"A Day at Cay Creek"

Teaching Materials and Ideas for Lesson Plans using features of Cay Creek Wetlands Park

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This document includes:

1. *List of Georgia State Standards for Science that may be achieved at Cay Creek (p. 2-4)*
2. *Background info on natural processes that may be observed at Cay Creek and glossary of vocabulary words on interpretive signs (p. 5-17)(Glossary p. 17-26).*
3. *Procedures for activities to be done in nature (p.27-31)(Handouts p.32-33)*
4. *Plant and animal lists for Cay Creek (p. 34-43)*

Age range: The activities in this curriculum are suited for students Kindergarten through 12th grade. Recommended age-groups are listed with each.

Goal: Students will explore their local natural environment at Cay Creek, observing their physical surroundings to better understand what is present in nature and how the environment changes. With exposure to and guidance in nature, students will grow to have a relationship with the environment that allows them to form scientific reasoning, a sense of stewardship, and a more perceptive outlook on the world around them.

This guide will provide background information that will help in teaching students about environmental science and some activities that can be done at Cay Creek.

Learning Objectives: A visit to the Cay Creek Wetlands Park enables teachers to apply many of the curriculum objectives outlined in the Georgia State Science Standards. The standards listed below are examples of how the Park can connect with your classroom.

Kindergarten:

- ***SKCS6.*** Students will understand the important features of the process of scientific inquiry.
- ***SKE2.*** Students will describe the physical attributes of rocks and soils.
- ***SKL1.*** Students will sort living organisms and non-living materials into groups by observable physical attributes.
- ***SKL2.*** Students will compare the similarities and differences in groups of organisms.

First Grade:

- ***S1CS4.*** Students will use the ideas of system, model, change, and scale in exploring scientific and technological matters.
- ***S1E1.*** Students will observe, measure, and communicate weather data to see patterns in weather and climate.
- ***S1P1.*** Students will investigate light and sound.
- ***S1L1.*** Students will investigate the characteristics and basic needs of plants and animals.

Second Grade:

- ***S2CS6.*** Students will be familiar with the character of scientific knowledge and how it is achieved.
- ***S2E2.*** Students will investigate the position of sun and moon to show patterns throughout the year.
- ***S2E3.*** Students will observe and record changes in their surroundings and infer the causes of the changes.
- ***S2L1.*** Students will investigate the life cycles of different living organisms.

Third Grade:

- ***S3CS8.*** Students will understand important features of the process of scientific inquiry.
- ***S3L1.*** Students will investigate the habitats of different organisms and the dependence of organisms on their habitat.
- ***S3L2.*** Students will recognize the effects of pollution and humans on the environment.

Fourth Grade:

- ***S4E2.*** Students will model the position and motion of the earth in the solar system and will explain the role of relative position and motion in determining sequence of the phases of the moon.
- ***S4E3.*** Students will differentiate between the states of water and how they relate to the water cycle and weather.
- ***S4L1.*** Students will describe the roles of organisms and the flow of energy within an ecosystem.
- ***S4L2.*** Students will identify factors that affect the survival or extinction of organisms such as adaptation, variation of behaviors (hibernation), and external features (camouflage and protection).

Fifth Grade:

- ***S5E1.*** Students will identify surface features of the Earth caused by constructive and destructive processes.
- ***S5L1***. Students will classify organisms into groups and relate how they determined the groups with how and why scientists use classification.
- ***S5L2.*** Students will recognize that offspring can resemble parents in inherited traits and learned behaviors.

Sixth Grade:

- ***S6E2.*** Students will understand the effects of the relative positions of the earth, moon and sun.
- ***S6E3.*** Students will recognize the significant role of water in earth processes.

Seventh Grade:

- ***S7L1.*** Students will investigate the diversity of living organisms and how they can be compared scientifically.
- ***S7L4.*** Students will examine the dependence of organisms on one another and their environments.
- **S7L5**. Students will examine the evolution of living organisms through inherited characteristics that promote survival of organisms and the survival of successive generations of their offspring.

Eighth Grade:

- ***S8SR2.*** Students will investigate an accessible scientific research problem in earth, life, or physical science.*
- ***S8SR3.*** Students will study the context of the accessible research question through system development and analysis.*
- ***S8SR1.*** Students will synthesize science content through standard science research protocols in earth, life, and physical science.*

*Cay Creek Wetlands Park could serve as an excellent site for eighth grade science projects in the fields of wildlife observation, hydrological studies, aquatic life, habitat diversity, and many other subjects.

Ninth-Twelfth Grade:

Biology

- ***SB4.*** Students will assess the dependence of all organisms on one another and the flow of energy and matter within their ecosystems.

Botany

- ***SBO1.*** **S**tudents will use current plant phylogenetic principles and describe the structural changes used to delineate the plant divisions
- ***SBO2*****.** Students will be able to identify and describe Georgia's major physiographic provinces and their natural plant communities.
- ***SBO4.*** Students will explore the defense systems of plants and recognize the impact of plant diseases on the biosphere.
- ***SBO5.*** Students will analyze the diversity of plant adaptations and responses to environmental extremes.
- ***SBO6.*** Students will analyze the economic and ecological importance of plants in society.

Ecology

- ***SEC1.*** Students will analyze how biotic and abiotic factors interact to affect the distribution of species and the diversity of life on Earth.
- ***SEC3.*** Students will explore and analyze community interactions.
- ***SEC5.*** Students will assess the impact of human activities on the natural world, and research how ecological theory can address current issues facing our society, locally and globally.

Entomology

- ***SEN1.*** Students will identify and analyze the roles of insects in ecosystems.
- ***SEN2****.* Students will investigate the reasons for insect success.
- ***SEN3.*** Students will investigate the impact of insects on the production of food and other products.
- **SEN4.** Students will investigate the impact of insects on human and animal health.

Zoology

- ***SZ4.*** Students will assess how animals interact with their environment including key adaptations found within animal taxa.
- ***SZ5.*** Students will evaluate the relationships between humans and other animals.

Background Information: Cay Creek Wetlands Park is a natural area that exhibits many of Georgia's coastal habitats. The habitats that can be found here are: Upland Maritime Forest, Upland Pine Flatwoods, Open Wetland, Freshwater Tidal Swamp, Marsh Hammocks and Shrubby Upland Edge, and Brackish Tidal Marsh. Each one is structurally and compositionally unique. Young children will be able to see these differences in the way that animals and trees are present or the amount of water and sunlight that you can see in a habitat. Older students may explore species composition and the more subtle changes of plants over a salt water and topographic gradient. Underlying the ecosystem structures, the greater biogeochemical life forces are churning.

Contents:

1. NATURAL SYSTEMS

What are the different types of clouds?

Clouds are a very important part of our atmosphere because they contribute to controlling the climate of earth's surface. They form around mineral particles that make their way into the atmosphere through the process of condensation (when water vapor converts to liquid drops). Clouds indicate current or impending weather conditions.

Cirrus clouds are thin and wispy, sometimes called "horse-tails" because of their appearance. They occur highest in the atmosphere and are formed by high winds. They are so high that their water particles are frozen ice crystals. They indicate changing weather.

Alto clouds are the next highest. They are formed of ice and water droplets and appear gray or dark blue. These are the clouds you may see before a rainstorm or snowstorm.

Stratus clouds are lower lying and they cover the entire sky you can see in a uniform gray mass. They can produce a light drizzle or flurries.

Cumulus clouds are white, puffy clouds that appear in the sky when there is good weather. They are often shaped with a flat underside and puffy top.

Cumulonimbus clouds are are thunderstorm clouds, and they sometimes appear gray and dark, because they are so saturated that sunlight cannot pass through them. They have a shape like an anvil, with a flat top and bottom that come together in a point.

What is the geology and soil like in this area?

Cay Creek Wetlands Park is on the on the border of the outer Coastal Plain and the Maritime ecoregion. Much of the wetlands are tidally influenced, which causes them to be classified under the Maritime ecoregion habitat type. The coastal plain is comprised of loose particles, or sediments (mostly sand), of the eroded Appalachian Mountains. Few rocks can be found in the soil here other than gravel and stones used for buffers or driveways. These rocks are often made of limestone or sandstone that was quarried in another part of the country and shipped here.

Some of the sediments here date back to as old as the Pleistocene epoch, which began 2.6 million years ago. However, sands and sediments are still being eroded, transported, and deposited on the coast every day. Younger sand and sediments are slightly larger (or coarser) with sharp edges than the older Pleistocene sediments, which are finer and rounder. Of course you can only see these differences under a magnifying lens!

Scientists describe soil based on the size of the particles that are in it. Large particles are called sand, medium sized particles are called silt, and tiny particles are called clay. One grain of sand can be the size of 300 particles of clay all stuck together! Most soils have many different sized particles in them. If we put the soil in a jar of water and shake it then the sizes will separate out and we can

see the proportion of sand, silt, and clay. The heavy sand particles will settle first, then lighter silt and finally (maybe after several hours) the lightest clay. This also demonstrates how sediments in a stream or lake tend to settle on the floor. The sand particles will settle much faster and the clay particles will take a longer time. The clay might stay suspended if the water is moving until it is in a very quiet, calm location.

This water jar experiment helps to demonstrate why the sand on Georgia's beaches is much finer than other coastal states. Wave energy on the Georgia coast is much lower because of the shallow Continental Shelf and the inward curve of the Georgia Bight. Therefore finer grained particles can stay on the beach because they are not stirred up by strong pounding waves.

The sand on Georgia's coasts (and all of eastern North America) is made mostly of quartz crystals and that is why it sometimes appears sparkly. Light reflects off of conchoidal fractures on the sand grain's surface, giving it a shimmery quality.

Most of the soils in the Maritime ecoregion are acidic, but in small pockets it may be neutral to slightly alkaline due to the presence of oyster shells, which break down and shed calcium.

Cay Creek has two main substrates, or soil types. The upland areas have a high sand content while the wetland depressions and marsh are very high in silt, or mud that has settled in the quieter sheltered lagoons behind the barrier islands. Some of these sediments are, like the sand, from the Piedmont region and transported by large rivers such as the Altamaha and Savannah Rivers. This type of dark fine soil also has a high content of detritus (dead organic matter) that has been broken down and digested by the plant and animals that live in this habitat. These sediments are dark in color because they are submerged in an oxygen-deficient wet area.

What are the characteristics of the water cycle in this area?

As previously stated, the Georgia coastline is reported to have the lowest wave energy levels along the southeastern coast. This is not to be confused with tidal energy, however, for Georgia has one of the largest ranges from high to low tide, an average of nine vertical feet. The tidal energy from South Carolina and Florida coasts, which are much further east, funnels into the Georgia Bight, causing a tremendous swell.

The interplay between fresh and brackish water is what shapes the plant composition of the communities of Cay Creek. As you travel from the upland forests toward the tidal creek, you pass through a series of habitats that gradually become lower in elevation, wetter, and saltier. These three factors are something to look for along the way.

The water in the swamps has a distinctly different source than the water in the tidal creek. The freshwater swamp is part of what is called a blackwater system, named for the dark color of the

water that is produced by the tree roots and fallen leaves that are submersed in it. The tree roots and vegetation release tannins, bitter substances that aid in defense against disease and rot, from their plant tissue. This water comes from local groundwater seeps and collects in low areas.

Rain water that falls on the uplands soaks into the sandy soil quickly and travels downward between the sand grains until it hits the water table. You can find out how deep the water table is by using a hand augur and digging a small well into the ground until you hit standing water. In the upland forests at Cay Creek this may be as shallow as 2-4 feet. This will change seasonally and daily, depending on the amount of rainfall the area has recently experienced.

Once the water flowing down through the soil hits the water table it changes direction and flows laterally to a "discharge" zone where the water table is lower. This discharge zone could be a well that is extracting water for plumbing or it could just be a place low in elevation, called a depression. The water table around a well forms a "cone of depression" as groundwater is extracted. Big industries that use a lot of water, such as a paper mill, will have the effect of making the cone of depression so large that the water table drops over a large area. This may result in salty water making its way into the aquifer.

The tides play a huge part in the groundwater level and salinity of these systems, which is why they are said to be "tidally influenced." Salty water is denser than fresh water because of the salt that is dissolved in it. Therefore it remains below the fresh water, but when the tides rise, the pressure in the pore spaces between soil particles increases, pushing the water level in the swamps higher. The swamps still have a fresh water lens on the surface, but may have salt water below.

2. ECOLOGY

What are the natural communities of Cay Creek?

There are 6 distinct habitats that have been identified at Cay Creek. These are: Upland Maritime Forest, Upland Pine Flatwoods, Open Wetland, Tidal Freshwater Swamp, Marsh Hammock and Shrubby Upland Edge, and Brackish Marsh.

The Upland Maritime Forest at Cay Creek is characteristic of other coastal hardwood forests. There is an abundance of live oaksand other species that produce fruit and mast (acorns). These fruits are an important food source for the omnivorous birds and mammals here. Live oak acorns are eaten by deer, raccoons, feral hogs, wild turkeys, and other birds. Other important trees and shrubs for providing food include laurel oak, saw palmetto, smilax, American holly, yaupon, dahoon holly, wax myrtle, vacciniums (blueberry), red bay, sweet bay, southern magnolia, American beautyberry, Virginia creeper, muscadines and other wild grapes. Spanish moss that drapes over the trees provides nesting and feeding habitat for large numbers of songbirds and woodpeckers. **Common plant species here are:** pignut hickory, flowering dogwood, American holly, southern magnolia, red mulberry, devilwood, black cherry, white oak, live oak, sassafras, common sweetleaf, devil's walkingstick, American beautyberry, witchhazel, American mistletoe, sparkleberry, trumpet

honeysuckle, summer grape, muscadine, resurrection fern, smooth elephant's foot, oakleaf fleabane, coral bean, narrowleaf purple everlasting, partridgeberry, spotted beebalm, Carolina phlox, Carolina wild petunia, lyreleaf sage, Canada germander, Spanish moss.

Upland Pine Flatwoods are represented by the line of Pine trees along the right of the driveway. These trees here are loblolly pines that remain from a large tract that was planted for lumber or pulpwood. This area would likely grow up to be a Pine Flatwoods habitat if left to natural succession. A Pine Flatwoods has dry soils during the summer and moister soils in the winter, spring, or times of heavy rainfall. Pine Flatwoods let in much more light relative to the Maritime Forest. The more open canopy encourages herbaceous plants to grow in a mat of needles. Together these dry plant materials provide fuel for frequent fires. The effects of periodic burning are favorable to the maintenance of a predominantly pine stand This habitat hosts many herbivorous grazers like insects and animals that eat small seeds. **The plant species that may be found here include:** slash pine, loblolly pine, winged sumac, highbush blueberry, cross vine, yellow Jessamine, greenbriar, muscadine, switchcane, Maryland golden aster, comfortroot, hairy lespedeza, powderpuff mimosa, woolly ragwort, American pokeweed, blackeyed Susan, and helmet flower.

The Open Wetland is the beginning of the wetland depression that is described in the hydrology section. Remnants of rice culture are suggested by the elevated ridges and linear channels. This wetland was likely created by both natural and artificial means, for canals were dug to introduce more water for growing rice. **Common plants in this area include:** common buttonbush, Virginia sweetspire, American elderberry, possumhaw viburnum, groundnut, climbing hempvine, American wisteria, bushy bluestem, swamp flatsedge, common rush, sugarcane plume grass, woolgrass, Alligator weed (invasive), Monnier's water-hyssop, justiceweed, floating marshpennywort, seashore mallow, anglestem primrose-willow, herbwilliam, pickerelweed, lizard's tail, and bladderwort.

The Freshwater Tidal Swamp is a dark forested wetland that is tidally influenced. This type of ecosystem has been reduced in Georgia by extractive practices of logging cypress trees and clear cutting to make rice dikes. It provides essential habitat and refuge for an abundance of bird and aquatic species. Characteristics of the Freshwater Tidal Swamp include the knees and buttresses of the bald cypress trees, adaptations that allow them to grow in saturated conditions. **Common plants in this area include:** red maple, sweetgum, sweetbay, swamp tupelo, swamp bay, spruce pine, bald cypress, American elm, southern swamp dogwood, dwarf palmetto, climbing aster, trumpet vine, climbing hydrangea, greenbriar, poison ivy, sensitive fern, royal fern, netted chainfern, smallspike false nettle, Virginia iris, bulltongue arrowhead, sphagnum moss.

The Marsh Hammock and Shrubby Upland Edge occurs on the edge of the marsh, creating unique islands of biodiversity. Trees and shrubs are established on hammocks from seeds dispersed by birds. They often have high calcium content from shell middens (mounds) deposited by American Indians. **Common plants in this habitat include:** dahoon holly, southern red cedar, cabbage palm, wax myrtle, hammock snakeroot, and marsh elder.

The Brackish Marsh is riddled with swamp drainage streams that empty into Cay Creek. The water here is slightly more saline (salty) than in the freshwater swamps because of the tidal creek influence. There is no midstory or understory in the Brackish Marsh, and only a few grass and shrub species grow here. Many sea creatures use the marsh as a nursery, traveling into the small creeks to mate and spend their juvenile lives. **Common plants in this habitat include:** groundsel bush, salt-marsh bulrush, black needle rush, smooth cordgrass, big cordgrass, saltmeadow cordgrass, sweetscent, and seaside goldenrod.

What is a habitat?

A habitat is the place where a plant or animal lives. It must provide all of the necessary resources to sustain an organism's life. For plants these include: water, sunlight, space, air. For animals these include: water, food, and shelter.

Plants get their food using their green leaves by capturing the sun's energy. They turn it into sugar using photosynthesis, similar to the way humans digest their dinners. Some plants live out in the open because they require more sunlight than plants that live in the shade, like a swamp. Plants also live in conditions where the amount of water is most suitable for them. A plant like a bald cypress tree, that likes a lot of water, will grow in a swamp. A plant like a pine tree, that likes dry soil, will grow on higher land, like an upland forest. If a pine tree tried to grow in a swamp it might drown, and if a cypress tree tried to grow in a pine forest it might die of thirst. Use these examples to show young children how one habitat is different from another.

Plants and animals depend on healthy habitats to complete their life cycles. They also need the ability to shift to suitable locations if outside pressures, like drought or flooding, force them to move. We tend to think of plants as sedentary species, and indeed, an individual plant cannot move its roots on its own accord beyond the means of a creeping root or rhizome. However, populations of plants do move. Seeds and nuts disperse at a landscape level by wind and water, birds and mammals. If a seed lands in a good habitat it will have a better chance of surviving in this new place and growing to produce seeds of its own.

Animals get their food from plants or other animals. Some are herbivores, like vegetarians, and they only eat plants. Others are carnivores, and they only eat animals. Animals that eat plants and other animals are called omnivores.

Plants and animals that have similar needs, but fill different niches, tend to live together in a community. An ecological community is a group of interacting plant and animal species that live in the same place and influence each other.

What is living and what is non-living?

Simply put, plants, animals, fungi, and microorganisms are living. Everything else is non-living. Living things have cells that grow and perform different functions. Dead matter used to be alive, but it lacked the ability survive and perform functions so it perished. This seems like an obvious distinction, but young children may not be able to grasp certain aspects of what is alive and what is

not alive. A good way to teach these definitions is by showing examples of each category. These could include:

Living	Dead	Non-living
pine tree	wooden table	metal screws in table
potted plant	fresh cut flowers	flower vase
leaves on tree branch	leaves on the ground	wind
fungus growing on a log	log on the ground	sand and rocks

Some tricky ones: Spanish moss is living. Soil is not living, but has millions of living organisms in it. Water is non-living, but it constitutes most mass of living plants and animals.

What is an exotic-invasive species?

Exotic species are not necessarily the same as invasive species, but oftentimes plants and animals that are introduced to a region that is not their native habitat become invasive. Exotic plants are introduced on purpose and by accident. They are shipped from other regions for landscaping or agricultural reasons or to be kept as pets or draft animals. The exchange of plant and animal species across oceans has occurred since humans have learned to travel the seas and continues today at an exponential rate.

Quite commonly exotic species are introduced by accident as "hitchhikers" on planes, ships, or even muddy boots as they cross geographical borders. They can be destructive to the native habitat if they have adaptations that allow them to flourish and outcompete for resources like light, space, water, or food.

In this region, hogs are a harmful invasive species that was introduced by European settlers. They disturb soil and plants like longleaf pine seedlings when they root for food and are predators of sea turtle eggs. Some invasive plant species in Georgia are Japanese honeysuckle, Chinese privet, spring silverberry, chinaberry, Chinese wisteria and Chinese tallow-tree. Japanese honeysuckle and Chinese tallow-tree are present in Cay Creek, though volunteers have worked to eradicate them so the native plants can have a better chance of survival.

Poison ivy is an example of an invasive plant that is native to the area. Not only is it poisonous to many people, but it propagates by its roots and can be very difficult to eradicate for good.

3. PLANTS

What does poison ivy look like?

This is very important for all teachers to know. Though work has been to eradicate the poison ivy at Cay Creek, underground roots may remain and it is likely that the plant will resprout every year.

Poison ivy can grow in a variety of forms, but is usually a vine or shrub. It can be light or dark green, and shiny or flat. Sometimes the leaves have slight lobes and sometimes they are smooth. It turns

red in the fall, and the leaves die back in the winter, though the roots remain underground and can still cause a rash to people who are allergic.

What is Spanish Moss?

Spanish moss *(Tillandsia usneoides)* is a perennial plant that drapes the larger trees. It is not a true moss and does not grow from the tree, but instead obtains nutrients from dust and water particles that soak into it when it rains. It is an epiphyte, meaning that it grows in the canopy of another species. It is classified in the family Bromeliad, of which the pineapple is also a member. Spanish moss affects the forest by reducing the amount of light that penetrates the canopy so that the forest floor retains more moisture and supports plant life. Many birds nest in the Spanish moss (parula and yellow-throated warblers and colorful painted buntings) and others use it to build nests. Lots of insects live in Spanish moss.

What is salt tolerance and how can we see the salt water gradient in the marsh?

Salt tolerance describes the amount of salinity that a plant can grow and thrive in. Some plants have special adaptations that allow them to live in very salty water. Smooth cordgrass, for example, sometimes exudes salt crystals from special glands and secretes it on the leaf surface. Smooth cordgrass also has special root membranes that filter out a lot of the salt. Most other plants do not like salty soil and water. Smooth cordgrass can live in freshwater as well, so it is perfectly adapted to live in low elevation areas that are sometimes inundated with salt water by tides or storms. For these reasons smooth cordgrass is often the only plant that lives in a salt marsh, appearing as a sea of green.

Other rushes and grasses have varying levels of salt tolerance and they can act as indicators of salinity levels. Giant cutgrass is not tolerant of salt and will only grow in fresh water. Big cordgrass and salt marsh bulrush are somewhat tolerant and will fill as ground cover where the cutgrass cannot.

Black needlerush occurs at slightly higher elevations that are infrequently flooded, especially where salinity is lower. It occurs as a narrow zone around the salt marsh or on hammocks.

4. ANIMALS

What is metamorphosis?

Metamorphosis refers to the change in an animal's appearance as it matures. Many arthropod (invertebrate) and amphibian species undergo complete or incomplete metamorphosis as they grow and change. Insects like butterflies, moths, and dragonflies have a completely different appearance as juveniles and then they enter a stage of dormancy (pupa or chrysalis in butterflies) before emerging in their adult form. Juvenile butterflies and moths are caterpillars, juvenile beetles are grubs, and juvenile frogs are tadpoles.

Insects that go through incomplete metamorphosis often look like small versions of the adult when they are young. The "baby" insects that look like adults are called nymphs. They grow by periodically shedding an outer layer (called molting) and expanding in the soft body left behind. Cicadas do this, leaving behind a crusty shell. Crustaceans also molt, and soft-shell crabs are simply the newly molted version of a regular, hard-shelled crab.

What is the difference between resident and migrant?

A migrant species is one that must travel to different ecosystems in order to carry out its life history traits , or the things it must do to live. Many birds are migrant species. For example, the Swallowtail Kites live the majority of the year in the forests of Brazil but migrate to the southeastern United States during the summer months. Resident species mostly stay in the same ecosystem for the entirety of their lives because that ecosystem has everything they need to carry out their life history traits.

At Cay Creek, the live oak and pine forests are used extensively as feeding areas by many resident species. Resident birds that occupy this habitat type include Carolina chickadee, brown-headed nuthatch, Carolina wren, brown thrasher, pine warbler, cardinal, and rufous-sided towhee. Numbers of birds in the live oak-pine forests are greatly augmented each year with migrant species. Some migrants such as the yellow-bellied sapsucker, ruby-crowned kinglet, eastern phoebe, and white-throated sparrow become winter residents. Other migrants that feed in oak-pine forests include solitary vireo, black-and-white warbler, prothonotary warbler, and American redstart

What are some of the protected species in Cay Creek?

All plant and animal species are important and vital to maintaining the health of the natural world in their own particular way, but some species need more protection than others. "Protected species" are the plants and animals that, for whatever reason, are more susceptible to harm from human disturbances, such as road and housing construction and pollution.

Conservation groups have created lists of all the plants and animals in the world and made a scale to rank their level of endangerment. This online database is called the IUCN Redlist (International Union for Conservation of Nature). The rankings range from species of least concern (these species

populations are robust and not in danger) to critically endangered (these species are on the brink of extinction and need human help to revitalize their dwindling populations).

IUCN Redlisted threatened to critically endangered species at Cay Creek:

- Spotted Turtle (endangered)
- Black Racer (critically endangered)
- Gopher Tortoise (vulnerable)
- Painted Bunting (near threatened)
- Bachman's Warbler (critically endangered)

You can check the status of your favorite animals online at http://www.iucnredlist.org/

How is the marsh used as a nursery?

The marsh-estuary system performs ecological functions that contribute to maintaining the stability of the biosphere. In particular, the marsh regulates atmospheric composition and moves nutrients to and from marine and terrestrial food chains.

Tidal action is perhaps the most important factor influencing primary production. Twice daily, tides of approximately 7-9 ft carry essential nutrients into the marshes, carry detritus and nutrients back into estuaries, and provide a space for the reproduction of phytoplankton.

The ecological function of marshes and the role of tidal action make them ideal "nurseries" for many aquatic species. Marsh tidal creeks are surrounded by dense and nutrient-rich marsh grasses, like smooth cordgrass. The dense vegetation serves as a protective shield, obscuring animals in the water from bird predators above. These grasses filter pollutants and add nutrients to the water when they decompose. Without the intense wave energy of the ocean, all of this decomposing matter breaks down in the water, making it very nutrient-rich. This rich water serves as an ample food source for plankton. Plankton and other floating creatures are abundant because of the nutrients from the marsh vegetation; these creatures serve as excellent food sources for the early stages of oceanic fish and crustacean species that come to marshes to spawn. In addition, predatory aquatic creatures, like sharks, do not come into the small and twisted tidal creeks, giving the marshes another dimension of protection.

One example of a crustacean that uses marsh tidal creeks as a nursery and breeding ground is the Blue Crab. Blue Crabs go through "metamorphosis" like other arthropods. A series of molts allows crabs to grow into adults. When they molt, their hard outer exoskeleton peels off and the soft skin below becomes saturated with water and nutrients. They grow bigger in the process and a new hard shell forms around them. In between molts, they are very vulnerable to predation, so the marsh is a safe place to be. It takes about 21 molts to reach full maturity.

Georgia White Shrimp are another common animal that utilizes the function of the marshes. Adults lay eggs in the open ocean that drop to the ocean bottom. Fertilized eggs float to the surface and

make their way to the safe tidal creeks. Here they transform into juvenile forms, eating plankton and other small floating creatures. Adults return to the ocean to spawn and the cycle repeats again.

5. HUMANS AND THE ENVIRONMENT

Who was here before us?

The history of Liberty County and the Georgia Coast is a story of how humans and nature interact. The American Indians were living on the coast as far back as 11,500 years ago. They traveled the waterways, finding ample sustenance in native animals and plants for food and medicine. The Guale were here when the Spanish began exploration of Georgia in the 16th century, and the two groups exchanged knowledge of the land and food. The Spanish and colonists from France, Germany, and England introduced exotic species, such as hogs and horses, that continue to affect coastal ecology today.

King George II of Great Britain signed a charter creating the colony of Georgia in 1732. King's Grants were issued for land in St. John's Parish, which became a part of Liberty County in 1777. Rice, cotton and sugar were dominant crops. This area was home tomany plantations including one here at Cay Creek, then called Salter's Creek. Owned by Raymond Cay, the plantation grew rice on a small scale as well as other food crops. Salter's Creek Plantation was also home to enslaved workers who enabled rice culture to be possible through their unpaid labor. Although the white planters and black slaves lived in two very different social worlds, they both depended on the ecology of the coast for their sustenance. Tidal fluctuations and river currents created the forces upon which agriculture, fishing, and gathering were, and still are, dependent.

After the American Civil War the main coastal resource used was pine, followed by shrimping, fishing, and oystering. Pine trees were abundant and their sap was gathered for tar, turpentine and other naval stores. Fishing and shrimping became the main industry of the coast after chemicals products began to replace those derived from the pine. The large estuarine systems of coastal Georgia support myriad marine life that provided economic growth for the area.

During the early 20th century pine again became an economic resource when paper companies from the North, such as Union Camp Corporation, saw the potential of the forested resources in the South. Union Camp built mills in the area and bought thousands of acres of pine lands, including Cay Creek. At its peak in 1910 nearly 8 million acres of southeastern pine forests were in production, producing 600,000 metric tons of rosin and turpentine.

Much of the Georgia Coast remains undeveloped due to slow economic growth following the Civil war as well as geography. The shallow continental shelpf and inward curve of the coast create the Georgia Bight and land that is suitable for growing few crops other than rice and pine. It does, however, provide many opportunities for recreation, tourism and conservation. The City of Midway purchased the site of Cay Creek Wetlands Park in 1996 to provide a place for locals and visitors to enjoy and learn about the natural communities of the coast. The future of areas like Cay Creek

depends on people understanding the value of these landscapes to the environmental health of the coast as well as the cultural landscape of its people.

How has rice culture shaped the landscape at Cay Creek?

Rich wetland soils from the piedmont sediments made this region productive for growing rice. In fact, marsh mud was often mixed with shell pieces, cordgrass and manure to be used as fertilizer on the fields. Daily tides were essential in bringing water necessary for rice culture as well.

Rice was grown in fields made by clearing cypress swamps. These lands were then ditched (dug) and diked (mounded) to control the flow of water. This type of landscape became abundant with mosquitoes that bred in the still water and carried disease, though many people at the time did not understand that the source of this illness was the mosquitoes. Rice production reached its peak between 1850 and 1860. In Georgia, Chatham County was the leading producer, followed by Camden, McIntosh, Glynn, Liberty, and Bryan counties. In 1859 planters were harvesting an average of 50 bushels per acre, with about 23,000 acres in cultivation. Though almost all rice production ended by 1910 (after a series of devastating hurricanes in the 1890s), traces of the ditches and canals dug for these purposes can still be seen in arial photographs as long, straight depressions along creeks and rivers.

Deforestation along waterways led to erosion of the riverbanks. Early methods of protecting the banks were to dump oyster shells along them to protect the soil from being washed away with the current. William Bartram, a naturalist who traveled these parts in the early 1800s remarked, "I re-assumed my travels, proceeding down the high road towards Fort Barrington, on the Alatamaha, passing through a level country, well watered by large extensive swamps and marshes, their sources: these swamps are daily clearing and improving into large fruitful rice plantations, aggrandizing the well inhabited and rich district of St. John's parish."

Rice culture's effect on the landscape continued into the 1950s, when the government incentivized the draining of these wetlands for other types of agriculture and to decrease mosquito populations.

How has the timber industry shaped the ecology of Cay Creek?

Coastal live oak timber was important to northern shipbuilding. USS Constitution and others like her were the most sophisticated and technologically advanced warships of their type. The Brooklyn Bridge in New York was constructed from live oak as well.

Bald Cypress trees were harvested heavily as a rot-resistant lumber for building homes. Logs were floated down the rivers to coastal sawmills. Many of these sunk to creek bottoms and are salvaged today by divers and heavy machinery.

In the early 1900s timber was used for naval stores, like tar and turpentine, to waterproof boats. Herty Pots were developed to collect sap in a method that did not kill the tree. The scars left on pine trees from this operation are called "catfaces." Charles Holmes Herty, inventor of the Herty pot,

said, “In 1864 when I first went over the railroad from Savannah to Thomasville there was an almost unbroken forest of magnificent pines extending from Bryan Bounty to Thomas County through which the railroad cut its way like a ditch - but now one may go over that same route and scarcely see a merchantable pine. From most of the visible land the timber is entirely gone and the same state of things prevails in much of the piney woods part of the state.”

Today the lumber industry grows pine trees for timber and pulpwood. These plantations encourage a monoculture crop that inhibits diversity in the canopy. Frequent disturbance and clear cuts do not allow for an old growth forest to develop and destroy habitats for many wildlife species.

What are some ways that conservation is enacted?

Today, 14% of the 22,045,897 acres in the Maritime ecoregion is in some form of permanent conservation. In the early 1900s many wealthy people bought large tracts of land here for conservation. Many delicate and important ecosystems have been preserved.

It is important that development is limited on the coast because a human presence can severely impact the ability for wildlife to survive. The coast is home for some of the richest and most diverse habitats and should be cared for because of its great ecological value. Aside from development, land and water pollution are also harmful to wildlife. Standards for industries, such as the shrimping or logging industry, can help to decrease the amount of pollution along the coast. One way to make it easier for individuals to be able to have more responsibility for their waste is to have recycling centers more accessible.

Coastal marshes and shoalwaters are destroyed by construction of roads and widening of waterways for shipping. Conservation initiatives fight the construction of roads in and across delicate habitats, and civic action can also change the course of events and save marshlands.

6. GLOSSARY

Terms on Cay Creek Signs in the order they appear on signs:

Diversity, Ecosystems, Ecotone, Edge, Habitat, Maritime, Hammock, Brackish, Waterway, Tributary, Watershed, Elevation, LiDAR, Topography, Rice Culture, Impoundments, Groundwater, Omnivore, Carnivore, Granivore, Nectarivore, Scavenger, Plumage, Host plant, Nectar plant, Mutually beneficial, Co-evolution, Migrating, Oviposit, Canopy, Midstory, Understory, Forbs, Herbaceous, Pupae, Remnant, Upland, Bogs, Naval stores, Catfaces, Herty pots, Human-applied, Adapted, Fire-resistant, Outcompeting, Freshwater, Saltwater, Salinity, Communities, Estuaries, Tidally influenced, Salt tolerant, Tides, Semi-diurnal, Spring tide, Neap tide, Syzygy, Georgia Bight, Continental Shelf, Sustenance, Guale Indians, Exotic species, Commercial resource, Geography, Conservation, Recreation, Tourism, Sustenance, Guale Indians, Exotic species, Commercial resource, Geography, Conservation, Recreation, Tourism, Insect, Arachnid, Predators, Prey, Decomposers, Pollinators, Juvenile, Exoskeleton, Nymphs, Flowering plants, Stamens, Ovaries, Fertilizing,

Kleptoparasitism, Cocoons, Emergent, Dikes, Crustacean, Moisture-loving, Detritus, Wetland depression, Tidal pulses, Seep, Buttresses, Cypress knees, Spores, Seeds, Fiddleheads, Fronds, Vegetation, Cavities, Storm events, Cold-blooded, Reptiles, Bask, Metabolism, Enzymes, Digest, Toxic, Transition, Exotic-invasive, Venomous, Poisonous, Nocturnal, Suite, Nesting, Mammals, Amphibians, Lichen, Bark, Camouflage, Ear-like tufts, Canals, Meander, Tannin, Organic matter, Languid, Plant tissue, Pests, Rot-resistant, Rodent, Chemical process, Hammock, Dynamic, Refuge, Middens, Calciophyte, Reflection, Wading bird, Breeding season, Aigrettes, Extinction, Rookeries, Focal point, Graminoids, Shelter

Definitions of Terms in Alphabetical Order:

Adapted: the process of adjusting to new conditions; organisms are adapting to the environment all of the time, both in the short-term and over long-term periods.

Aigrettes: decorative feathers (plumage) on Great Egrets that appear during mating season.

Amphibians: animals, such as frogs and salamanders, which are characterized by being cold-blooded, laying eggs in water, having permeable skin, and their tendency to undergo metamorphosis.

Arachnid: the variety of arthropods (in the class Arachnida) that have four pairs of segmented legs and a body that is subdivided into two regions. Common examples are spiders, tarantulas, scorpions, and ticks.

Bark: the outer protective covering of a tree that consists of dead (outer) cells and living (inner) cells.

Bask: the method of lying in sunny or warm places that cold-blooded species use to raise their body temperatures.

Bog: a freshwater swamp.

Brackish: a mix of salt and fresh water.

Breeding season: the time(s) of year that a species typically gives birth to young.

Butterfly Host plant: a plant species or particular group of plants that adult butterflies must lay their eggs on. The caterpillar that hatches from the egg then feeds on this single host plant until it is time to complete metamorphosis (transform) into a chrysalis (cocoon). A common example of a butterfly-host plant pairing in this region is the orange Gulf Fritillary and the Purple Passionflower.

Buttresses: widened bases of trees that grow in swamps and helps them to be stable in the saturated substrate.

Calciophytes: plants that thrive on calcium rich soil and make it available in the soil for other plants by absorbing it into their roots.

Camouflage: a mode of survival by which animals match the color and/or patterns of their surroundings so that they may not be as easily detected by predators.

Canals: ditches dug to conduct water.

Canopy: refers to forest structure- the uppermost layer of a forest.

Catfaces: a scar that remains in a tree from the process of extracting sap; resembles a cat's face.

Carnivore: an organism that only eats meat/flesh. Carnivores are typically at the top of the food-chain. Examples include lions, tigers, and sharks.

Cavities: hollow places in trees that may form where a branch has rotted or split. Cavities provide homes and shelter for many wildlife species.

Chemical process: a reaction causing a chemical change, often indicated by color change, emission of a gas, or heat production.

Co-evolution: the evolutionary process by which two groups of organisms inhabiting the same environment adapt tendencies that are mutually beneficial to both groups involved in the relationship

Cocoons: a case, made for the pupal life stage for insects like moth caterpillars, in which they live while making the transformation into the adult stage.

Cold-blooded: Almost all reptiles, amphibians, insects, arachnids, and fish are cold-blooded, which means that their body temperature takes on the temperature of their surroundings. Mammals (like humans), on the other hand, are warm-blooded, meaning that their bodies heat themselves to maintain a constant temperature.

Commercial resource: a natural resource harvested extensively for commercial, or economical, profit. For example, the Georgia White Shrimp is a commercial resource that supplies a large area with its shrimping harvests.

Communities: ecologically speaking, a community is an assemblages of two or more populations of different species the same geographical area.

Conservation: a growing concern and need in the modern world, conservation refers to the preservation, protection, or restoration of the natural environment, natural ecosystems, vegetation, and wildlife.

Continental Shelf: the area of seabed around a large landmass, such as the United States, where the sea is relatively shallow compared to the depths of the open ocean. It is very wide and shallow off the coast of Georgia.

Crustacean: a group of arthropods like shrimp, lobster, or crab that have exoskeletons and segmented legs.

Cypress knees: adaptations of cypress trees, similar to mangrove roots, that are thought to help the tree have access to more oxygen.

Decomposers: an organism, usually a bacteria or fungus, that breaks down living cells of other organisms. They play a vital role of returning nutrients to the soil in an ecosystem.

Detritus: partially decomposed bodies of dead organisms that has been broken up into tiny bits.

Digest: to break down food into a simpler form that can be used by the body.

Dikes: an artificial slope or levee built to control water flow.

Diversity: having variety; diverse ecosystems have many different plant and animal species; the greater the "biodiversity" in an ecosystem, the healthier it is.

Dynamic: changing

Ear-like tufts: the decorative feathers on some owls (Great Horned Owl and Screech Owl) that resemble ears but are actually for display only. Their actual ears are located on either side of their head.

Ecosystems: a biological community of interacting species and their physical environment

Ecotone: the transition area between two adjacent ecosystems; ecotones have very unique biological communities because they incorporate species from both ecosystems.

Edge: in an ecological setting, edge refers to the outer boundary of an ecosystem that are typically more susceptible to disturbance by outside forces.

Elevation: refers to the topographic level, or height, of something, usually an area of land.

Emergent: coming out of the water.

Enzymes: molecules of different chemical composition that assist the body in performing various functions.

Estuaries: where tide meets the stream; the tidal mouth of a river as it arrives at the sea.

Exoskeleton: the protective tor supporting structure covering the outside of the body of many animals, such as blue crabs and other crustaceans. Insects also have an exoskeleton, and this is what they shed when molting.

Exotic species: a human-introduced species that is not native to the ecosystem it was introduced to.

Extinction: refers to a species that no longer has any living individuals.

Fertilizing: the process of reproduction in plants when a pollen grain is received by the ovaries.

Fiddleheads: young fern fronds that are tightly curled to resemble the end of a fiddle.

Fire-resistant: plants that are adapted to surviving fire events.

Flowering plants: Also known as angiosperms, flowering plants produce flowers with ovaries that, when pollinated, develop into a fruit or seed.

Focal point: a spot where two lines of vision converge for superb visibility.

Forbs: herbaceous flowering plants other than grasses.

Freshwater: of or relating to water that is not salty. Freshwater has a salinity measurement less than 0.5 ppt (parts "salinity" per thousand). Drinking water is "freshwater."

Fronds: the leaves of a fern.

Geography: the shape and arrangement of natural places and physical features of the earth.

Georgia Bight: the geographical curve ("bight") that occurs in the state of Georgia, causing tidal waves to accumulate at the center of the bit. This deep indentation gives the Georgian coastline great tidal fluctuations of or more than 3 meters.

Graminoids: a group of plants that includes grasses, sedges, and rushes.

Granivore: an organism that eats only seeds and grains. Many song bird species are granivores, such as finches and wrens. Granivores can also exhibit omnivorous behavior, eating insects and grubs, on occasion as well.

Groundwater: a vital part of the water system; water held underground in the pore space of soils and crevices of rock. We tap this water source to nourish populated areas.

Guale Indians: the American Indian chiefdom that existed along the Georgian Coast on the Sea Islands. Guale society was decimated during the 17th century due to extensive epidemics of disease brought by European settlers in the area. The remnant Guale populations banded together to form the Yamasee, an ethnically mixed group of American Indians.

Habitat: the natural home or environment of a particular organism.

Hammock: an elevated area that forms a unique habitat separate from surrounding environment.

Herbaceous: leafy, herby plants; the opposite of "woody" plants.

Herty pots: a pot that was used to collect sap from pine trees in the early 1900s.

Human-applied: a management system used by humans to maintain the health of an ecosystem

Impoundments: a structure that stops, decreases, or controls the flow of water; can be natural (beaver dams) or man-made (dams, levees, and dikes)

Insect: refers to arthropods (organisms in the arthropod phylum) that have six legs and usually one or two pairs of wings.

Juvenile: an animal in its young stage of development. In some species (like humans) the juvenile looks like a miniature version of the adult. In other species (those that undergo metamorphosis) the juvenile looks drastically different than the adult.

Kleptoparasitism: a relationship in which one organism benefits from another by stealing its resources.

Languid: moving slowly.

Lichen: a composite organism that consists of a fungus and a photosynthetic organism (such as algae) that lives on surfaces such as trees and rocks.

LiDAR: a detection system that works on the principle of radar, but uses light from a laser. LiDAR stands for Light Detection and Ranging.

Mammals: animals that are characterized by being warm-blooded, giving birth to live babies, producing milk, and having hair on their bodies.

Maritime: living or found by the sea.

Meander: to wind to and fro; to travel on a winding path.

Metabolism: the process of converting food to energy.

Middens: piles created by discarded shells

Midstory: refers to forest structure- the middle layer of forest trees or shrubs.

Migrate: to travel from one location to another. Many animals that migrate do so regularly and at the same time every year, such as birds who fly to warmer climates during the cold winter months.

Moisture-loving: plants that grow well in moist to wet soils and have roots that can tolerate low oxygen environments.

Mutually beneficial: this refers to an action, state, or relationship that is advantageous to both organism species participating in the act. Many plant-insect relationships are mutually beneficial. For example, butterflies and thistle have a mutually beneficial relationship because the thistle provides nectar food for the butterfly and the butterfly pollinates the thistle- every time a butterfly feeds on a certain plant, it gets pollen on its legs and then feeds on another plant. This process mixes up the pollen of many different thistle plants, aiding in plant reproduction.

Naval stores: articles or materials used in the shipping industry.

Neap tide: a lower than average tide that occurs during the 1st and 3rd quarter moon phases.

Nectar plant: a plant that serves as a nectar food source for a variety of nectaring organisms, from insects to birds.

Nectarivore: an organism that mostly feeds on nectar. A common example is a hummingbird. Nectarivores will also exhibit omnivorous behavior on occasion, eating small flying insects for extra protein.

Nocturnal: an animal that is active at night.

Nymphs: the juvenile stage of an insect that undergoes metamorphosis.

Omnivore: an organism that can eat and digest both meat/flesh and plant products, such as vegetables, fruits, and seeds/nuts. Humans, pigs, and dogs are some common examples of omnivores.

Organic matter: any living or dead matter that is produced by an animal or plant, i.e. feces, leaf litter, bones.

Outcompeting: when one organism is more successful than another organism that is competing for the same resources.

Ovaries: the male reproductive organs of a flower that develop into a seed or fruit when fertilized.

Ovipost: the term used to describe when a butterfly lays its eggs on its host plant.

Pests: insects that attack and/or kill a plant.

Plant tissue: living parts of a plant.

Plumage: describes the feathery covering of birds.

Poisonous: something that is toxic by contact or digestion.

Pollinators: an animal, like an insect, bat, or bird, which transports pollen from one flower to another.

Predators: an organism that hunts for its food.

Prey: an animal that is hunted by a predator.

Pupae: the life cycle stage in between immature larva and mature adult; usually an inactive stage. A common example is the chrysalis stage (cocoon) of a butterfly's life cycle.

Recreation: activities that humans do for enjoyment.

Reflection: an image created by light bouncing off of the water's surface.

Refuge: a place of safety

Remnant: refers to ecosystem fragmentation- the remains of a patch of habitat after the area is disrupted by man-made disturbance.

Reptiles: Reptiles include turtles, alligators, snakes, and lizards. They have lungs and scales and lay leathery eggs on dry land.

Rice Culture: the cultivation of rice by planting on dry land, transferring the seedlings to a flooded field, and draining the field before harvesting

Rodent: a mammal, such as a beaver, rat, mouse, or squirrel, which has a pair of teeth (called incisors) that grow continuously, causing the animal to constantly gnaw wood.

Rookeries: nesting sites for birds (like herons and egrets) that nest together.

Rot-resistant: wood that is dense or has chemicals in its structure that make it less susceptible to decomposition.

Salinity: of or relating to the salt content of a liquid.

Salt-tolerant: animal and plant species that are able to survive in environments characterized by the presence of salt. An example would be salt cordgrass that thrives in brackish marsh environments.

Saltwater: of or relating to water that has a high salt content or water from the sea. Ocean water has an average salinity measurement of 35 ppt.

Scavenger: mostly carnivorous, scavengers eat the scraps leftover from other animals' feeding. Common scavenger examples are vultures who feed on the carcasses of animals that have died either naturally or by another predator. Some scavengers are mostly carnivorous while others, like raccoons and rats, are more omnivorous, feeding on all sorts of garbage scraps. Scavengers are an important part of the food chain as they aid in the turnover of dead material, or decomposition.

Seeds: the mode of reproduction for gymnosperms and angiosperms, containing the genetic information needed to make a new plant if put in the right conditions.

Seep: a spot where groundwater drains from the earth, forming the source for a stream, spring, or swamp.

Semi-diurnal: refers to the tides in Coastal Georgia that occur twice a day.

Shelter: a home or place of refuge from weather and predators that every animal needs to survive.

Spores: the mode of reproduction for ferns, different from a seed in that it is not made through sexual reproduction. The spore grows into a fern that is a clone of its parent.

Spring tide: the tide following a full or new moon.

Stamens: the male pollen bearing reproductive organs of a flower. They often consist of filaments (long stems) with anthers at the ends which hold the pollen.

Storm events: any instance of extreme weather that produces heavy rains or winds, such as a hurricane.

Suite of plants: a group of plants that is closely taxonomically related; a group of plants that grows in the same habitat.

Sustenance: refers to food and drink that provides nourishment.

Syzygy: astronomically speaking, the nearly straight-line configuration of three celestial bodies (the sun, moon, and earth)

Tannin: a compound produced by woody shrubs and trees that aid in protection against pests by giving the plant tissue a bitter taste.

Tidal pulses: surges in the water level of creeks that occur as a result of increased pressure during a rising tide.

Tidally-influenced: an ecosystem that is effected by the presence of tidal action on a regular basis.

Tides: the alternate rising and falling of the sea, typically twice a day, due to the attraction of the moon's gravitational pull.

Topography: the contour of the land and changes in elevation. May be depicted on a map to show features like mountains, hills, and rivers.

Tourism: the commercial organization and operation of vacations and visits to places of interest.

Toxic: something that is poisonous or harmful upon exposure, digestion, or injection.

Transition: a gradual change over a given area.

Tributary: a smaller river or stream that flows into a larger river or stream.

Understory: refers to forest structure- the lowest layer of trees, usually consisting of small trees and shrubs no taller than 4 ft.

Upland: an area of high land.

Vegetation: the green leafy part of a plant; all plants growing in an ecosystem.

Venomous: something that is toxic by injection, i.e. a snake.

Wading bird: a bird that stalks its prey by standing in shallow waters and spearing it from above.

Watershed: an area or region drained by a river, river system, or other body of water. Georgia has 14 major watersheds.

Waterway: a river, canal, or other water route, typically referring to travel by water.

Wetland depression: poorly drained low areas that collect water from precipitation or that seeps through the ground.

Activities: These are just a few ideas of educational activities you can to do with students at Cay Creek or almost any outdoor setting. Many were adapted from Project WILD and Joseph Cornell's *Sharing Nature with Children*.

Starter Games:
It is a good idea to begin with a high energy ecology-focused game when you arrive at Cay Creek. The long open grassy area between two forest habitats provides an irresistible space to play games. Below are some ideas of physical activities that would be appropriate for K-1 students in Cay Creek.

1. **Butterfly Life Cycle/Red Light Green Light (10 min)(K-5th grade)**

Line up the students side-by-side in a large grassy area with enough room between them so that they do not bump into one another. Begin by asking questions and explaining how a butterfly transforms during the complete metamorphosis (see background section). Stand facing them to explain the game. The point of the game is for students to act like a butterfly does in its various life cycles in order to "race" to where you, the teacher, are standing. In only two of the life stages can the butterfly/child move forward (caterpillar and adult), and in the other two it can only wiggle in place (egg and pupa). When you call out "egg" the students must curl up in a ball. When you call "caterpillar" he/she may crawl forward on all fours. When you call "pupa" the students stand in place with arms wrapped around their bodies and wiggle. When you call "adult" or "butterfly" the students may run forward, flapping their wings. Change up the order to keep them on their toes! The game is over when everyone has crossed the "finish line."

2. **Quick Frozen Critters (15 min)(K-5th grade)**

This game teaches ideas of locomotion, adaptation, survival, and predator-prey relations. A few students are chosen to be foxes, and the rest are rabbits. The rabbits must make it from one end of the playing area to the other without being "eaten" (tagged) by the foxes. The rabbits have a defense tactic, however, and when they freeze in place the foxes cannot "see" them, so they can't tag them. Students may need to be told that rabbits can only freeze for 10 seconds at a time before the foxes can sniff them out. You may set up safe zones, "thickets" that can be resting grounds for the rabbits. Once all the rabbits have been eaten or a sufficient amount of time has passed ask the students what tactics were used by the rabbits and foxes to achieve safety and food. Make sure to talk about how camouflage, speed, and "safety in numbers," are all factors that affect an animal's ability to survive.

3. **Scavenger Hunt (15 min) (All ages)**

Scavenger hunts are a lot of fun, but can require some additional planning and supervision. With enough chaperones, however, it is a great way for young kids to explore nature independently, which is very important to them cultivating a relationship with nature. Students should split up onto teams of 2-4 and (with a chaperone) go off within certain boundaries to find a number of items on a list. The grassy area at Cay Creek is good for this activity because the teacher can supervise all

the groups within eyesight but the area is large enough that some substantial exploration can take place. Students should be given plastic bags or collecting jars to store objects. Another option is to have a photo-scavenger hunt and each group is required to take pictures of the objects instead of collecting them. Here are examples of lists that students may receive.

K-2nd grade	3rd-5th grade	6th-8th grade	9th-12th grade
blade of grass	hairy leaf	magnolia leaf	a grass, a rush, & a sedge
green leaf	smooth leaf	oak leaf	something inorganic
brown leaf	2 types of soil	sweetgum leaf	fungi
something red	something manmade	an invertebrate	3 types of seeds

4. Nature Items race game (20 min)(3rd - 8th grade)

This game can be played at Cay Creek with a little extra preparation time, or the materials may be gathered in another location ahead of time. You will need 5-10 natural objects (see examples below) and have some background information about their role in the natural ecosystem. Begin by gathering the students around for "show and tell." Pick up each object one by one and tell them to listen very closely and remember everything they can while you tell them a few facts about its life cycle, habitat, function, or composition. Once you have described each object, have the children line up in two equal rows, spaced about 30 feet apart. Assign each child a number so that there are correlating numbers standing across from each other. The way you play the game is the teacher names a fact, and then calls out a number. The two children who have that number race to the center to grab the object that the teacher described and bring it back to their spot. Then the teacher asks the class which object(s) she described (so they learn the names as well as the appearance) and all items are returned to the center. The teacher continues calling out facts and numbers until every student gets to go at least once. At the end of the game you may assess the students by naming the facts and having them respond in a chorus.

5. Creepy Crawly Dance Moves (15 min)(K-5th grade)

This game is meant to engage the kids in a fun way and have them think about different ways that insects use locomotion. Each kid is asked to think of an insect (or "bug") and a dance move that reminds them of how that insect moves. This can be used as a name –game for students that aren't familiar with one another. One-by-one the students introduce themselves and teach the class their dance move, while calling out the name of the insect it represents. After each student teaches their move, the whole class must repeat all of the moves that have been done so far, so that by the end there is a long chain of dance moves and insect names that the whole class does together. Some students might have difficulty thinking of an insect and should be given plenty of time to make up a dance. Some examples of fun bugs to represent are: stinkbug, butterfly, roly-poly, dragonfly, grasshopper, spider, flea, ladybug, cicada, mosquito, walking stick, water strider, dung beetle, and many more!

Becoming a Naturalist (30-40 min)(K-3rd grade): Many children like to wear costumes or use props, which allow them to adopt a new personality. Many teachers have found that teaching kids to be "naturalists" and having some way of denoting this status helps engage the children with nature. One simple way to do this is for each child to have a naturalist's journal to record thoughts and observations about nature. An example of the journal is attached to this document and can be printed, stapled, and distributed for this lesson.

Materials: Naturalist "journals" (can be printed from Coastal Wildscapes website), pencils, drawing supplies, glue sticks, writing boards/clipboards. Optional supplements: garden trowel, ziploc bags, insect sweep net, aquatic net.

Procedure: Explain to the children the purpose of a naturalist journal. You may explain what a naturalist is, and tell about how early explorers kept journals of their observations so they could describe in detail what they saw in new foreign lands. Lewis and Clark were sent by President Thomas Jefferson into the unsettled West and wrote descriptive entries of what they encountered. Naturalist journals can help people in the future to understand how land has changed.

Set off on your "excursion" through Cay Creek Wetlands. You can all go together, or split up into smaller groups if you have chaperones. Another option would be to have different teachers or chaperones at "stations" and the children rotate from one to the next to explore a diversity of subjects. Tell the children to whisper so that they can hear any bird calls, tree frogs, insects, or other sounds of wildlife. They should also be encouraged to use their sense of touch and smell whenever they encounter something new. Be sure to educate them on the dangers of splinters. Show them pictures of poison ivy and lookout to make sure none is in the vicinity. Also ask them to stay in the boundaries of the grassy area by the gravel driveway and not to get off of the boardwalk once they are on it.

On this excursion you will make several stops along the way. Give the students the chance to collect leaves, write or draw in their notebooks, and have them describe aloud what they see. In order, here are some ideas of stops you can take in your Cay Creek exploration.

1. **Weather Watching**

It is important that one of the first things the children observe is the weather conditions. This is best in the open grassy area where the games are played. Weather effects animal behavior as well as plant behavior, and this might change what they see on their excursion. Have them lie on their backs and observe the clouds for several minutes and ask what shape and color clouds they see. Also point out other signs of weather change, like wind moving the leaves or moving clouds. There is a page on the naturalist's journal where they may draw a sketch of the weather conditions.

2. **Soil Stop**

Before you get to the boardwalk, stop in two places that are far apart from each other to look at soil. With a small trowel dig up a small amount near the forest edge or in a place that will not be obvious to other visitors. Have the students feel it (texture) and smell it, and describe what color it is. Is it sandy or does it feel more like clay? Does it stick together or fall apart? Is it wet or dry? Is it light or

dark? What else is mixed in with the soil? Have them record their observations. Bring a little bag to put some of the soil in and carry it to the next stop. Again, dig up soil and compare it to the first site so they can see how similar or different it is.

3. Leaf Collection

Each child will create their own miniature "herbarium," a place for storing pressed plant specimens. A herbarium can have many uses: to teach others about plants, to preserve a particularly interesting find, or to document what was found in a particular habitat. Only a few examples should be taken so that it does not harm the plant. Students should choose 2-4 leaves that look different and glue them into their naturalist journals using non-acidic glue. They can write words beside the plant that describe their shape, size, color, texture, and other attributes. Discussion should teach students that all plants of the same species grow to look the same way. Show them pictures of other types of leaves and ask them which ones are most similar to the leaves they have. You can find a simple classification of leaf shapes that can be used to describe the leaf with the handouts. You may photocopy and distribute this image to the students.

4. Animal tracks

Observe the sandy and muddy areas for animal tracks. These may be seen from the boardwalk. Look for otter crawlways, crab footprints, bird prints, snake and alligator slides, and raccoon tracks. Many animals are nocturnal and are not active during the time when you may be at Cay Creek, so you may not see them all, but it is more likely that you will find evidence of their presence with tracks. Draw the tracks with a scale for size, or take a photograph to identify them later.

5. Habitat Observation

Have the students spend some quiet time using their senses to soak in and observe the natural space around them. If there is time, have the students do this in 2 different habitats so that they can compare the structure, function, and other characteristics of each. Depending on the age group, ask them to write a reflection or verbally express what they saw. You may suggest specific features for them to look for, like presence of water, type of substrate (sand/mud), amount of light and/or shade, movement, sounds, colors, smells, signs of wildlife (tracks), signs of a human presence (litter), wildlife sightings, etc.

6. Bird, butterfly, herp, or mammal counts

More advanced students may want to do faunal counts, recording what species they see during their visit. Field notebooks and species lists are helpful when doing counts, and binoculars can be essential as well. An especially useful tool for conducting these surveys is a high quality camera that can capture a quickly-flying bird or butterfly better than your own two eyes. The species can be identified later using credible sites like butterfliesandmoths.org, bugguide.net, or Cornell's allaboutbirds.org. Butterfly, bird, mammal, herp and plant lists can be found at the end of this document.

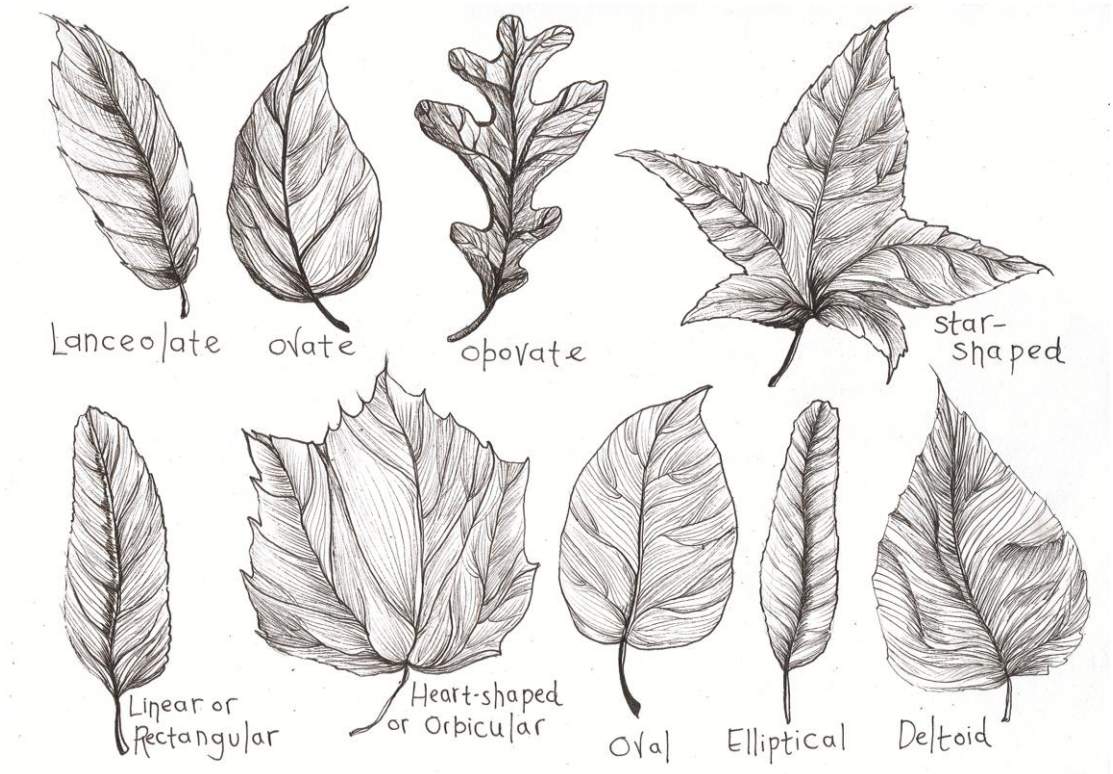
Activities involving Interpretive Signs at Cay Creek:

On the Coastal Wildscapes website you can find a link to a PowerPoint presentation that has pictures of all of the signs at Cay Creek. These slides also include discussion questions that can be formed from the information and themes on the signs. For older middle or high school students you may consider connecting observations at Cay Creek with a classroom research project, and information contained on the signs.

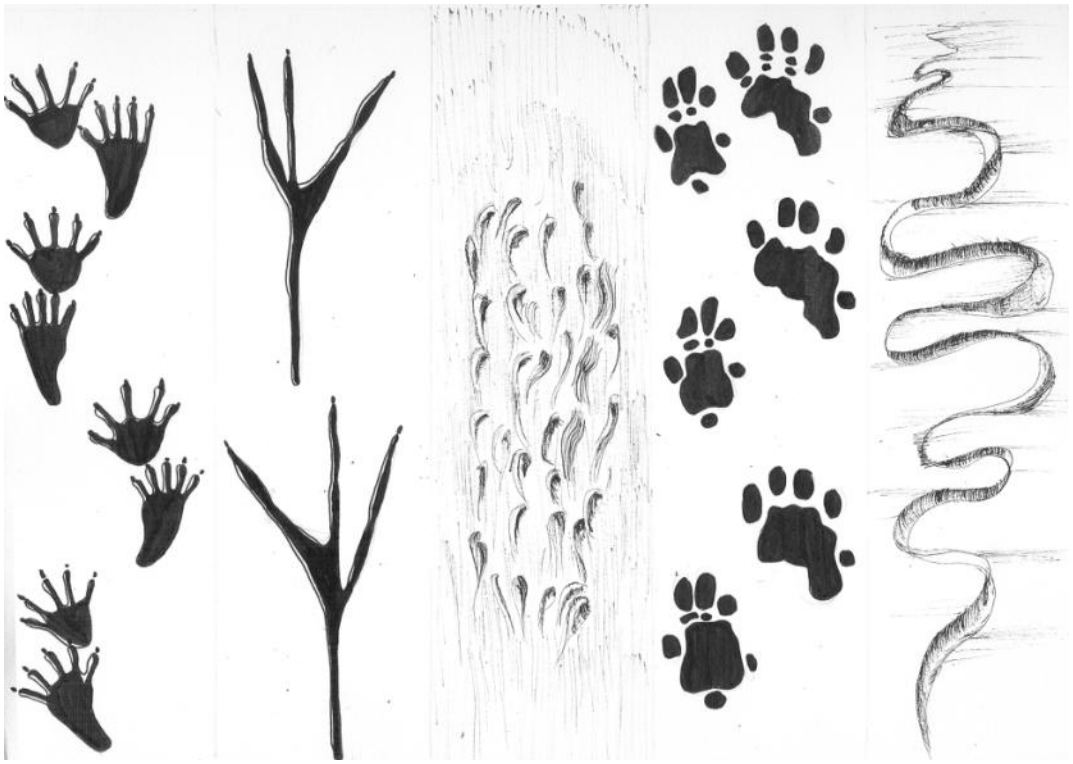
List of interpretive signs at Cay Creek in order from road to dock:

#1- Welcome to Cay Creek
#2- Rules and Regulations
#3- Cay Creek Waterways
#4- Avian Appetites- birds and their food sources
#5- Landscape Plan
#6- Be Our Guest- butterflies and their host plants
#7- Maritime Forest
#8- Pine Flatwoods
#9- Where Creek Meets Tide
#10- Plant Communities of Cay Creek
#11- History and Culture of Cay Creek
#12- Benign Bugs- insects and arachnids
#13- An Edible Landscape- rice culture and blue crabs
#14- Open Wetland
#15- Find the Flora and Fauna
#16- Freshwater Tidal Swamp
#17- Open Canopy
#18- Canopy Voices- treefrog and owl calls
#19- Ecosystem Engineers- beavers and blackwater tannins
#20- Hammock Havens- hammocks, snags, sea level rise
#21- Brackish Marsh Species- Great Egrets and Graminoids
#22- Tidal Travels

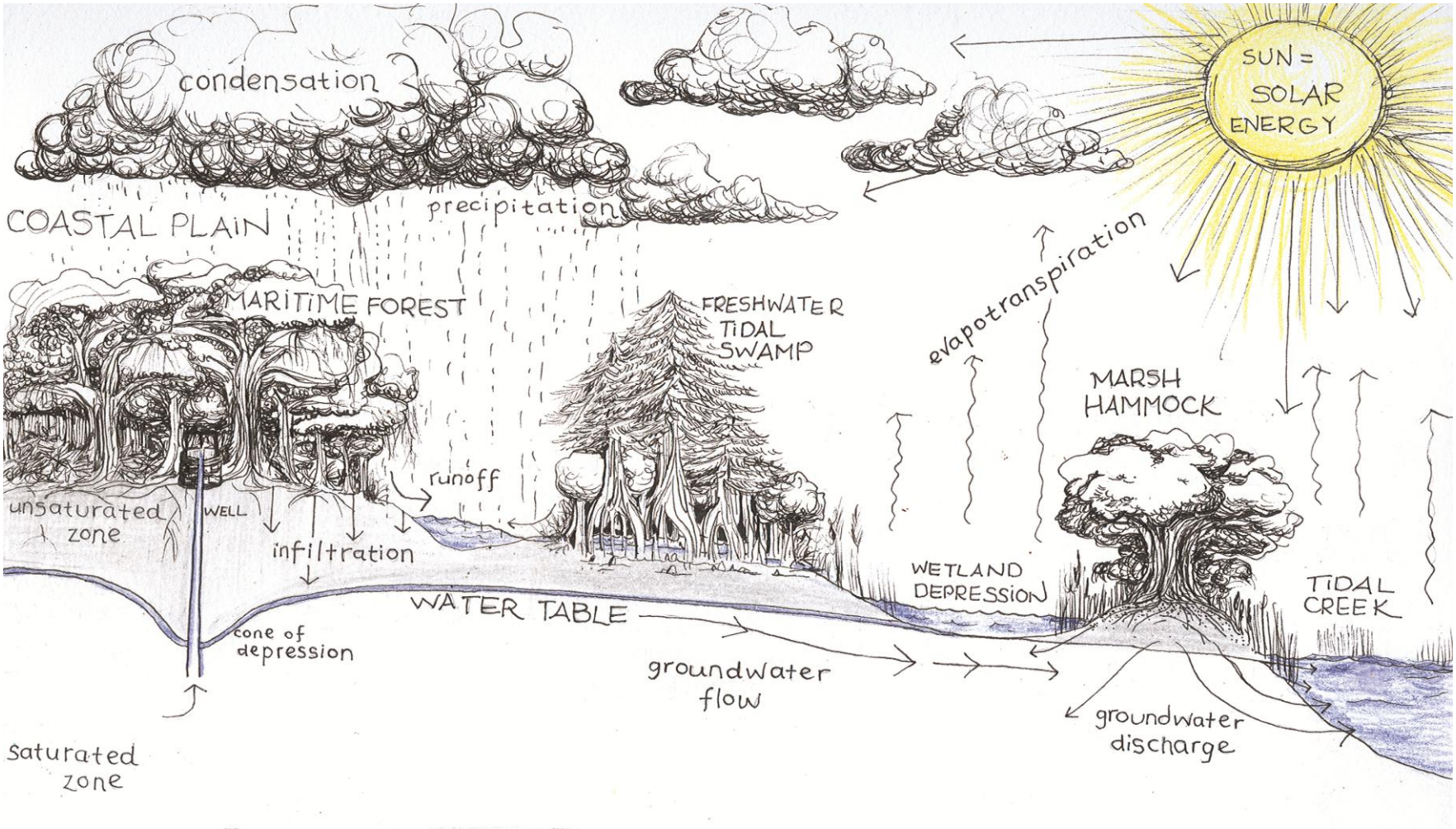
HANDOUTS



Names used to describe leaf shapes.



Some animal tracks you may see at Cay Creek: raccoon, great blue heron, fiddler crabs, otter, snake.


condensation
SUN = SOLAR ENERGY
precipitation
COASTAL PLAIN
evapotranspiration
MARITIME FOREST
FRESHWATER TIDAL SWAMP
MARSH HAMMOCK
runoff
unsaturated zone
WELL
infiltration
WETLAND DEPRESSION
TIDAL CREEK
WATER TABLE
cone of depression
groundwater flow
groundwater discharge
Saturated zone

Animal and Plant Lists: These lists are the species of animals and plants that have been documented at Cay Creek. It is possible that there are many species present that are not listed, but these will help to guide you and your students to identify the flora and fauna that make a home in Cay Creek Wetlands Park.

Lists:

1. Birds
2. Butterflies
3. Herps (reptiles and amphibians)
4. Mammals
5. Other Aquatic Creatures
6. Plants

1. BIRDS

Accipiter cooperii	Cooper's Hawk
Agelaius phoeniceus	Red-winged Blackbird
Archilochus colubris	Ruby-throated Hummingbird
Ardea alba	Great Egret
Ardea Herodias	Great Blue Heron
Baeolophus bicolor	Tufted Titmouse
Bombycilla cedrorum	Cedar Waxwing
Bubulcus ibis	Cattle Egret
Buteo jamaicensis	Red-tailed Hawk
Buteo lineatus	Red-shouldered Hawk
Cardinalis cardinalis	Northern Cardinal
Cathartes aura	Turkey Vulture
Catharus guttatus	Hermit Thrush
Cistothorus palustris	Marsh Wren
Cistothorus platensis	Sedge Wren
Coccyzus americanus	Yellow-billed Cuckoo
Colaptes auratus	Northern Flicker
Contopus virens	Eastern Wood-Pewee
Coragyps atratus	Black Vulture
Corvus brachyrhynchos	American Crow
Corvus ossifragus	Fish Crow
Cyanocitta cristata	Blue Jay
Dendroica coronate	Yellow-rumped Warbler
Dendroica discolor	Prairie Warbler
Dendroica dominica	Yellow-throated Warbler
Dendroica palmarum	Palm Warbler
Dendroica pinus	Pine Warbler
Dryocopus pileatus	Pileated Woodpecker
Dumetella carolinensis	Gray Catbird
Egretta thula	Snowy Egret
Empidonax virescens	Acadian Flycatcher
Eudocimus albus	White Ibis

Falco sparverius	American Kestrel
Gallinula galeata	Common Gallinule
Geothlypis trichas	Common Yellowthroat
Hirundo rustica	Barn Swallow
Icterus spurious	Orchard Oriole
Ictinia mississippiensis	Mississippi Kite
Lanius ludovicianus	Loggerhead Shrike
Leucophaeus atricilla	Laughing Gull
Megaceryle alcyon	Belted Kingfisher
Megascops asio	Eastern Screech-Owl
Melanerpes carolinus	Red-bellied Woodpecker
Melanerpes erythrocephalus	Red-headed Woodpecker
Melospiza Georgiana	Swamp Sparrow
Melospiza melodia	Song Sparrow
Mimus polyglottos	Northern Mockingbird
Mniotilta varia	Black-and-white Warbler
Myiarchus crinitus	Great Crested Flycatcher
Pandion haliaetus	Osprey
Parula Americana	Northern Parula
Passerina ciris	Painted Bunting
Phalacrocorax auritus	Double-crested Cormorant
Picoides pubescens	Downy Woodpecker
Pipilo erythrophthalmus	Eastern Towhee
Piranga rubra	Summer Tanager
Poecile carolinensis	Carolina Chickadee
Polioptila caerulea	Blue-gray Gnatcatcher
Protonotaria citrea	Prothonotary Warbler
Quiscalus major	Boat-tailed Grackle
Quiscalus quiscula	Common Grackle
Regulus calendula	Ruby-crowned Kinglet
Sayornis phoebe	Eastern Phoebe
Sialia sialis	Eastern Bluebird
Sitta pusilla	Brown-headed Nuthatch
Sphyrapicus varius	Yellow-bellied Sapsucker
Spinus tristis	American Goldfinch
Strix varia	Barred Owl
Tachycineta bicolor	Tree Swallow
Thryothorus ludovicianus	Carolina Wren
Toxostoma rufum	Brown Thrasher
Troglodytes aedon	House Wren
Troglodytes hiemalis	Winter Wren
Turdus migratorius	American Robin
Tyrannus tyrannus	Eastern Kingbird
Vermivora celata	Orange-crowned Warbler
Vireo flavifrons	Yellow-throated Vireo
Vireo griseus	White-eyed Vireo
Vireo olivaceus	Red-eyed Vireo
Wilsonia citrine	Hooded Warbler
Zenaida macroura	Mourning Dove
Zonotrichia albicollis	White-throated Sparrow

2. BUTTERFLIES

Abaeis nicippe	Sleepy Orange
Agraulis vanillae	Gulf Fritillary
Amblyscirtes aesculapius	Lace-winged Roadside-Skipper
Amblyscirtes hegon	Pepper and Salt Skipper
Anartia jatrophae	White Peacock
Anatrytone logan	Delaware Skipper
Ancyloxypha numitor	Least Skipper
Anthanassa texana seminole	Seminole' Texan Crescent
Anthocharis midea	Falcate Orangetip
Ascia monuste	Great Southern White
Astercampa celtis	Hackberry Emperor
Astercampa clyton	Tawny Emperor
Atalopedes campestris	Sachem
Atlides halesus	Great Purple Hairstreak
Brephidium pseudofea	Eastern Pygmy Blue
Calephelis virginiensis	Little Metalmark
Callophrys gryneus	Juniper Hairstreak
Callophrys gryneus sweadneri	Sweadner's Juniper Hairstreak
Callophrys henrici	Henry's Eflin
Calpodes ethlius	Brazilian Skipper
Calycopis cecrops	Red-banded Hairstreak
Celastrina idella	American Holly Azure
Celastrina ladon	Spring Azure
Celastrina neglecta	Summer Azure
Cercyonis pegala	Common Wood Nymph
Colias eurytheme	Orange Sulphur
Copaeodes minimus	Southern Skipperling
Cupido comyntas	Eastern-tailed Blue
Cyllopsis gemma	Gemmed Satyr
Danaus gilippus	Queen
Danaus plexippus	Monarch
Enodia creola	Creole Pearly Eye
Enodia portlandia	Southern Pearly-eye
Epargyreus clarus	Silverspotted Skipper
Erynnis baptisiae	Wild Indigo Duskywing
Erynnis brizo	Sleepy Duskywing
Erynnis horatius	Horace's Duskywing
Erynnis juvenalis	Juvenal's Duskywing
Erynnis zarucco	Zarucco Duskywing
Euphyes berryi	Berry's Skipper
Euphyes bimacula	Two-spotted Skipper
Euphyes dion	Dion Skipper
Euphyes dukesi	Dukes' Skipper
Euphyes pilatka	Palatka Skipper
Euphyes vestris	Dun Skipper
Euptoieta claudia	Variegated Fritiallary

Eurema daira	Barred Yellow
Eurytides marcellus	Zebra Swallowtail
Feniseca tarquinius	Harvester
Heliconius charitonius	Zebra Heliconian
Hemiargus ceraunus	Ceranus Blue
Hermeuptychia sosybius	Carolina Satyr
Hesperia meskei	Meske's Skipper
Hylephila phyleus	Fiery Skipper
Junonia coenia	Common Buckeye
Leptotes cassius	Cassian Blue
Lerema accius	Clouded Skipper
Lerodea eufala	Eufala Skipper
Libytheana carinenta	American Snout
Limenitis archippus	Viceroy
Limenitis arthemis	Red-spotted Purple/White Admiral
Limenitis arthemis astyanax	Astyanax' Red-spotted Purple
Megathymus yuccae	Yucca Giant-Skipper
Megisto cymela cymela	Little Wood-Satyr
Megisto cymela viola	Viola's' Little Wood-Satyr
Nastra lherminier	Swarthy Skipper
Nathalis iole	Dainty Sulfur
Neonympha areolatus	Georgia Satyr
Nymphalis antiopa	Mourning Cloak
Oligoria maculata	Twin-spotted Skipper
Panoquina ocola	*Ocola Skipper*
Panoquina panoquin	*Salt Marsh Skipper*
Papilio cresphontes	Giant Swallowtail
Papilio glaucus	Eastern Tiger Swallowtail
Papilio palamedes	Palamedes Swallowtail
Papilio polyxenes	Black Swallowtail
Papilio troilus	Spicebush Swallowtail
Parrhasius m album	White M Hairstreak
Phoebis sennae	Cloudless Sulphur
Pholisora catullus	Common Sootywing
Phyciodes phaon	Phaon Cresent
Phyciodes tharos	Pearl Crescent
Pieris rapae	Cabbage White
Poanes aaroni	Aaron's Skipper
Poanes hobomok	Hobomok Skipper
Poanes viator	Broad-winged Skipper
Poanes yehl	Yehl Skipper
Poanes zabulon	Zabulon Skipper
Polites origenes	Crossline Skipper
Polites themistocles	Tawny-Edged Skipper
Polites vibex	Whirlabout
Polygonia comma	Eastern Comma
Polygonia interrogationi	Question Mark
Pompeius verna	Little Glassywing
Pontia protodice	Checkered White
Problema bulenta	Rare Skipper

Problema byssus	Byssus Skipper
Pyrgus communis	Common Checkered-Skipper
Pyrgus oileus	Tropical Checkered-Skipper
Pyrisitia lisa	Little Yellow
Satyrium calanus	Banded Hairstreak
Satyrium favonius favonius	Southern Oak Hairstreak
Satyrium kingi	King's Hairstreak
Satyrium liparops	Striped Hairstreak
Satyrium titus	Coral Hairstreak
Staphylus hayhurstii	Hayhurst's Scallopwing
Strymon melinus	Gray Hairstreak
Thorybes bathyllus	Southern Cloudywing
Thorybes confusis	Confused Cloudywing
Thorybes pylades	Northern Cloudywing
Urbanus dorantes	Dorantes Longtail
Urbanus proteus	Long-tailed Skipper
Vanessa atalanta	Red Admiral
Vanessa cardui	Painted Lady
Vanessa virginiensis	American Lady
Wallengrenia egeremet	Northern Broken-Dash
Wallengrenia otho	Southern Broken-Dash

3. HERPS

Toads, Frogs, Salamanders

Acris gryllus	Southern Cricket Frog
Alligator mississippiensis	American Alligator
Ambystoma opacum	Marbled Salamander
Ambystoma talpoideum	Mole Salamander
Amphiuma means	Two-toed Amphiuma
Anaxyrus quercicus	Oak Toad
Anaxyrus terrestris	Southern Toad
Anolis carolinensis	Green Anole
Aspidoscelis sexlineatus	Six-lined Racerunner
Desmognathus auriculatus	Southern Dusky Salamander
Desmognathus conanti	Spotted Dusky Salamander
Eurycea cirrigera	Southern Two-lined Salamander
Eurycea guttolineata	Three-lined Salamander
Eurycea quadridigitata	Dwarf Salamander
Gastrophryne carolinensis	Eastern Narrow-mouthed Toad
Hyla chrysoscelis	Cope’s Gray Treefrog
Hyla cinerea	Green Treefrog
Hyla femoralis	Pine Woods Treefrog
Hyla squirella	Squirrel Treefrog
Lithobates catesbeianus	Bullfrog
Lithobates clamitans	Green Frog
Lithobates grylio	Pig Frog
Lithobates heckscheri	River Frog

Lithobates sphenocephalus	Southern Leopard Frog
Necturus punctatus	Dwarf Waterdog
Notophthalmus viridescens	Eastern Newt
Ophisaurus attenuatus	Slender Glass Lizard
Ophisaurus ventralis	Eastern Glass Lizard
Plestiodon fasciatus	Five-lined Skink
Plestiodon inexpectatus	Southeastern Five-lined Skink
Plestiodon laticeps	Broadhead Skink
Plethodon ocmulgee	Ocmulgee Slimy Salamander
Pseudacris crucifer	Spring Peeper
Pseudacris nigrita	Southern Chorus Frog
Pseudacris ocularis	Little Grass Frog
Pseudotriton montanus	Mud Salamander
Pseudotriton ruber	Red Salamander
Scaphiopus holbrookii	Eastern Spadefoot
Sceloporus undulatus	Eastern Fence Lizard
Scincella lateralis	Ground Skink
Siren intermedia	Lesser Siren
Siren lacertina	Greater Siren
Stereochilus marginatus	Many-lined Salamander

Snakes

Agkistrodon contortrix	Copperhead
Agkistrodon piscivorus	Cottonmouth
Cemophora coccinea	Scarlet Snake
Coluber constrictor	Black Racer
Coluber flagellum	Coachwhip
Crotalus adamanteus	Eastern Diamondback Rattlesnake
Crotalus horridus	Timber Rattlesnake
Diadophis punctatus	Ringneck Snake
Farancia abacura	Mud Snake
Farancia erytrogramma	Rainbow Snake
Heterodon platirhinos	Eastern Hognose Snake
Lampropeltis elapsoides	Scarlet Kingsnake
Lampropeltis getula	Common Kingsnake
Micrurus fulvius	Eastern Coral Snake
Nerodia fasciata	Banded Watersnake
Nerodia taxispilota	Brown Watersnake
Opheodrys aestivus	Rough Green Snake
Pantherophis alleganiensis	Eastern Rat Snake
Pantherophis guttatus	Corn Snake
Regina rigida	Glossy Crayfish Snake
Sistrurus miliarius	Pigmy Rattlesnake

Turtles

Apalone ferox	Florida Softshell
Apalone spinifera	Spiny Softshell
Chelydra serpentina	Snapping Turtle
Clemmys guttata	Chicken Turtle
Gopherus polyphemus	Gopher Tortoise

Kinosternon baurii	Striped Mud Turtle
Kinosternon subrubrum	Eastern Mud Turtle
Pseudemys floridana	Florida Cooter
Sternotherus minor	Loggerhead Musk Turtle
Sternotherus odoratus	Common Musk Turtle
Terrapene carolina	Eastern Box Turtle
Trachemys scripta	Pond Slider

4. MAMMALS

Cingulata sp.	Armadillo
Castor canadensis	Beaver
Odocoileus virginianus	Deer
Pteromyini sp.	Flying Squirrel
Sciurus carolinensis	Gray Squirrel
Sylvilagus palustris	Marsh Rabbit
Didelphimorphia sp.	Opossum
Lontra canadensis	Otter
Sus sp.	Pig

5. AQUATIC CREATURES

Callinectus sapidus	Blue Crab
Uca pugnax	Mud Fiddler Crab
Littorina littorea	Periwinkle Snail
Litopenaeus setiferus	Georgia White Shrimp

6. PLANTS

Acer rubrum	red maple
Carya glabra	pignut hickory
Castanea pumila	chinquapin
Cornus florida	flowering dogwood
Ilex cassine	dahoon holly
Ilex opaca	American holly
Juniperus virginiana	eastern red cedar
Juniperus virginiana silicicola	southern red cedar
Liquidambar styraciflua	sweetgum
Magnolia grandiflora	southern magnolia
Magnolia virginiana	sweetbay
Morus rubra	red mulberry
Nyssa biflora	swamp tupelo
Nyssa sylvatica	black gum
Osmanthus americanus	Devilwood, native teaolive
Persea palustris	swamp bay
Pinus serotina	pond pine
Pinus taeda	loblolly pine

Prunus serotina	black cherry
Quercus nigra	water oak
Quercus pagoda	cherrybark oak
Quercus stellata	post oak
Quercus virginiana	live oak
Sabal palmetto	cabbage palm
Symplocos tinctoria	common sweetleaf
Taxodium distichum	bald cypress
Ulmus americana	American elm
Aralia spinosa	devil's walkingstick
Baccharis halimifolia	groundsel bush
Callicarpa americana	American beautyberry,
Cephalanthus occidentalis	common buttonbush
Clethra alnifolia	coastal sweetpepperbush
Cornus stricta/foemina	Southern swamp dogwood
Hamamelis virginiana	witchhazel
Itea virginica	Virginia sweetspire
Morella cerifera	wax myrtle
Phoradendron serotina	American mistletoe
Rhus copallinum	winged sumac
Sabal minor	dwarf palmetto
Sambucus nigra (canadensis)	American elderberry
Vaccinium arboreum	sparkleberry
Viburnum nudum	possumhaw
Onoclea sensibilis	sensitive fern, bead fern
Osmunda regalis	royal fern
Pleopeltis polypodioides *	resurrection fern
Woodwardia areolata	netted chainfern
Ageratina jucundum *	hammock snakeroot
Alternanthera philoxeroides	Alligator weed
Bacopa monnieri	Monnier's Water-hyssop
Boehmeria cylindrica	smallspike false nettle
Chamaecrista fasciculata	partridge pea
Chrysopsis mariana	Maryland golden aster
Cicuta maculata	spotted water hemlock
Cirsium horridulum	yellow thistle
Cnidoscolus urens	tread-softly
Elephantopus nudatus	smooth elephant's foot
Erigeron quercifolius	oakleaf fleabane
Erythrina herbacea	coral bean
Eupatoriadelphus fistulosus *	Joepye weed

Eupatorium leucolepis	justiceweed/boneset
*Gamochaeta falcatum **	narrowleaf purple everlasting
Hibiscus aculeatus	comfortroot
Hydrocotyle ranunculoides	floating marshpennywort
*Hypericum hypericoides **	St. Andrew's cross
Iris virginica	southern blue flag
Iva frutescens	marsh elder, Jesuit's bark
Kosteletzkya virginica	seashore mallow
Ludwigia leptocarpa	anglestem primrose-willow
Mimosa strigillosa	powderpuff
Mitchella repens	partridgeberry
Monarda punctata	spotted beebalm
*Nuttallanthus canadensis **	Canada toadflax
Packera tomentosa	woolly ragwort
Phytolacca americana	Americam pokeweed
Pluchea odorata	sweetscent, marsh fleabane
Pontederia cordata	pickerelweed
Ptilimnium capillaceum	herbwilliam
Pyrrhopappus carolinianus	Carolina desert-chicory
Rudbeckia hirta	blackeyed Susan
Sagittaria lancifolia	bulltongue arrowhead
Saururus cernuus	lizard's tail
Solidago sempervirens	seaside goldenrod
*Symphyotrichum tenuifolius **	perennial saltmarsh aster
Tillandsia usneoides	Spanish moss
Trichostema dichotomum	forked bluecurls
Andropogon glomeratus	bushy bluestem
Arundinaria tecta	switchcane
*Chasmanthium laxum **	slender spikegrass
Cyperus distinctus	swamp flatsedge
Juncus effusus	common rush
Juncus roemerianus	black needle rush
*Saccharum giganteum **	sugarcane plume grass
Scirpus cyperinus	woolgrass
Spartina alterniflora	smooth cordgrass
Spartina cynosuroides	Big Cordgrass
Spartina patens	saltmeadow cordgrass
Typha sp	cattail
Ampelaster carolinianus	climbing aster
Apios americana	groundnut
Berchemia scandens	Alabama supplejack

Bignonia capreolata *	cross vine
Campsis radicans	trumpet creeper, trumpet vine
Centrosema virginianum	spurred butterfly pea
Decumaria barbara	climbing hydrangea
Gelsemium sempervirens	yellow jessamine
Lonicera sempervirens	trumpet honeysuckle
Mikania scandens	climbinghempvine
Mimosa microphylla *	sensitive brier
Parthenocissus quinquefolia	Virginia creeper
Smilax auriculata	earleaf greenbrier
Smilax bona-nox	saw greenbrier
Toxicodendron radicans *	poison ivy
Vitis aestivalis	summer grape
Vitis rotundifolia	muscadine
Sphagnum sp.	sphagnum moss
Wisteria frutescens	American wisteria

References:

Edwards, Leslie; Johnathan Ambrose; L. Katherine Kirkman. *The Natural Communities of Georgia*.The University of Georgia Press Athens, Georgia, 2013. Print.

Project WILD K-12 Curriculum and Activity Guide. Council for Environmental Education, Houston, Texas, 2011.