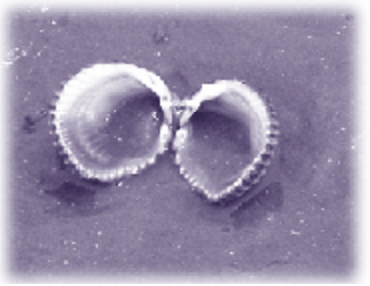
Chapter One

The North Carolina Coast

THE ECOLOGY



Visitors to the North Carolina coast might well think that barrier islands and their beaches are the heart of the coastal area. They are, after all, the center of activity for thousands of people every summer day. An aerial photograph of the coast tells a different story, though: the islands appear to be only a slender, slightly bowed, ribbon in the midst of an enormous sea. Water dominates the image, an image that is the key to understanding North Carolina's coastal ecosystem.

The Atlantic Ocean, too wide for all of it to fit into the frame of the photograph, has an equal amount of influence in shaping the lands, waters, plants and animals of the coastal area. Wind, waves, and tides – all affected by (and affecting) the huge body of water – are constantly at work, shaping the size and location of barrier islands and inlets, determining what types of plants will grow where. For example, just wind-borne salt significantly affects how maritime trees, and thus the shape of entire forests, develop.

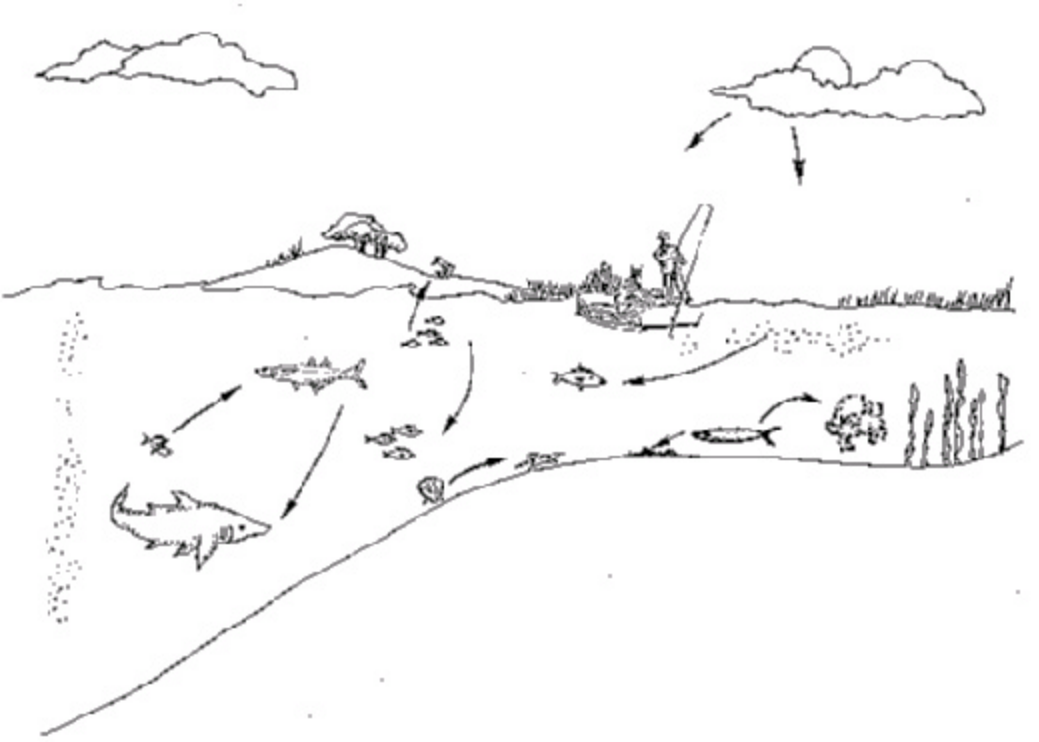
Climate, which the ocean affects through the temperature of water currents, in turn influences the types of plants and animals found along the coast. The rising and falling of tides affect not only the types of organisms found on a beach and the specific places where they can survive, but the types of species found behind the barrier islands, in the sounds, as well.

This leads to the other half of that watery photograph - the estuarine system. That is the scientific phrase used to describe North Carolina's 2.2 million acres of shallow sounds, rivers and creeks. As water from the ocean moves through the inlets between the barrier islands, it mixes with the water from inland rivers and streams. The part-salt, part-fresh water is called brackish. It is the special type of water that, when mixed with nutrients from marsh plants and other organisms, creates the foundation for life in the coastal area.

What a remarkable community of life it is, too, from imposing birds like the osprey to the microscopic waterborne animals called zooplankton. Intricately interrelated, all forms of life in the estuarine area are adapted to what would appear to be a harsh environment – one where change is constant, in water levels, salinity, and temperature. Within this complex natural system are habitats, the places where plants and animals live, that together form one of the most productive systems on the earth.

Each habitat contains "niches," roles, really, that each organism plays in maintaining the balance of the natural system. These patterns of life in the estuarine area – who eats and produces what – are described by scientists with food webs and food chains, as shown in the illustration on the next page.

THE ECOLOGY



An important part of that illustration is the "top" of the food web: people. Although one might not automatically connect an estuary with a flounder dinner, the two are inseparable. In fact, North Carolina's estuarine area, the third largest in the country, is the foundation of economic life at the coast.

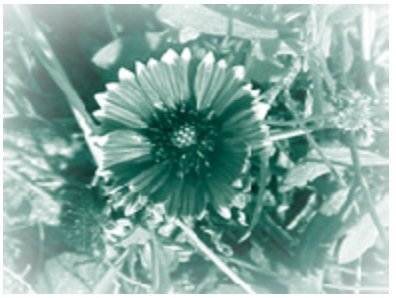
Ninety-five percent of the commercial fish species caught in the state depend on the nutrients and shelter of estuaries during some part of their lives. Tourism, sport fishing, agriculture and industry are multi-million dollar enterprises that also depend on this area.

In North Carolina, estuaries vary considerably from broad, shallow sounds (like the Albemarle and the Pamlico) to narrow bodies of water (such as Currituck Sound). Differing water levels, basin types, tidal patterns, salinity, temperature and sediment types make each estuary unique, and define the types of habitats and organisms that are found there.

The sites of the North Carolina National Estuarine Research Reserve – Currituck Banks, Rachel Carson, Masonboro Island and Zeke's Island – represent the primary types of estuaries found in North Carolina.

THE GEOLOGY

The estuarine area of North Carolina is part of the Coastal Plain, a region that evolved over tens of thousands of years as changes in climate and ocean level influenced deposition and erosion of vast quantities of sand, silt and clay. The majority of these sediments at one time or another were part of the ocean bottom or mountains, primarily the Appalachians. Physical and chemical weathering of the upland created rocks of various sizes that were reduced to smaller particles. Wind, water and gravity carried these sediments to the coast where they mixed with existing deposits to become part of the now typical beaches, dunes, flats, marshes, shoals and sound bottoms. These processes that developed the coastal landscape are still at work, continuing to change the relationship between land and water.

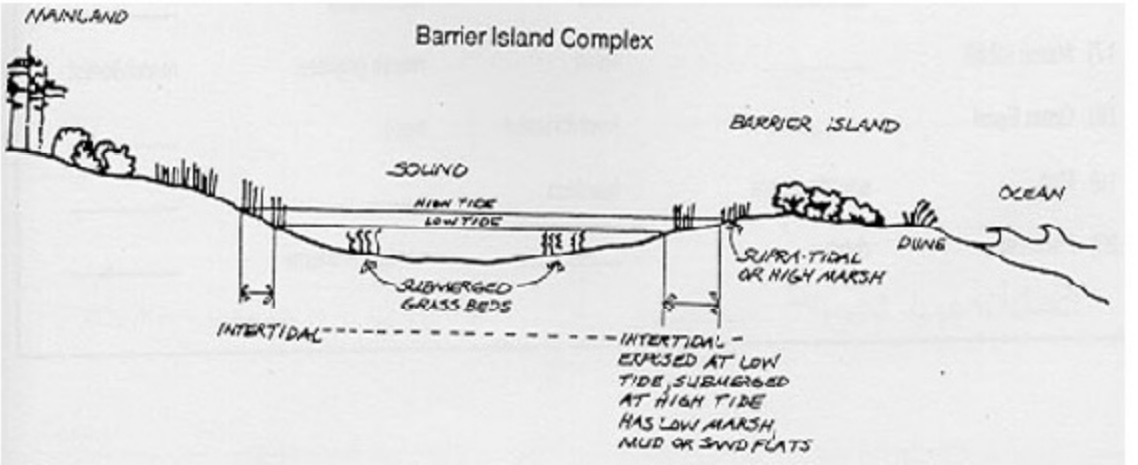


The barrier islands within the four Estuarine Reserve components are at the easternmost edge of the Coastal Plain and the state's estuarine area. Although there are different theories about how the islands and the sounds behind them formed, one of the most likely explanations is that these islands were created by a process known as mainland beach ridge drowning.

Before the glaciers began to recede 10,000 to 14,000 years ago, dunes had formed along the seaward edge of the mainland. The rapid rise in water level from the melting glaciers flooded the low areas behind the dunes, creating shallow sounds bordered by developing barrier islands. When sea level rise slowed to a fairly constant rate of one foot per century 5,000 years ago, the new barrier islands were able to build up, enabling plants to take hold and bind the dynamic sediments.

Through ocean overwash, islands are continuing to "migrate," moving landward as the sea level rises. Evidence that this process, known as erosion to most beachgoers, is still occurring and can be seen in old sound-side peat or shell deposits, and former maritime forest tree stumps that are now exposed on the beaches of barrier islands. It is also possible to find the shells of estuarine organisms, like oysters, on barrier island beaches. The shells are actually fossils of organisms that lived in the sounds several thousand years ago that were deposited on the beaches as the islands moved back-ward over the sounds.

THE GEOLOGY


MAINLAND
Barrier Island Complex
BARRIER ISLAND
SOUND
HIGH TIDE
LOW TIDE
OCEAN
DUNE
SUPRA-TIDAL
OR HIGH MARSH
SUBMERGED
GRASS BEDS
INTERTIDAL
INTERTIDAL -
EXPOSED AT LOW
TIDE, SUBMERGED
AT HIGH TIDE
HAS LOW MARSH
MUD OR SAND FLATS

North Carolina's coastal area has a temperate climate with summer temperatures averaging over 27 degrees celsius (80 degrees Fahrenheit) and winter temperatures that are rarely below 0 degrees celsius (32 degrees Fahrenheit). The climate in northern areas, such as Currituck County, is slightly cooler, especially as compared to southern counties like New Hanover. This is partly because of the influence of the Labrador Current, which is colder than the waters of the Gulf Stream off the southern coast. As a result of these two currents, northern North Carolina is the transition zone between the northern and southern parts of the East Coast.

For many plants and animals, North Carolina is the southernmost place where northern species are found, and the northernmost place for southern species to survive.

Precipitation is mostly rain, approximately 50 inches per year, with only an occasional snowfall. Prevailing winds are from the southwest throughout the spring and summer, while fall winds change to northwesterly. During the winter, winds are mainly from the north.

THE CLIMATE

Tropical storms and hurricanes moving along the eastern seaboard occasionally produce heavy rains, high winds and abnormally high tides, which can substantially change the physical characteristics of barrier islands. Extratropical storms, better known as “nor’easters,” typically occur from October to May and bring northeast winds which may blowcontinuously for three or more days, causing considerable beach erosion.

The potential for coastal storms to create or alter inlets is of particular importance in studying estuaries. Inlet location, as will be described in the section on Currituck Banks, can have a distinct effect on the salinity and other characteristics of the water, and therefore affect the type of organisms found there.

Lunar tides along the North Carolina coast average four feet, with spring tides averaging a foot higher. These tides are semi-diurnal, meaning that high and low tides occur twice a day. Estuaries that are far removed from inlets, and also ocean tides (such as at Currituck Sound), are influenced primarily by wind direction and speed.