find abundant niches for their life cycles in seasonal wetlands.



MELISSA MCGAW

KEN TAYLOR



Bottomland Hardwood Forest

What is a bottomland hardwood forest wetland?

Look at the big, broad floodplains of some of our Coastal Plain river systems and you'll find some of the best-developed bottomland hardwood forests in the South.

Topographically, these forests look like washboards, with relatively dry ridges dominated by oaks and other hardwood trees and with wet swales dominated by water-tolerant bald cypress and gum trees. You'll find most bottomland hardwood forests in the Coastal Plain, where the river floodplains are broader, but some can also be found in the Piedmont and in broad stream valleys in the Mountains.

How are bottomland hardwood forests created?

The key to this wetland system is the fluctuating water regime. After heavy rains, the swollen rivers often overtop their banks and pour into the surrounding floodplain. The ridges generally remain dry, but the sloughs and backswamps near the river hold standing water much of the year. Because the landscape is so flat, river channels don't remain constant but migrate across the floodplain. Over time, they change their channels often, perhaps in the course of a single flood, leaving behind old channels that fill with water.

What unique species are found in bottomland hardwood forests?

Species that live in these flood-haunted bottomlands must adapt to seasonal flooding or die. That's why you can see bald cypress trees and water tupelos here, their spreading trunks anchoring them in the water-logged soils. On the drier ridges grow a host of acorn-producing trees—the water oak, willow oak, shumard oak and cherrybark oak—and fruit-bearing shrubs and vines that feed many wildlife species.

Once bottomlands provided habitat to ivory-billed woodpeckers and Carolina parakeets. Today you're more likely to find cavity-nesting species like pileated woodpeckers, wood ducks, white-breasted nuthatches and barred owls that take to the abundant snags that form in these woods. In some of the Coastal Plain streams like the Roanoke and the Neuse rivers, broad floodplains provide rich habitat to black bears and white-tailed deer. Some of the largest populations of wild turkeys in the state are found in the Roanoke River's bottomlands. The rare four-toed salamander and mole salamander are found in the bottomlands skirting smaller streams and in the upper floodplains of rivers, where flooding is normally less frequent and less intense.

Why are bottomland hardwood forests important?

Bottomlands are often the last large forested tracts in areas where uplands have been developed, and thus they are important travel corridors for wildlife. The temporary pools are important breeding areas for amphibians, and the eggs of anadromous fish such as striped bass are protected by the forests during peak flows. In late winter, some fish species feed in the flooded bottomlands.

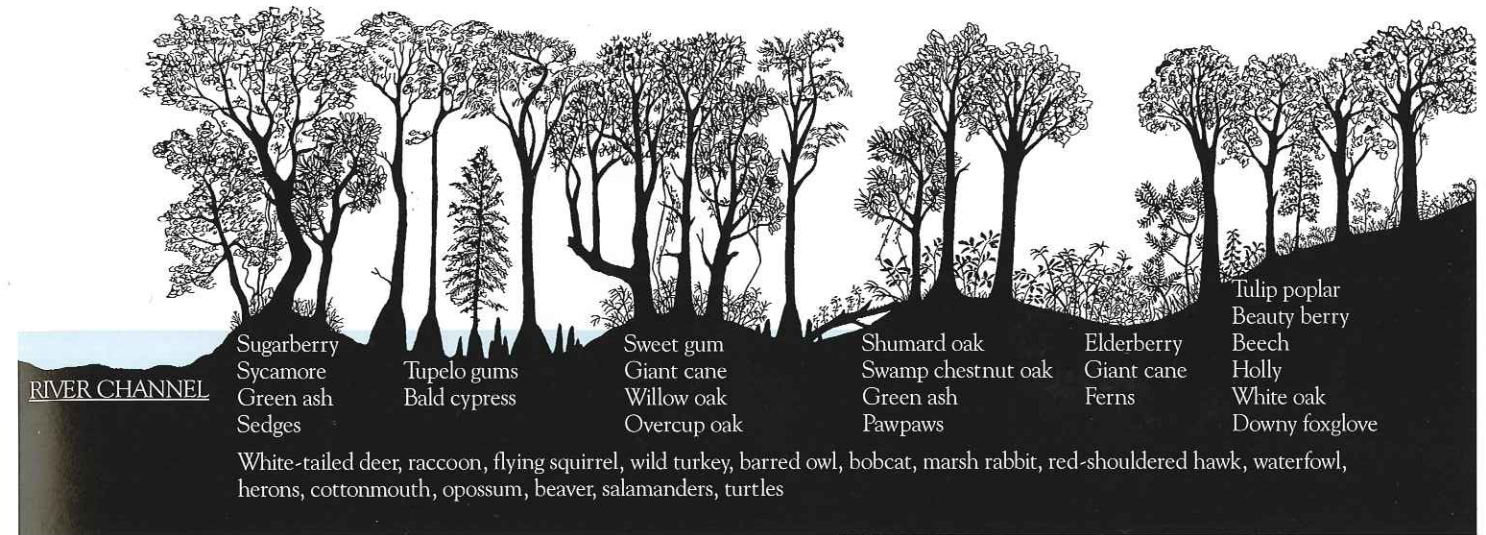
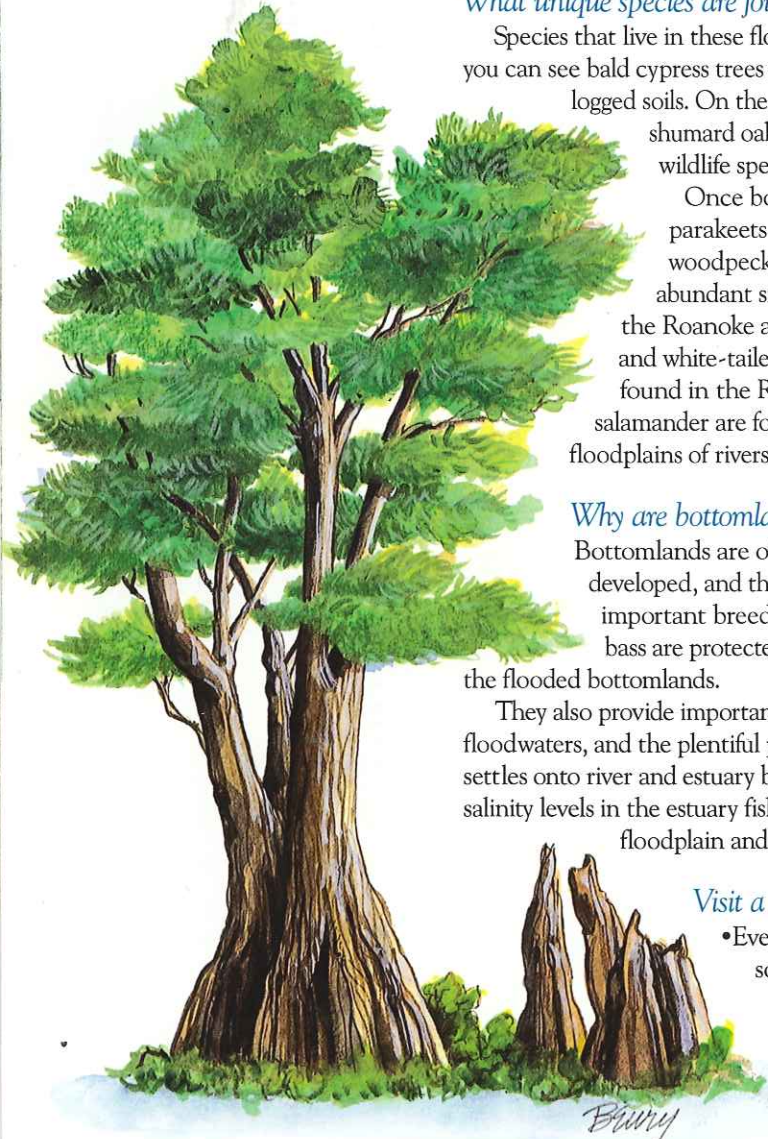
They also provide important services to the estuaries downstream. Sloughs and backswamps store floodwaters, and the plentiful plants trap sediments introduced by floodwaters, reducing the load that settles onto river and estuary bottoms. By slowing the flow of water during flood stages, they protect the salinity levels in the estuary fish and shellfish nurseries. Organic materials are lifted by floodwaters from the floodplain and become important parts of the estuary food chain.

Visit a bottomland

- Everett Jordan Lake, New Hope Creek Bottomlands. From Durham, drive south on N.C. 751, turn right on Stagecoach Road. Walk south on abandoned railroad right-of-way. Telephone: (919) 362-0586.
- Roanoke River National Wildlife Refuge. From Williamston, drive north on U.S. 17/13. Both sides of the river for 20 miles. Telephone: (919) 357-1191.

The baldcypress tree is an important canopy tree in the swamp portions of the bottomland hardwood forest.

ILLUSTRATION BY JEANNE BEURY



Landscape note: Bottomland hardwood forests consist of dry ridges and water-filled sloughs.

GRAPHIC BY ANNE RUNYON



JACK DERMIID



MELISSA MCGAW

Seasonal flooding in bottomland hardwood forests means that water levels, even in the wettest parts of the forest, vary during the year. In winter and spring months water levels are generally the highest. The rolling landscape of ridges and sloughs provides rich hunting habitat for red-shouldered hawks (above) and many other wildlife species.