WETLAND COMMUNITIES

I. Objectives:

1. To learn the basic attributes of what distinguishes a wetland habitat from other habitats in our region.

2. To examine plants, hydrology, and soils along a transect on campus that crosses wetland boundaries.

3. To examine several types of wetlands and discuss their boundaries and the problems they face and cause as they are lost.

II. Introduction:

In one sense, all communities on Earth are wetlands because they depend on water to some degree. Environments vary, however, in the amount of water that they contain. At one extreme are very wet (aquatic) habitats while at the other are very dry upland habitats (deserts). Between these two extremes is a transition zone. At some point in this transition, the impact of water becomes great enough that the soil becomes **anoxic**. **Wetlands** are habitats that have anoxic soils for at least some portion of the growing season. Historically, wetlands have been vilified as the source of diseases and as obstacles to human progress. Throughout human history wetlands have been modified through filling or drained and converted to farmland or sites for houses and factories. A large proportion of wetlands around the world has been destroyed as a result. Ecologists that studied transition zones between upland and aquatic habitats traditionally did not try to determine the exact boundary between them. They recognized the unique nature of flooding and the plant and animals. The term wetland was not used, instead swamps, marshes, moors, bogs, etc., were used to describe the habitat under study.

When the **Clean Water Act** was passed in 1979, **Section 404** of that legislation prohibited the filling of “Waters of the United States,” which included wetlands. This meant that a clear definition was necessary so that those attempting to obey the law would know where wetlands existed and those in charge of enforcing this new law could enforce it. Unfortunately, the zone between an aquatic habitat and the upland terrestrial habitat is seldom marked by an abrupt boundary. Instead there is a gradual change from the aquatic habitat that is almost always dominated by the effects of water, to the upland side where water is a limited resource. Where wetlands end and upland habitats begin has occupied a great deal of scientists’ and attorneys’ time since the act was passed.

The current definition of a wetland is based on the presence of three parameters: 1) **hydrology**, 2) **hydric soils**, and 3) **wetland plants**. A wetland is an area that is flooded for a sufficient length of time so that it is dominated by **hydrophilic** (water loving) or at least water tolerant plants, and where the soil has responded such that it is anaerobic within the top 12 inches (30.5 cm) for a least 5% of the growing season, or about 14 days in southeastern North Carolina. Although the definition used by federal, state, and local agencies may vary, this concept forms the basis for most definitions. While this may seem like a straightforward definition, it is often difficult to determine exactly where a boundary begins or even if a site is a wetland. Rainfall is not uniform over the year or even over many years, so wetlands can often be extremely dry and uplands can be flooded for long periods of time. It often takes wetland scientists to make boundary determinations and even then, scientists may argue over exactly where the boundary should be. Some state agencies, frustrated over the difficulty of determining where wetlands exist, use another approach. If certain plants dominate, then the habitat is considered a wetland, no matter if it floods or not.

Most people are familiar with large classical wetlands such as the Everglades or the Okeefenokee Swamp. Few, however, realize that wetlands are everywhere, even in their backyards, on mountainsides, and in the desert. Wetlands have important ecological functions, including some of the same ones as nearby upland and aquatic habitats. Within the classification of wetlands are giant swamps covering large areas of the Earth and very small areas of damp earth. Each type has certain functions that contribute to the function of the entire landscape. While most of us recognize the importance of preserving large systems such as the Everglades, which harbors Endangered Species and nurtures the coastal fisheries of south Florida, we often neglect the small temporarily flooded pools in our backyards, which may be the only nesting habitat for frogs and toads in the area. Without these small wetlands, important predators may be missing from the nearby landscape. Thus, each wetland has value, no matter how small or temporary.

Federal, state, and local regulations protect most large wetlands from destruction, but small ones are afforded little protection and are disappearing rapidly from the landscape, taking with then many species that depend on them. UNCW's campus has a number of wetlands that are in various states of health.

Water

Obviously, water is the critical component of these wetlands. Both the depth of flooding and the duration of flooding are important. To represent this aspect of a wetland's hydrology, we use a **hydrograph**. A hydrograph typically shows the flooding frequency and duration over a specific period of time, for example a tidal marsh in the Cape Fear River over one 24-hour cycle (Fig. 1) or a bog in New England over the course of one year (Fig. 2). Note that the marsh and bog are not flooded all of the time.

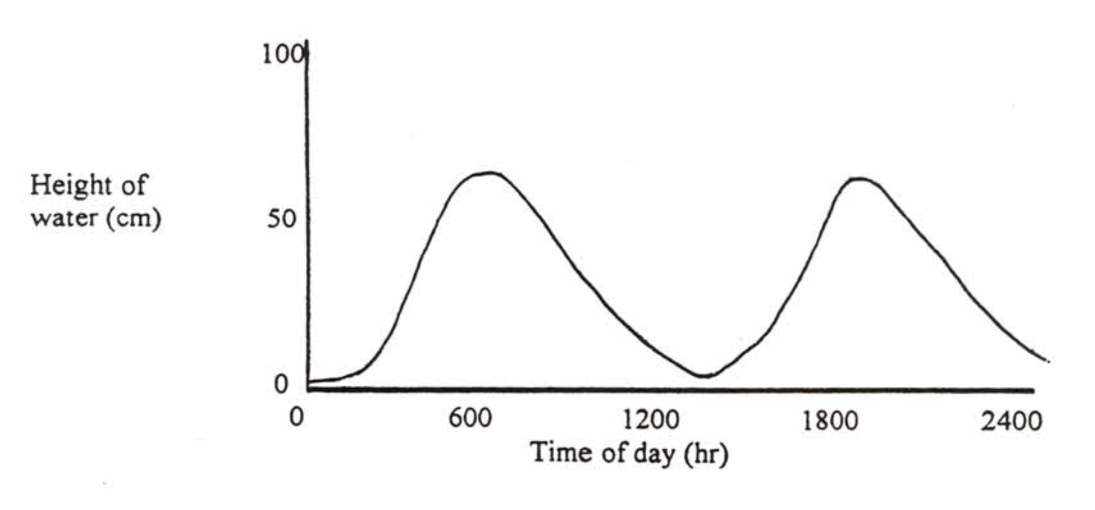

Fig. 1. Hydrograph of a tidal marsh showing surface flooding during each high tide.

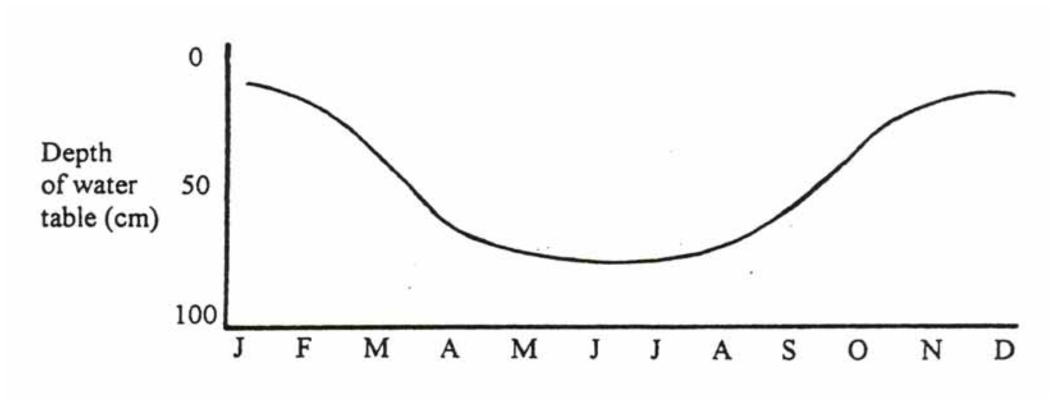

Fig. 2. Hydrograph of a bog showing the depth of the water table during each month of the year.

Ecological Functions

Each wetland has ecological functions that differ depending on its position in the landscape. A tidal wetland serves as a feeding area for juvenile fish and shrimp, and so contributes biomass to the adjacent ocean. Swamps along rivers remove sediment and nutrients from the adjacent river, purifying water. Isolated wetlands serve as reservoirs, holding water so that parts of the landscape below them do not flood as often or severely. Some hold floodwater and allow it to percolate into the ground, thus recharging our ground water. Not all wetlands have all functions, but every one has an important role in the landscape. Wetlands are often important for animals that are not wetland species, but need wetlands for breeding, protection, or for food.

McCrary's Bog

This area was once connected to the wetland behind the greenhouse, but was separated from it by the sidewalk and fill placed along this corridor. At one time, Venus flytraps and sundews were abundant here. Although small, it contains a clam shrimp and a fairy shrimp that have been found in only a few areas near Wilmington. The only other known sites for these species were located where the present Wal-Mart is now and in what in now the Landfall golf course. When this area is flooded by rainfall, these small crustaceans hatch, grow, mate, lay eggs, and die, all in the course of a few weeks. During this period of time, various frog and toad species will also use the area for breeding. A few buttressed black gum trees are the only overt sign that this area is a wetland. There may be no flooding here for years at a time followed by months of flooding. Runoff from the adjacent road, fertilizer, and inadvertent filling continue to degrade this site. A hydrograph of McCrary's Bog would indicate ponding after heavy rains, especially during the winter months when **evapotranspiration** is minimal.

Greenhouse Bay

Behind the greenhouse is a relatively large area of dense shrubbery called a Carolina bay. In this part of North Carolina, such bays may occupy many square miles and are important areas for wildlife. These evergreen shrub bogs exist because water is trapped temporarily, causing the accumulation of organic matter, which in turn produces very acidic peat that limits the types of plants and animals that can live there. These wetlands are usually flooded during the winter. When the vegetation begins to grow in mid-April, evapotranspiration removes the water, lowering the water table. During these times, the ground water level may be four feet or more down in the soil. These wetlands usually evapotranspirate more that the 50+ inches of rainfall that falls each year. When plants cease growth in mid- to late September, these wetlands rehydrate and remain wet until the cycle begins again.

Ditches connected to the University's storm-drain system have drained this wetland. Several years ago some of these ditches were filled, restoring some of the wetland's water retention capability. In addition, some of the water that flowed into the gutters from the roof of Friday Hall was diverted into this wetland. Recent projects alongside this wetland and the introduction of exotic species, such as water hyacinth, and garbage into this wetland threaten its natural state. In addition, fire has been eliminated. Fire is a natural part of this community, and favors the growth of herbaceous plants such as the carnivorous Venus flytrap, pitcher plants, and sundews over woody species.

III. Methodology and Assignment:

1. Visit the south side of the Greenhouse Bay (cross the bridge and immediately turn right into the upland forest). Face north towards the bay. You are now standing in an upland forest and facing a wetland habitat. Note the gentle slope downward towards the bay. At what point does the upland forest stop and the wetland begin?

   We will answer this question by examining the hydrology, soil, and vegetation at several sites along a transect that extends from the upland forest and into the bay. At each site, there is a hydrology well that has been inserted into the ground. By sticking a long pole into the well, we can determine where the water table is in relation to the surface of the soil. Record the depth of the water table (in cm) at the first well on the data sheet. Use a soil auger to measure the depth of the litter layer and the depth where the A-horizon meets the B-horizon near the first well. Identify the four most dominant plant species at the first well.

   Repeat this procedure at each station.

2. Draw a graph depicting the depth to the top of the water table in relation to the surface of the soil at each station. Why isn't this a hydrograph? What would you need to do to make it a hydrograph?

3. Draw a graph depicting the thickness of the O (litter) and A-horizon at each station. At what point does the soil become anoxic along the transect?

4. Compare your dominant vegetation with the list provided in lab. At what point do wetland plants begin to dominate the vegetation?

5. Enter the data on depth to top of water table and thickness of the O and A horizons in the JMP program. Run a correlation analysis between the thicknesses of the two soil horizon, and the thickness of each horizon with the depth to the top of the water table (three analyses total). What do these results tell you and how do you interpret them?.

DATA SHEET

Station number	Water table	Depth (in cm) of Litter	A-horizon	Dominant vegetation
1				a. b. c. d.
2				a. b. c. d.
3				a. b. c. d.
4				a. b. c. d.
5				a. b. c. d.
6				a. b. c. d.
7				a. b. c. d.
8				a. b. c. d.

WETLAND COMMUNITIES

Plant List

<u>Upland</u> <u>Plants</u>

Long-leaf Pine (*Pinus palustris*)

Turkey Oak (*Quercus laevis*)

Post Oak (*Quercus stellata*)

Live Oak (*Quercus virginiana*)

Sassafras *(Sassafras albidum*)
virginiana)

Wire Grass (*Aristida stricta*)

Bracken Fern (*Pteridium aquilinum*)

Pixie-moss (Pyxidanthera barbulata)

<u>Wetland</u> <u>Plants</u>

Pond Pine (*Pinus serotnia*)

Jessamine (*Gelsemium sempervirens*)

Red Bay (*Persea borbonia*)

Loblolly Bay (*Gordonia lasianthus*)

Sweet Bay (*Magnolia*

Bull Bay (*Magnolia grandiflora*)

Red Maple (*Acer rubrum*)

Greenbrier *(Smilax laurifolia*)

Inkberry (*Ilex glabra*)

Gallberry (*Ilex coriacea*)