A Peek at Pocosins

A Peek at Pocosins Lesson Plan

Lesson plan developed by:

Sources:

Niering, William A. "Bogs." *Wetlands*. New York: Knopf, 1985. N. pag. Print.

Rezendes, Paul, and Paulette M. Roy. *Wetlands: The Web of Life*. San Francisco, CA: Sierra Club, 1996. Print.

Objective

The Pocosin Project is an education initiative highlighting the beauty, mystery, and importance of eastern North Carolina's pocosins. These unique wetland systems derive their name from an Algonquian word meaning "swamp on a hill." In recent years, APNEP has supported the protection and management of these ecosystems to improve water quality in the rivers and sounds downstream.

As part of The Pocosin Project, "A Peek at Pocosins" combines six hands-on stations for educators to use as an introduction to pocosin habitats. This lesson plan has all of the written materials you need to set- up the stations. Use the Scavenger Hunt Worksheet to guide students through the stations.

Duration

- One class period

Grade Levels

- 5^{th} -8^{th} grade

North Carolina Essential Standards

- 5.L.2.1, 5.L.2.2, 5.L.2.3
- 6.L.2.1, 6.L.2.2, 6.L.2.3
- 8.E.1.1, 8.L.3.1

Virginia Standards of Learning

- 5.5.c, 5.6.c
- 6.5.f, 6.7.a, 6.7.d, 6.7.f, 6.9.b, 6.9.c
- LS.4.d, LS.6.b, LS.6.d, LS.8.a, LS.9.b, LS.9.c

Pocosin Plant Station 1

Summary: The pocosin plant station describes how plants survive in the acidic peat soils of the pocosin. It also explains how botanists monitor the number of rare pocosin plant species.

Part 1. Introduction to Carnivorous plants

Materials:

- Carnivorous Plant Examples (Ask your local botanical gardens to borrow some carnivorous plants. Home improvement stores also carry a selection.)
- Magnifying glass
- Page 5- Name tags for common pocosin carnivorous plants
- Page 6- Pocosin soil conditions
- Page 7- Pocosin plant adaptations
- Page 8- Venus flytrap fun facts- describes how they eat bugs

Instructions:

Pick carnivorous plant species from page 4 and try to find them at your local botanical gardens or home improvement store. Cut out the names to use as name tags for the plants you choose to examine. Print out pages 6-8 and place at the station. Have students read the pages and then use a magnifying glass to closely examine the structure of Venus flytraps.

Venus flytrap

Dionaea muscipula

Hybrid pitcher-plant

Sarracenia x catesbael

Purple pitcher-plant

Sarracenia purpurea

Sundew

Drosera

Yellow pitcher-plant

Sarracenia flava

Bladderwort

Utricularia

Plants have to <u>adapt</u> to survive in the pocosin water, soil, and disturbance conditions.

<u>Adaptation</u>: a change over time in an organism's structure or function that helps it better survive in its environment. What do plants need to survive? Water, nutrients, and sunlight.

Dominant plants in an ecosystem are determined by:	**Dominant plants in pocosins are adapted to:**
How much water is available?	*Waterlogged soils*
What is the soil like?	*Acidic, nutrient poor*
What disturbances occur in the ecosystem (fire, hurricanes, drought)?	*Fire*

Cool plant adaptations to overcome low soil nutrients:

1. **Don't lose your leaves**- The majority of plant species in pocosins hold their leaves all year unlike deciduous trees whose leaves change colors and fall off.
    a. Shrubs that do not lose their leaves are called evergreens.
    b. Sweetbay Magnolia is an example of an evergreen shrub

2. **Eat Bugs**- Carnivorous plants are found in pocosins because they can get their nutrients from bugs instead of the soil.
    a. Fly traps catch ants, spiders, beetles, and crickets.

3. **Be tolerant of fire**- Fire adds nutrients to the soil, so if you can survive the fire, you will be better off!
    a. Pond pine cones are triggered by fire- their cones open when heated, releasing seeds onto the ground.
    b. Fire helps keep competition down for the native plants

4. **Stay small**- Many trees in pocosins have stunted growth meaning they remain short because there are not enough nutrients to grow tall.
    a. This is why shrubs dominate the pocosin environment.

Venus Flytrap FUN Facts

Scientific Name: *Dionaea muscipula*

There are about **500 species** of carnivorous plants, most of which grow in poor soil, like pocosins (bogs) and sandy wooded areas.

They survive by **attracting, capturing, killing, digesting, and absorbing nutrients** from bugs.

How does the **Venus flytrap** get its nutrients from bugs?

*It attracts prey with a **sweet smelling nectar**. Then it turns the insect into a tasty meal using the following steps:*

1. When an insect lands on the head of the fly trap, if the plant is lucky, it will touch two of the hairs located in the jaws of the trap.

2. If 2/3 of the hairs are triggered, the mouth snaps shut trapping the victim.

3. The plant secretes an enzyme that kills the insect, turning it into a digestible meal.

4. After a few days, the fly trap will re-open, waiting for the next victim.

Part 2. Rare Species in Pocosins

Materials:

- Natural Heritage Program Help and Definitions packet: http://www.ncnhp.org/c/document_library/get_file?uuid=10c7095f-7864-46d4-b681-c042bdaafa62&groupId=61587
- Page 9- Venus flytrap map

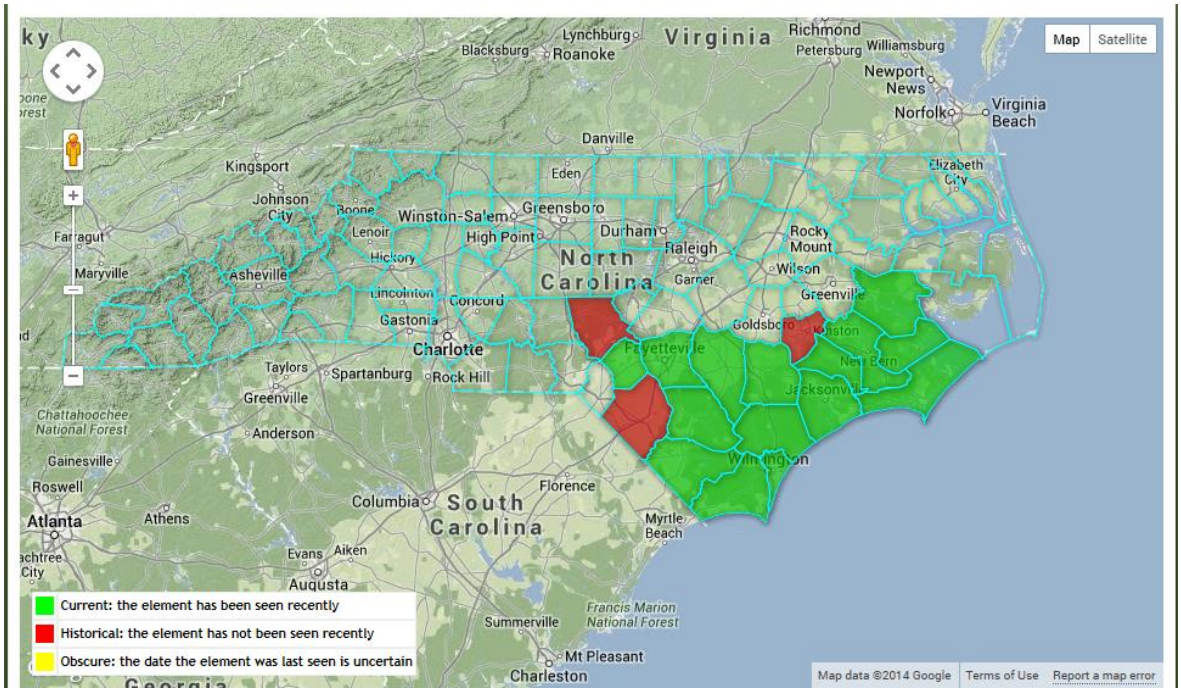
Instructions:

Many carnivorous plants and shrubs found in pocosins are rare species. The map below shows historical sightings of the rare Venus flytrap. Print one copy of the *Natural Heritage Program's Help and Definitions* packet and have students use this to look up information about the current status of the Venus flytrap based on its state rank of S2 (on map). This will expose students to the key used by botanists in N.C. to classify rare plants.

Scientific Name*: Dionaea muscipula*

Common Name: Venus Flytrap

Taxonomic Group: Vascular Plant, State Status: **SC-V**, Federal Status: **FSC**, State Rank: **S2**, Global Rank: **G3**
Habitat Comment: savannas, seepage bogs, pocosin edges



Source: http://www.ncnhp.org/web/nhp/database-search

Sources:

Blevins, David, and Michael P. Schafale. *Wild North Carolina: Discovering the Wonders of Our State's Natural Communities*. Chapel Hill: U of North Carolina, 2011. Print.

"Bogs." *US EPA*. Web.

http://water.epa.gov/type/wetlands/bog.cfm

"Ecoregions of North Carolina and South Carolina (EPA)." *Ecoregions of North Carolina and South Carolina (EPA)*. Web.

http://www.eoearth.org/view/article/152148/

Pocosin Animal

Station

2

Summary: A hands on food web activity allows students to practice what they know about trophic levels.

Part 1. Pocosin Animal Specimens

Materials:

- Ask your local state/ federal park to borrow skins, skulls, or mounts of species found in pocosins. Suggested specimens:
    - Beaver pelts &chews
    - Meadow vole
    - Eastern big eared bat
    - Spotted salamander
    - Eastern musk turtle
    - Any species from the pocosin animal pictures

Part 2. Pocosin Food Chains

Materials:

- Felt board
- Felt cut into four, 3in arrows
- Velcro (Sticky on one side)
- Signs that say: Primary producer, primary consumer, secondary consumer
- Page 15- Intro to wildlife in pocosins: Pocosin biodiversity
- Pages 16-18- What eats what clues
- Pages 19-21- Pocosin animal pictures
- Labels (optional)
- Template for labels with species names (optional)

Instructions: Print page 14 to place at station. Print out pocosin animal pictures, cut them out (laminating is optional) and attach a small piece of velcro to the back. Attach Velcro to the back of the producer and consumer signs. Cover a display board with felt and add arrows to one side of board (felt sticks to felt). Arrange pictures under different sign categories. Cut out the "what eats what" clues and place at station. Let students make pocosin food chains by selecting a picture from each category and putting them in order of what eats what. If a student is having trouble, have them look at the clues.

Pocosin Biodiversity

Pocosin Lakes National Wildlife Refuge provides habitat for over 300 wildlife species. This includes 40 mammal species, many are nocturnal. Pocosins provide unbroken, large tracts of land making them a refuge for animals that require large areas of land like the black bear, bobcat, and red wolf.

The signs of their presence can be observed in their scat, tracks, fur, and scrape marks.[1]

Food chain definitions:

Producers- Green plants that use the sun's energy to make their food through photosynthesis.

Consumers- Living things that eat other living things

- Herbivore- Eats plants
- Carnivore- Eats other animals
- Omnivore- Eats plants and meat

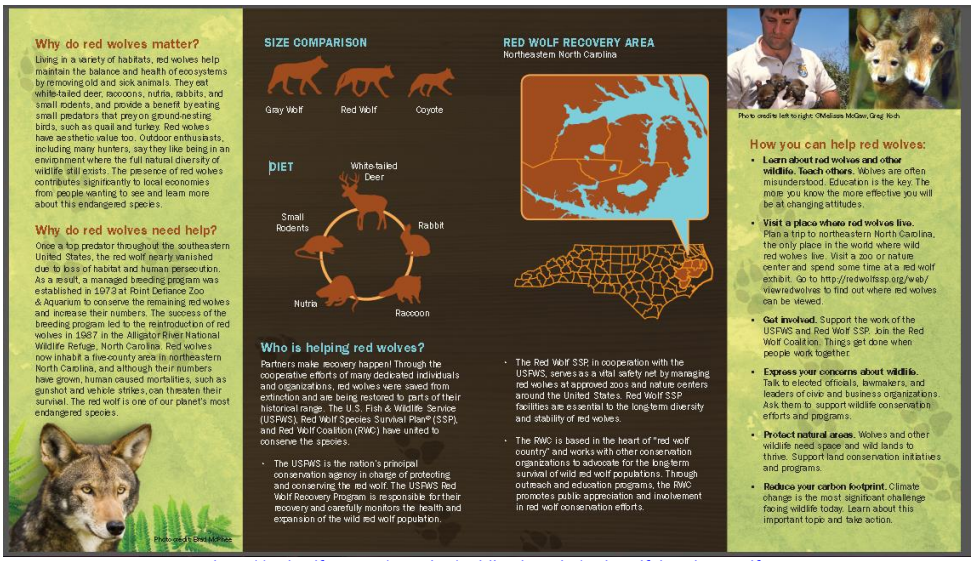
[1] http://www.fws.gov/southeast/pubs/pocwild.pdf

What eats what clues:

Clue #1. Bats eat insects. Look at the many species of bats found in NC's pocosins!

Clue #2. Shrews eat insects, nuts, worms, salamanders, and other shrew. The shorttail shrew is poisonous meaning it can eat mammals the size of its body! Shrew live less than a year because they have such a high metabolism and must eat three times their body weight a day.

Clue #3. Red Wolf diet circle

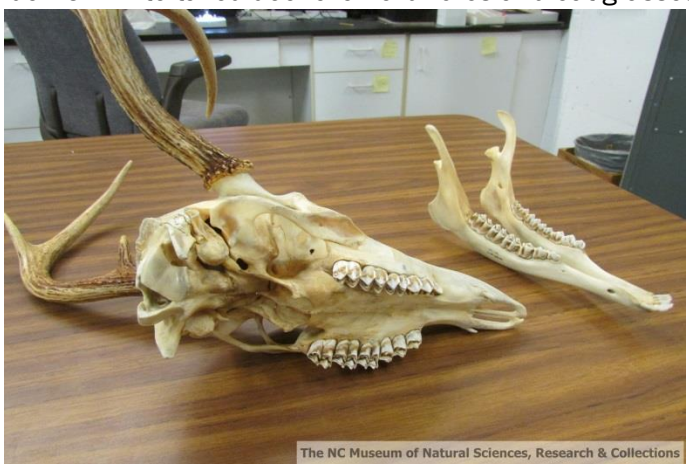


http://redwolfssp.org/newsite/public_domain/red_wolf_brochure.pdf

Clue #4. Nutria eat grasses and crops and can outcompete beavers for this vegetation.

Top to bottom: nutria, beaver, groundhog

Clue #5. White-tailed deer are herbivores and eat grasses.



Clue #6. Red-tailed hawks are carnivores and eat small mammals, birds, and reptiles.

Clue #7. A cotton mouse eats seeds and insects.

There are numerous species of rodents in pocosins. Left to right: Hispid cotton rat, marsh rice rat, golden mouse, cotton mouse, white-footed mouse, house mouse, eastern harvest mouse, boblemming, meadow vole, pine vole

---

Clue #8. Yellow-belly sliders eat insects and fish.

Clue #9. Carolina anoles eat crickets, grasshoppers, and grasses.

Clue #10. Eastern newts eat insects, molluscs, amphibians, and worms.

Clue #11. Bears are omnivorous and eat acorns, berries, carrion, corn, frogs, insects, fruits, reptiles, and small mammals.

Pocosin Animal Pictures

Secondary consumers:

Primary Consumers:


Bruce Sorrie, North Carolina Natural Heritage Program


Richard LeBlond, North Carolina Natural Heritage Program

Primary Producers:

Resources:

Pocosin Animal Pictures also available on APNEP Flickr site

Link to find out more information about Pocosin wildlife species:
http://www.pocosinlakesfriends.org/index.cfm?page=wildlife

Sources:

Thank you to the NC Museum of Natural Sciences, Research and Collections for their information and photos.

Restoration Station 3

Summary: In 2008 and 2011, two large peat fires burned across NC's coast. The restoration station provides information about these fires and ways to prevent these devastating natural disasters from happening again.

Fire is important to pocosins and adjacent savannas. Fires add nutrients to the soil and species like pond pines require the heat to open their pine cones and release seeds.

Fires can get out of control when pocosins are altered and drained to build roads or farms. The layers of peat dry out and become vulnerable to catching fire. It is difficult to extinguish peat fires because they burn underground and can smolder for weeks. In order to prevent these large fires, APNEP and other groups are working to restore the natural hydrology of many acres of pocosin peatland.

Materials:

- Page 25- The Problem: facts about the decline of pocosin habitat
- Page 26- Chart with facts on NC's recent peat fires
- Page 27- The Solution: examples of restoration projects that help prevent fires
- Page 28- What is restoration?
- Page 29- Reasons to restore and conserve pocosins
- Page 30- News release on Evan's road fire showing the stark contrast between restored and burned lands
- Article: "Carbon Sequestration Benefits of Peatland Restoration: Attracting New Partners to Restore Habitat on National Wildlife Refuges" http://www.fws.gov/raleigh/pdfs/FWS_PeatlandCS_factsheet.pdf

Instructions:

Print out all pages and place at station or on a display board. If used as a presentation, talk about the draining of pocosins, the fires that resulted from their alteration, the definition of restoration, and the ways we can restore pocosins.

The Problem:

Humans have been causing a change in hydrology in pocosin wetlands since the 1700s.

- Attempts to drain the Great Dismal swamp, a habitat containing many acres of pocosins, began in 1763 led by **President George Washington**.

- Between 1962 and 1979, 3000 sq. miles were drained. About 1400 sq. miles of undisturbed pocosin remain.

- Threats: agriculture, timber harvesting, peat mining, phosphate mining.

Highly organic soils leave pocosin wetlands vulnerable to fires when the water table drops and peat dries out. Peat fires smolder for weeks because organic matter catches fire easily. These fires happen underground and require LOTS of water to put out. Recently, there have been two big fires in NC's peatlands:

Year	Length of Fire	Acres Consumed by fire	Cost of fire suppression	Facts
2008 Evans Road Fire	June1, 2008- Jan. 5, 2009	40, 704 acres	$20 million	Smoke impacted cities as far away as Raleigh and Charlotte
2011 Lateral West Fire	Aug. 4, 2011- Nov. 21, 2011	6, 500 acres	$12. 5 million	Took place at Great Dismal Swamp NWR

The Solution:

Restoration projects

Many NC agencies have been involved in multiple projects to restore the pocosin ecosystems that have been drained or burned.

Here are three examples of APNEP restoration projects completed with our partners:

1. Hydrologic management of Dismal Swamp Peatlands with The Nature Conservancy
2. Atlantic white cedar plantings at Dismal Swamp State Park. The group planted 10,000 trees after the 2011 fire
3. Water quality restoration of Alligator River, Long Shoal River, and Pamlico Sound. The project took place on Mattamuskeet Drainage Association land in 2013.

What is restoration?

Restoration is returning something to a previous state.

Ecosystem restoration is attempting to return an ecosystem to the same processes and cycles that were present before disturbances.

Restoring the hydrology of pocosins stops the loss of peat soils and allows soil generation and biomass accumulation to start over.

Restoring the pocosins is an opportunity to sequester carbon. "Trees are good carbon eaters, peat bogs and tidal marshes are even better"[2].

Hydrology: Properties of the earth's water, especially its movement in relation to land. Think water cycle!

[2] http://www.fws.gov/southeast/climate/stories/pocosinlakes.html

Why are pocosins important to conserve and restore?

- They act as a corridor for wildlife.
- They are a habitat for songbirds to rest while migrating.
- They provide a buffer against flooding.
- They absorb pollutants and release clean water into our estuaries.
- They store lots of CO2.
  - Resaturating 11,000 acres of Pocosin Lakes National Wildlife Refuge is equal to taking 6000 cars off the road[2]

[2] http://www.fws.gov/southeast/climate/stories/pocosinlakes.html

U S Fish & Wildlife Service

Pocosin Lakes National Wildlife Refuge
P. O. Box 329
Columbia, North Carolina 27925
Contact: Howard Phillips- 252-796-3004 ext 226

News Release
August 6, 2008

Restoring Wetlands Improves Wildlife Habitat, Helps the Environment, and Protects from Wildfires

Photo Credit- USFWS- Tom Crews (taken Aug 3, 2008)

Aerial view of Evans Road, showing the **hydrology restoration site** in the foreground on the west side of Evans Road, the Evans Road Firebreak alongside the road, and, in the background, the **aftermath of the Evans Road Fire**.

More resources on peat wildfires:

5 key moments of the 2011 lateral west fire:
http://www.fws.gov/news/blog/index.cfm/2011/12/12/5-Key-Moments-of-the-Lateral-West-Fire
National geographic article on the severity of the NC peat fires:
http://news.nationalgeographic.com/news/2008/06/080613-wildfire-peat.html
Human health effects of peat fires:
http://www.epa.gov/research/priorities/docs/nc-wildfire-study-fact-sheet-final.pdf
Detailed article on the benefits of restoring NC's peatlands:
http://www.fws.gov/raleigh/pdfs/PeatlandRestoration_CSeqBenefits_Jan2010.pdf
2008 Evan's road fire article:
http://www.coastalwildliferefuge.com/pr/pr011209.pdf

Evans Road Fire on Pocosin Lakes National Wildlife Refuge Officially Declared "Out"

Fire suppression activity during the Evans Road Fire tacked burning peat- a major challenge for firefighters.

On January 5, 2009, Pocosin Lakes National Wildlife Refuge Fire Management Officer Vince Carver declared the Evans Road Fire to be officially "out".

This call was made two weeks after the last known hotspot had been extinguished. The Evans Road Fire began as a result of a lightning strike on private land south of Pocosin Lakes National Wildlife Refuge on June 1, 2008. The fire burned a total of 40,704 acres of land; 60% of the acreage was refuge property and the remaining was State or private land. Countless tons of peat were consumed by the fire, and suppression efforts cost just under $20 million.

Carver summarized the fire, "Early in the Evans Road Fire, there were some terrific runs - as great as 12,000 acres in one day. But after the first two weeks, the fire's footprint didn't change significantly.

Unfortunately, there were extensive amounts of peat ignited and that presented many challenges for the firefighters. Over the duration of the fire, three Type 3 and six Type 2 Incident Management teams worked to suppress it. At one point during the height activity, there were more than 400 local, County, State and Federal personnel assigned to the incident.

Besides paid firefighters, the teams received a lot of resources and support from organizations like NC Baptist Men and CISCO Systems."

Putting out the fire burning underground in dry peat soil was one of the greatest challenges for firefighters. Over 2 billion gallons of water were pumped from Lake Phelps, New Lake and the NW and SW Forks of the Alligator River. Using additional high-volume pumps, the water was then moved over 35 miles to the areas with the most severe ground fire to prevent the fire from spreading. Because of the fire's size, it would have been impractical, if not impossible, to flood the entire area. But the pumping efforts, in combination with some heavy late-summer rains, extinguished most of the peat fire. The last hot spots were burning in a windrow associated with agricultural fields. Once the farmer harvested his crops, a bulldozer was used to dig out the fire . . .202 days after the first resources had arrived on scene.

Smoke from the Evans Road Fire impacted cities as far away as Raleigh and Charlotte. The town of Columbia was under health advisories for much of June and July due to the concentrations of fine particulates in the smoke. Two communities, Lake Phelps and Waterway Landing, were evacuated; however, no permanent homes were destroyed. Three mobile homes, used as hunting cabins, were burned. Other than a couple of heat-related injuries early in the initial attack, no serious injuries were reported.

The final After-Action Review for the Evans Road Fire will be held in January. Lessons learned on this fire will be shared with others in the firefighting community.

For more information on the Evans Road Fire, visit http://www.fws.gov/pocosinlakes/erf.html.

contact:

Bonnie W. Strawser
Visitor Services Manager
Alligator River/Pea Island
National Wildlife Refuges
P. O. Box 1969
Manteo, NC 27954
tel 252-473-1131 ext 230

Wetland Classification Station 4

Summary: The wetland classification station includes a map of pocosins in NC and an activity for learning how to distinguish pocosins from other wetland ecosystems.

Part 1. Where are pocosins in NC?

Materials:

- Page 34- Map: Peatland pocosins in APNEP region
- Page 35- Wetland types in the US

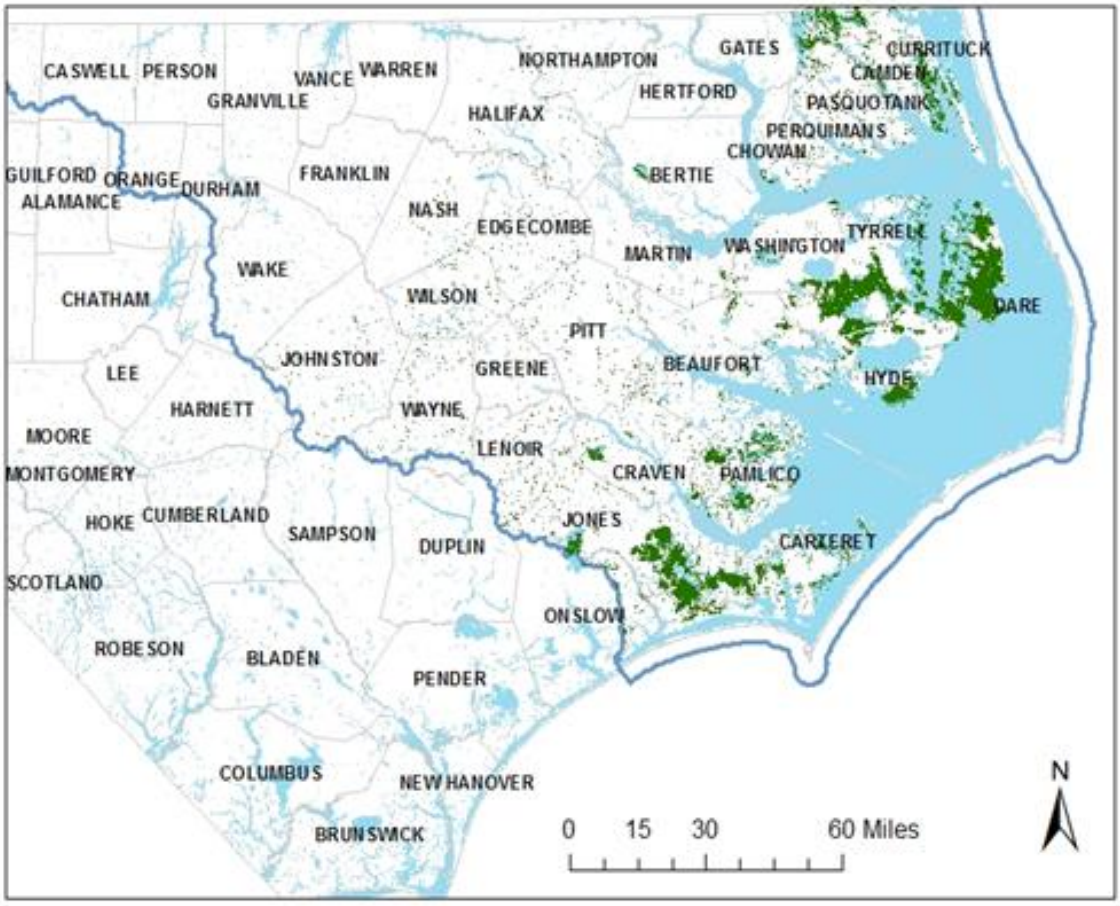
Instructions:
Have students look at the maps and talk about the geography surrounding the pocosins. The U.S. map (pages 35) can be used to show how pocosins are unique to N.C.

Resources:

Chart shows how scientists classify wetlands:

http://www.fws.gov/wetlands/Documents/Wetlands-and-Deepwater-Habitats-Classification-chart.pdf

Peatland Pocosin in APNEP Region



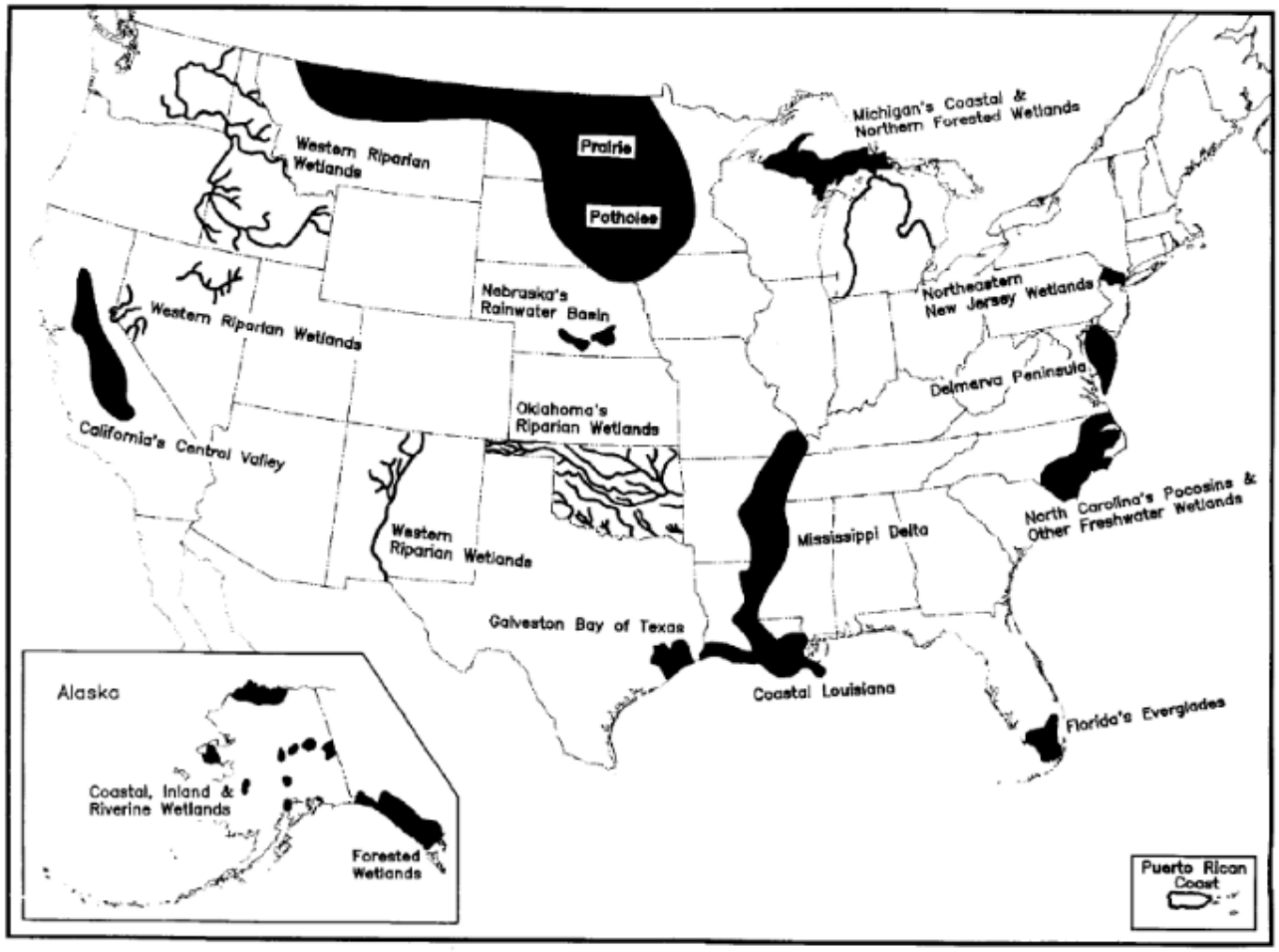
Data Source: Southeast Gap Analysis Project

Legend

- Counties
- Water bodies
- APNEP Region
- Pocosin Habitat

Wetlands of the United States

Shows the unique wetlands across the US



Source <http://www.doi.gov/pmb/oepc/wetlands2/images/usa.gif>

Part 2. Wetland classification

Materials:

- Felt board
- Velcro
- Wetland pictures
- Wetland descriptions
- Page 37- NC's freshwater wetlands
- Page 38- Wetland classification of pocosins
- Pages 39-41- Wetland pictures
- Pages 43-44- Wetland descriptions

Instructions:

Print pages 37 and 38 to place at the station. Print and cut out the wetland pictures and descriptions. Cover a display board with felt. Attach a small piece of Velcro to the pictures and descriptions. Students must match the wetland picture to the proper description based on defining characteristics of wetland habitats like plants, animals, and salinity.

NC's Freshwater Wetlands:

Geography and elevation affect where wetlands are created. NC's geography has a slow gradient which creates many different types of wetlands. Five of them are pictured here.

Pocosins are **ombotrophic, palustrine** wetlands.

Ombotrophic wetland: Rain provides most of the water instead of a river or ocean. Typically, there is no standing water in pocosins, but the soil is saturated by groundwater.

Scientists use the classification system below to categorize NC's wetlands.

Five systems of wetlands are defined:

- Marine--open ocean and its associated coastline
- Estuarine--tidal waters of coastal rivers and embayments, salty tidal marshes, mangrove swamps, and tidal flats
- Riverine--rivers and streams
- Lacustrine--lakes, reservoirs, and large ponds
- **Palustrine**--marshes, wet meadows, fens, playas, potholes, **pocosins,** bogs, swamps, and small shallow ponds

<http://water.usgs.gov/nwsum/WSP2425/definitions.html>

Maritime swamp forest

Pocosin

Pocosin-Pine Savanna Ecotone

Roanoke River Bottomland

Marsh

Matching activity adapted from "Name That Wetland- A Classification Game" [3] by the North Carolina State Museum of Natural Sciences and combined with "More Than Just a Swamp".

Swamp:

Wetlands where trees and shrubs grow. Flooded throughout most of the year.

Pocosin:

Dense shrub areas scattered with pond pines. The peat soils are spongy feeling and made up of decaying material. They are important sources of food and shelter for black bear, deer, and bobcat. They are found only on the Coastal Plain of the Southeastern US and most occur in NC.

[3] Beaman, Barbara, and Carla B. Burgess. *Freshwater Wetlands of North Carolina and the Southeastern United States: An Educator's Guide*. Raleigh, NC: Museum, 1996. Print.

River wetlands:

Wetlands found in forests. They soak up water during storms and then slowly release it into rivers. Also called bottomlands.

Marshes:

Wet areas filled with a variety of grasses and rushes. They can be found in both freshwater and saltwater areas near our coast.

Savannas:

These wetlands are open and grassy with longleaf pine scattered throughout. These wetlands require periodic fires and are often found next to pocosins. Carnivorous plants are found in this habitat.

Meet Peat

5

Summary: The meet peat station teaches about pocosin soil which is called peat. Peat is a great natural resource because it holds lots of carbon and has unique water filtration properties. One of the coolest things about peat is the slow decomposition rate found in the waterlogged soil. The lack of oxygen in the soil means that many well-preserved artifacts have been collected from peat bogs including human bodies! Burying representations of objects that have actually been discovered in peat bogs is a hands-on way to lead a discussion on soil science. Bog bodies can be exciting topic for older students. This station works well as a demonstration because the concept of decomposition can be challenging for students.

Materials:

- Clear plastic container
- Digging tool
- Peat soil
- Sphagnum moss
- Small piece of wood
- Oyster shell
- A book that you don't mind getting dirty
- Piece of felt or fake animal fur
- Page 48- Label for plastic container
- Page 49- Peat facts
- Page 50- Explanation of activity
- Page 51- Cross-section of peat

Instructions:

Make your peat bog by filling the plastic container with the peat soil. Bury the four "artifacts" in the peat soil- a book, piece of wood, oyster shell, and animal fur. Cover the peat with a sheet of moss. Print pages 48-51 to put at the station.

Explain to students why peat bogs are good at preserving items. Let students dig through the bog and when they extract an artifact, explain where it came from and remind them how peat soil keeps it in such good condition.

Wood: Large pieces of wood have been dug out of peat bogs. Wood typically decomposes quickly but in the oxygen free peat environment, certain microbes are not present and the large pieces lay under the ground for many years. [4]

Ancient text: In the same way, books that would usually decompose quickly have been found by researchers thousands of years later, including some important texts.[5]

[4] Sharitz, R.R., and J. W. Gibbons. 1982. The Ecology of Southeastern Shrub Bogs (Pocosins) and Carolina Bays: A community Profile. U.S. Fish and Wildlife Sercie, Division of Biological Services, Washington, D. C. FWS/OBS-82/04. 93 pp. http://www.nwrc.usgs.gov/wdb/pub/others/82_04.pdf

[5] Engber, Daniel. "How Do Bogs Keep Things Fresh." *Slate*. http://www.slate.com/articles/news_and_politics/explainer/2006/07/bless_this_boggy_book.html

Animal skins: Well preserved animal skins found in peat bogs give scientists great historical information on species. [6]

Oyster shell: "Around 1896, a company digging the Dismal Swamp Canal deeper, also dug up fossils and foot-long oystershells that weighed 5 pounds each! These fossils were from the Miocene Age". [7]

For older students you can talk about the bog bodies that have been found preserved in peat bogs. Over 1,000 bodies have been found in good condition in peat bogs including the Tollund Man from 350 B.C. found in Denmark with stuble on his chin and the rope that killed him around his neck and the Lindow man found in London with a beard still intact. [8]

Resources

Check out "People of the Bog" from Project WET (2004) to learn more about rates of decomposition in aerobic vs. anaerobic conditions and how they preserve artifacts from the past.

Gives a good description of peat and the rate it accumulates:
http://www.fws.gov/refuges/profiles/index.cfm?id=42535

[6] Engber, Daniel. "How Do Bogs Keep Things Fresh." *Slate*.
http://www.slate.com/articles/news_and_politics/explainer/2006/07/bless_this_boggy_book.html
[7] Marsh, Carole. *America's Scariest Swamp: The Dismal!* Decatur, GA: Gallopade, 1991. Print.

[8] Engber, Daniel. "How Do Bogs Keep Things Fresh." *Slate*.
http://www.slate.com/articles/news_and_politics/explainer/2006/07/bless_this_boggy_book.html

POCOSIN

PEAT BOG

The type of soil found in pocosins is called PEAT.

- Peat is a wet, acidic, and organic soil consisting of partially decayed vegetation.
    - The organic matter (dead leaves, moss, and other plants) acidifies the peat & water

- Peat is mostly made up of decayed sphagnum moss.
- Peat accumulates slowly, at the rate of about 1 inch/100 years.

- It sequesters carbon and cleans water very effectively. Peat is a chemical sponge for metals, carbon, and nutrients.

- Decay from organic material to mineral soil is a very slow process because of a lack of oxygen in the waterlogged soil

The lack of oxygen in the saturated soils inhibits the growth of bacteria and fungi meaning there is very slow decomposition. The slow decomposition means that items that get put in a bog may not decompose over thousands of years.

Your goal is to find the items that have been preserved in the peat bog!

The clues and items you can find in the peat represent real items that have been found and were preserved in a peat bog.

Clues:

1. Around 1896, a company digging the Dismal Swamp Canal deeper, also dug up fossils and foot-long oystershells that weighed 5 pounds each! These fossils were from the Miocene age.

2. Bits of animal skin have been found preserved in European peat bogs. They can last for thousands of years when trapped under the surface of peat. The acidic sphagnum and little oxygen helps preserve them.

3. A 1,200 year-old ancient book of psalms was found in an Irish bog.

4. Large chunks of wood that has not decomposed can severely interfere with agricultural practices. The amount of buried wood is a factor when companies consider draining a peatland for farming.

Since organic matter accumulates over thousands of years, peat deposits are an ancient ecosystem that can provide records of past vegetation and climates stored in plant remains, particularly pollen. This allows humans to reconstruct past environments and changes in human land use.

Peat soil profile. Photo Credit: The Nature Conservancy

Make a Terrarium Station 6

Summary: The “Make a Terrarium” station is most closely related to the “Meet Peat” station. Building a terrarium allows students to connect the feel of peat to its defining properties like holding water efficiently. The terrarium also helps visualize the peat layers and how the moss eventually decomposes into what is called peat and the peat eventually becomes mineral soil.

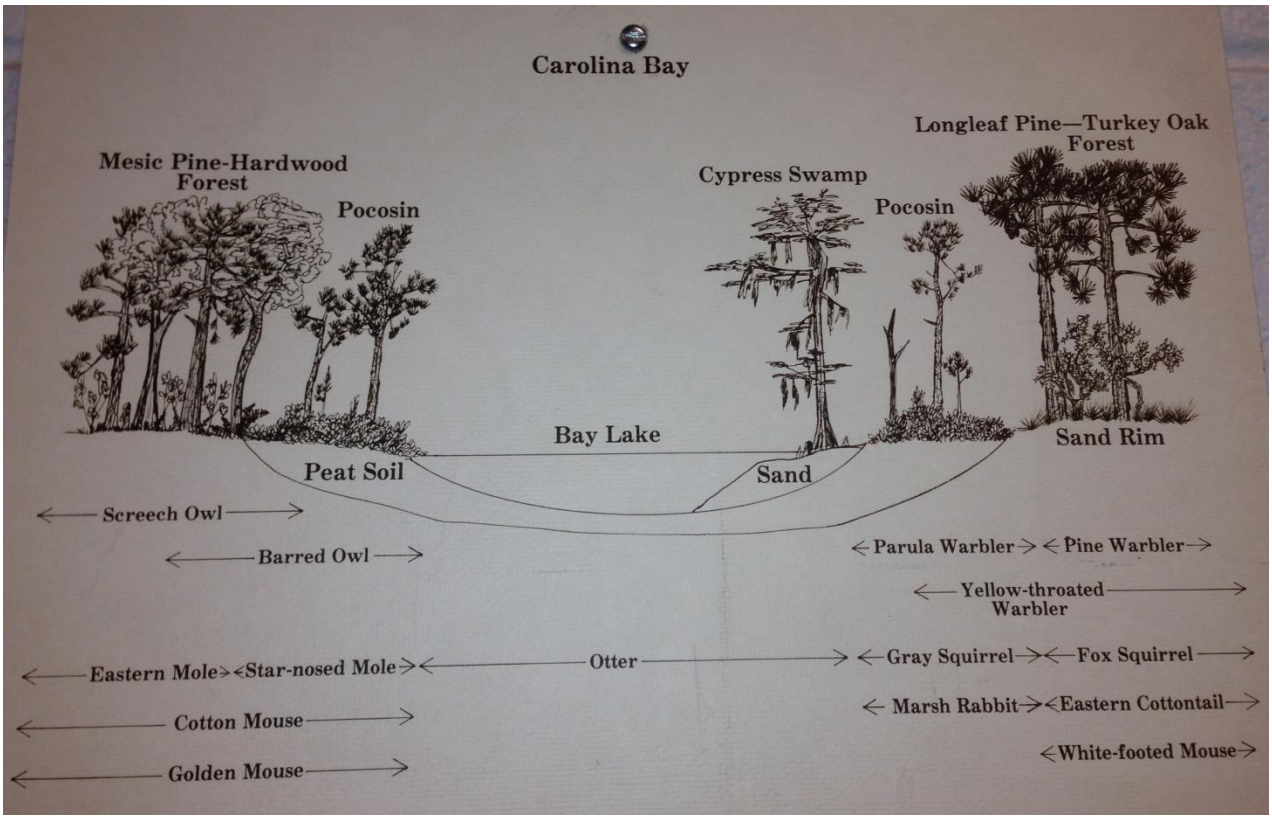
Materials:

- Clear glass or plastic jars
- Small rocks
- Dried sphagnum moss
- Live moss
- Peat soil
- Soil
- Page 54- Image showing the layering of a peat bog
- Page 55- Terrariums represent the ancient ecosystems of peat bogs
- Page 56- Directions on making a terrarium

Instructions: Lay out the six materials needed for layering the terrarium. Print out pages 54-56 and let students follow the steps or demonstrate in front of the class and talk about the layers and the difference between sphagnum moss, peat, and soil.

Your terrarium should have layers:

1.Living moss and pocosin shrubs
2.Peat soil
3.Mineral soil



The layers of peat in pocosins take a VERY long time to build up. It can take 100 years to make 1 in. of peat!

Over the thousands of years since the last ice age, an organic layer has piled up 10 ft thick or more in many pocosins. This makes it an **ancient ecosystem**!

Make your own ecosystem and monitor your moss in its mini-pocosin environment!

Make a Terrarium Directions:

1. Put a layer of pebbles in the bottom of the container. This will allow for good drainage.

2. Put a layer of dried sphagnum moss on top of the rocks
    - Sphagnum moss is a dried and wiry material which keeps the soil from falling into the rocks

3. Put a layer of soil on the top of all of this.

4. Put a layer of peat soil on top of this
    - This represents the wet sphagnum moss and other organic matter that has not been fully decomposed.

5. Poke small holes in the soil and transplant your live moss to the container.
    - Moss grows very well in pocosins because of the wet, acidic soil.

6. Place a miniature colored stone or plastic figurine in the container for an interesting look.

7. Water it a moderate amount with spray bottle and cover.

8. Label your jar.

9. Now monitor it over the next few days. Add more water if the moss is dry. If there is too much water, keep the cover off for a few hours so it can evaporate.

A Peek at Pocosins

Scavenger Hunt

Pocosin Plant Station

1. Name one species of carnivorous plant other than the Venus flytrap. _____

2. Venus flytraps are a rare species in NC so botanists monitor the remaining number of species to ensure their survival. Use the highlighted code found on the map and the Natural Heritage Program "Help and Definitions" packet to look up the number of individual plants that remain.

Based on the State Rank of S2, about how many individuals are left. _____

3. What is one adaptation if you are a plant living in low nutrient soils. _____

Pocosin Animal Station

4. Make 2 different food chains using the display and write 1 of them out here. Check out the clues if you are not sure what it eats what!

_____→_____→_____

Restoration Station

5. Circle the correct meaning of ecosystem restoration

A. Fish an area until there are no more fish

B. Introduce a new species into an environment

C. Return an ecosystem to its condition before disturbance

D. Clear-cut pine trees

6. Why were the 2011 and 2008 peat fires so difficult to extinguish?

Wetland Classification Station

Using the peatland pocosin map, name one county with the highest densities of pocosins on NC's coast.

7. _____

Match the freshwater wetland name and description to the correct wetland picture.

8. Wetland #1 Name _____

9. Wetland #2 Name _____

10. Wetland #3 Name _____

11. Wetland #4 Name _____

12. Wetland #5 Name _____

Meet Peat

13. Approximately how much peat is formed in 100 years? _____

14. Why does peat not fully decompose the items you found in the peat bog?

A Peek at Pocosins (ANSWER KEY)

Pocosin Plant Station

1. Name one species of carnivorous plant other than the Venus flytrap. **Sundew, pitcher plant, bladderwort**

2. Venus flytraps are a rare species in NC so botanists monitor the remaining number of species to ensure their survival. Use the highlighted code found on the map and the Natural Heritage Program "Help and Definitions" packet to look up the number of individual plants that remain.

Based on the State Rank of S2, about how many individuals are left. **1,000-,3000**

3. What is one adaptation if you are a plant living in low nutrient soils. **Eat bugs, be fire tolerant, don't lose your leaves, stay small**

Pocosin Animal Station

4. Make 2 different food chains using the display and write 1 of them out here. Check out the clues if you are not sure what it eats what! **Answers will vary**

Restoration Station

5. Circle the correct meaning of ecosystem restoration

A. Fish an area until there are no more fish **C. Return an ecosystem to its condition before disturbance**

B. Introduce a new species into an environment D. Clear-cut pine trees

6. Why were the 2011 and 2008 peat fires so difficult to extinguish? **The water level was lower, so the peat was dried out and very flammable. Peat fires can smolder for months because they are underground and difficult to put out.**

Wetland Classification Station

Using the peatland pocosin map, name one county with the highest densities of pocosins on NC's coast.

7. **Dare Co.**

Match the freshwater wetland name and description to the correct wetland picture.

8. Wetland #1 Name **Marsh**

9. Wetland #2 Name **Swamp**

10. Wetland #3 Name **River Wetlands**

11. Wetland #4 Name **Pocosins**

12. Wetland #5 Name **Savanna**

Meet Peat

13. Approximately how much peat is formed in 100 years? **1 inch**

14. Why does peat not fully decompose the items you found in the peat bog? **The acidic, water-logged conditions mean that there is a lack of oxygen making the soils anaerobic. Microbes require oxygen for the decomposition process.**