

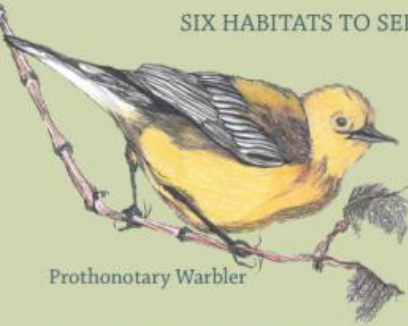
Welcome to Cay Creek Wetland Park



A diversity of ecosystems unite at Cay Creek Wetland Park to make a unique, natural place. Dry uplands meet low wetlands, forests meet marshes, and fresh water mingles with salt water. Areas where different ecosystems meet are called ecotones and the line between those ecosystems is called edge.

SIX HABITATS TO SEE

- Maritime Forest
- Pine Flatwood
- Open Wetland
- Freshwater Tidal Swamp
- Hammocks & Shrubby Upland
- Brackish Tidal Marsh & Creek



Prothonotary Warbler



Gulf Fritillary Butterfly

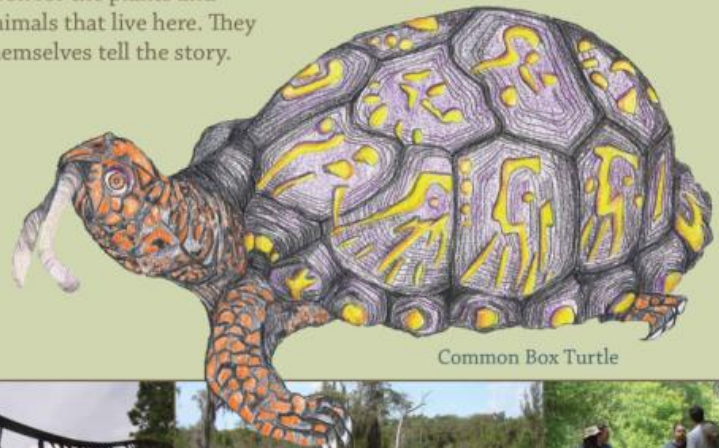


Green Tree Frog:
State Amphibian of Georgia

A 3/4 mile boardwalk stroll will take you from upland forests and meadow, through freshwater swamps, a Bald Cypress tidal swamp, up onto a wildlife viewing platform in the forest canopy, past hammocks and marsh, and finally to a delightful dock overlooking a brackish tidal creek.

Look for interpretive panels along the way. They describe how both fresh and salt water influence the environment.

Look for the plants and animals that live here. They themselves tell the story.



Common Box Turtle



Vocab Words

- Diversity
- Ecosystems
- Ecotone
- Edge
- Maritime
- Hammock
- Brackish

Discussion Questions:

What do you expect to see in these habitats based on their names?

What food web interactions do you witness on this slide? Draw a food web including the animals and plants here and other native species you expect to see.

Rules and Reminders

- Please do not drive on the grass or garden beds.
- No four-wheelers or other vehicles that can travel off-road are permitted in the Park.
- Use of the boardwalk is not permitted when the Park is closed.
- Do not get off the boardwalk in areas where there is railing.
- Do not play loud music that might disturb others in the Park
- Leaving food and or feeding any animals in the Park is prohibited.
- Do not release an animal that was brought into the Park.
- Only bring a pet if:
 - Its droppings are disposed of in trash receptacles.
 - It has been licensed and vaccinated as required by law.
- Please do not litter.
- Alcohol is prohibited.
- No fires are allowed unless permitted.



Cay Creek Wetlands Park is owned and maintained by the City of Midway, GA.
P.O. Box 125 Midway, GA 31320
912-884-3344

Discussion Questions

What is the importance of leaving no trace in any natural ecosystem?

What is the difference between wild and domestic animals and why is it important not to feed wildlife?

Cay Creek Waterways

As Cay Creek flows to the outer edge of the Coastal Plain it widens, forms oxbows, and meanders to and fro through marshes. It begins in freshwater wetlands and flows into the brackish North Newport River to reach the ocean at St. Catherines Sound.



LiDAR imagery (short for Light Detection and Ranging) can be used to reveal past human use of the landscape. These images show the watershed of Cay Creek. The interplay between elevation, water level, and water salinity influences habitat types.

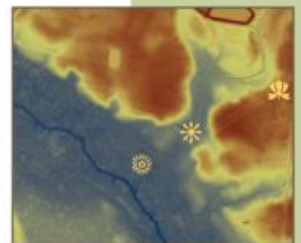
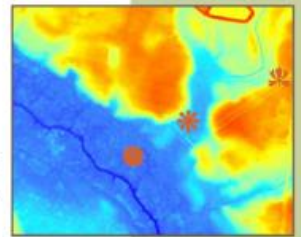
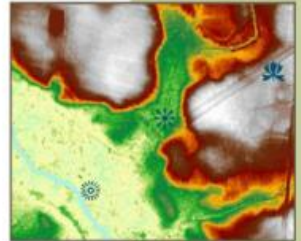
Symbols on the maps represent these locations:



Changes in topography are illuminated by bright colors representing various elevations- from the bottom of Cay Creek (light blue), to a brackish marsh (light yellow), to shrubby upland forest edge (green), to tidal swamps (red) and at last to upland forests (white).

Water features surrounding Cay Creek (depicted in blue) include remnants of rice culture. Look for straight perpendicular intersections with the tidal creek. These are channels that were dug to control the flow of water, or blow-outs from impoundments for rice fields.

Freshwater swamp and brackish marsh environments are represented by yellow and blue hues on the image. The push and pull of the tides increases groundwater pressure in the upland areas, forcing lenses of fresh water to the surface.



Vocab Words

- Waterway
- Tributary
- Watershed
- Elevation
- LiDAR
- Topography
- Rice Culture
- Impoundments
- Groundwater

Discussion Questions:

- How does the shape/size of Cay Creek Waterway change as it nears St. Catherines Sound? What influences these changes? Consider elevation gradient, tributary streams, groundwater, and erosion.
- What do the LiDAR images show us that we cannot see from an aerial photograph?
- How do the natural creek and the rice channels look different from above?
- How are elevation, salinity, amount of water and habitat type interconnected?

Avian Appetites

Over 80 different bird species have been seen at Cay Creek, and their palates are as diverse as their plumage. Below, birds identified at the Park are arranged by the food they eat. Some birds eat mostly insects (insectivores), while others prefer seeds (granivores) or fruits (frugivores). Hummingbirds are our only local birds who live mostly on nectar (nectarivores).

Even if a bird species prefers a certain type of food, it is not uncommon to see a granivore munching happily on an insect for that extra protein. Ruby-throated Hummingbirds not only sip from flowers but pack away quite a few insects, especially when feeding babies. Female birds seek out calcium-rich snails in order to produce strong egg shells.



Looks like this Hairstreak escaped a bird's hungry beak!



Bluebirds enjoy a plump caterpillar.



Dragonflies are protein rich, but catch them quick!



Southern Red Cedar has berries available in the winter.



Green anoles are prey to carnivorous birds.



The grass, Bushy Bluestem, has abundant edible seeds.



Elderberries are enjoyed by birds and humans. The dark berries make delicious syrups and wines.



This Black Swallowtail larva is edible to birds, but it mimics its poisonous cousin, the Pipevine Swallowtail, to deter hungry birds.



Can you find the blackberry bushes that line the Open Wetland habitat?



Red-bellied woodpeckers probe trees for sweet sap and juicy grubs.



Laurel Oaks fill the barren winter months with rich acorns for birds to eat.



An Eastern Tiger Swallowtail is eaten by an omnivorous Cuckoo.

Omnivores

Mainly Insects

American Kestrel
Acadian Flycatcher
Eastern Phoebe
Eastern Kingbird
Eastern Wood-Pewee
Gray Kingbird
Great Crested Flycatcher
Loggerhead Shrike
Barn Swallow
Tree Swallow
Blue-gray Gnatcatcher
Black-and-white Warbler
Common Yellowthroat
Hooded Warbler
Northern Parula
Orange-crowned Warbler
Palm Warbler
Pine Warbler
Prairie Warbler
Prothonotary Warbler
Yellow-rumped Warbler
Yellow-throated Warbler

Insects, Fruit, & Sap

Downy Woodpecker
Northern Flicker
Pileated Woodpecker
Red-bellied Woodpecker
Red-headed Woodpecker
Yellow-bellied Sapsucker

Insects, Fruit, & Seeds

Red-eyed Vireo
White-eyed Vireo
Yellow-throated Vireo
American Robin
Eastern Bluebird
Hermit Thrush
Cedar Waxwing
Summer Tanager
Gray Catbird
Northern Mockingbird
Brown Thrasher
Painted Bunting
Northern Cardinal
Orchard Oriole

Extreme Omnivores

Very Diverse

These birds have big appetites (seeds, fruit, insect, sap, and carrion!), allowing them to live in many different habitats.

Yellow-billed Cuckoo
American Crow
Fish Crow
Common Grackle
Red-winged Blackbird
Laughing Gull
Common Gallinule

Carnivores

Fish, Crustaceans, &

Insects

Belted Kingfisher
Great Blue Heron
Little Blue Heron
Tricolored Heron
Cattle Egret
Great Egret
Snowy Egret
White Ibis

Small Mammals, Birds,

& Herps*

Cooper's Hawk
Red-shouldered Hawk
Red-tailed Hawk
Barred Owl
Eastern Screech Owl

Herps* & Insects

Mississippi Kite
Osprey
Wading Birds

*Herps are reptiles and amphibians.

Scavengers

Carrion

Black Vulture
Turkey Vulture

Granivores

Mainly Seeds & Nuts

Carolina Chickadee
Tufted Titmouse
Brown-headed Nuthatch
Carolina Wren
House Wren
Marsh Wren
Sedge Wren
Winter Wren
Ruby-crowned Kinglet
Mourning Dove
Blue Jay
American Goldfinch
Eastern Towhee
Song Sparrow
Swamp Sparrow
White-throated Sparrow

Nectarivore

Mainly Nectar

Ruby-throated Hummingbird



How many birds can I see?

Vocab Words

- Omnivore
- Carnivore
- Granivore
- Nectarivore
- Scavenger
- Plumage

Discussion Questions:

What adaptations do birds need that allow them to eat different types of food? Think about talons, beaks, size, eyesight, hearing, wing shape, and color.

How do birds' diets change when they are feeding young and why?

Where do all of the birds here live? Do some stay at Cay Creek permanently and others just visit to gather food?

Landscape Plan

Fight Fragmentation

Coastal Wildscapes has partnered with the City of Midway, Georgia to revitalize Cay Creek Wetland Park. Thanks to a Coastal Incentive Grant and help from volunteers and local companies, many plans are underway. Interpretative panels have been added to the boardwalk. Verdant Enterprises, a Savannah landscape architecture firm, has envisioned a masterplan to redesign the park entrance, new parking, and a demonstration native wetland garden.

Plants and animals depend on healthy, connected ecosystems for fruitful and complete lives. Habitat connectivity allows animals to shift to suitable locations if outside pressures force them to move. They need the ability to travel between various habitats and access to native plants to meet all of their survival needs, from feeding to mating.

For example, generations of turtles, frogs and salamanders seek the place of their birth for nesting and egg laying when they are ready to reproduce. If habitats become isolated due to development, these species will perish.

Even sedentary plants depend on habitat connectivity. While fully-grown plants are stationary, seeds and nuts are dispersed across a landscape by wind, water, birds, and mammals. Young plants cannot establish themselves if there is no suitable habitat.

Monarch butterflies working their way north across the North American continent during spring migration will not survive to reproduce without milkweeds for their caterpillars.



Migratory songbirds depend on native berries, seeds, and insects during each leg of their spring and autumn journeys.

Hummingbirds follow the bloom of various flowering species each spring.

Landscape fragmentation is one of the greatest ecological issues of our times. As populations grow- and our appetites for bigger buildings, more malls, and wider roads- once viable habitats are being sliced and diced into tinier and tinier degraded pockets of land. Luckily, preventing the further loss of native habitats is something everyone can do, whether you live in the city or on a farm. Your garden, landscape, or managed piece of property can become a vital link from one natural community, reweaving a broken landscape, even if you live in a developed area. Simply planting native plant species is a small activity with potentially enormous ecological benefits. Our goal is to help you maintain the integrity and continuity of Southern Coastal Plain habitats and natural communities so that everyone, from our children to the live oaks that shade them, can reap the delightful rewards.

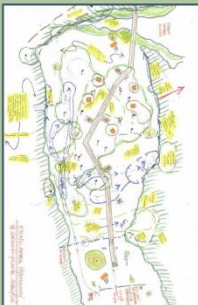
We need to maintain these natural spaces as much for our sake as for the plants and animals who inhabit them.



Preliminary Master Plan



Entrance & Parking Design



Picnic Area
Demonstration Garden



Future Drop-off and
Pavilion Site Design

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Vocab Words

Discussion Questions:

How can planting native plants in your garden benefit wildlife?

Be Our Guest

Over time, many plant and insect species have developed relationships that are mutually beneficial to both parties. Butterflies help flowering plants by pollinating them, and plants help butterflies by serving as host plants for their caterpillars. Some butterfly species depend on a particular host plant, while others, like the Red-banded Hairstreak, can use several different plants.

Adult butterflies are not so picky. They sip the nectar of most flowering plants. They may fly far afield in search of food. Migrating butterflies—such as American Ladies, Monarchs and Cloudless Sulphurs—appreciate plants that flower in the fall. Some butterflies even eat sap and dung! Below are host plants found at Cay Creek and butterflies that lay eggs (oviposit) on them.

Butterflies & their Host Plants

Maritime Forest

Hickory: Red-banded Hairstreak
 Flowering Dogwood: Spring Azure, Eastern Tailed-Blue
 American Holly: Henry's Elfin, Holly Azure
 Black Cherry: Eastern Tiger Swallowtail, Striped Hairstreak
 White Oak: 'Southern' Oak Hairstreak, White-M Hairstreak
 Live Oak: 'Southern' Oak Hairstreak
 Sassafras: Spicebush Swallowtail, Eastern Tiger Swallowtail
 Passionflower: Zebra Longwing, Gulf Fritillary
 American Mistletoe: Great Purple Hairstreak
 Narrowleaf Purple Everlasting: American Lady
 Carolina Wild Petunia: Seminole Crescent, White Peacock
 Pipevine: Pipevine Swallowtail

Pine Flatwoods

Loblolly Pine: Eastern Pine Elfin
 Winged Sumac: Red-banded Hairstreak
 Switchcane: Creole Pearly-eye, Southern Pearly-eye,
 Lace-winged Roadside-Skipper
 Savannah Mallow: Gray Hairstreak
 Hairy Lespedeza: Eastern Tailed-Blue
 Partridge Pea: Cloudless Sulphur, Sleepy Orange
 Yellow Thistle: Little Metalmark
 Toadflax: Common Buckeye

Marsh Hammock & Shrubby Upland Edge

Southern Red Cedar: 'Sweadner's' Juniper Hairstreak
 Wax Myrtle: Red-banded Hairstreak
 Yaupon Holly: Henry's Elfin
 Red Bay: Spicebush Swallowtail

Open Wetland

Bushy Bluestem: Common Wood-Nymph,
 Twin-spot Skipper
 Woolgrass: Dion Skipper
 Monnier's Water-hyssop: White Peacock
 Herbwilliam: Black Swallowtail
 Seashore Mallow: Gray Hairstreak

Tidal Swamp

Sweetbay: Eastern Tiger Swallowtail
 Swamp Bay: Spicebush and Palamedes Swallowtails
 American Elm: Mourning Cloak
 Smallspike False Nettle: Question Mark, Red Admiral
 Spotted Water Hemlock: Black Swallowtail

Brackish Marsh

Big Cordgrass: Broad-winged Skipper, Rare Skipper



Common Buckeye



Henry's Elfin



Holly Azure



Eastern Tiger Swallowtail



Gulf Fritillary



Pipevine Swallowtail



Great Purple Hairstreak



American Lady



Red-banded Hairstreak



Southern Pearly-eye



Lace-winged Roadside-Skipper



Cloudless Sulphur



Zebra Longwing



Twin-spot Skipper



Black Swallowtail



Palamedes Swallowtail



Sleepy Orange



Question Mark



Red Admiral

Discussion Questions:

Vocab Words

- Host plant
- Nectar plant
- Mutually beneficial
- Co-evolution
- Migrating
- Oviposit

What is the life cycle of a butterfly? Why do they eat different plants as caterpillars and butterflies?

How do some butterflies use colorful markings to detract predators? Do others have camouflage?

Why do some butterflies migrate? Where do they spend their summers and winters? In what life stage do they spend the winter?

Do you notice that different butterfly species have different manners of flying? What factors influence how they fly? Think about wing shape and size.

Maritime Forest

A Maritime Forest is literally one that is "near the sea." A healthy forest has a canopy, midstory and understory of native plants. A Maritime Forest canopy may have Live Oak, Red Cedar, Hickory, and Magnolia. The midstory has small trees and shrubs like Sparkleberry, Sweetleaf and Beautyberry. Beneath them is an understory of forbs (herbaceous plants) and grasses.



Many animals need all parts of a forest to live. Oak Hairsteak caterpillars eat Live Oak buds in the canopy and their butterflies drift down to drink nectar on Sparkleberry flowers in the midstory. The butterfly pupae then spend summer and winter in the understory waiting for spring, when the oak buds swell and the flowers bloom.



Live Oak is a classic Maritime Forest species. The strong, curved limbs and rot resistant wood made it desirable for ship building. Timbers cut from Georgia barrier islands were used to construct ships like the USS Constitution, also known as "Old Iron Sides" because cannon balls bounced off the wood. One hundred years later, Live Oak timbers from this coast were shipped north to build the Brooklyn Bridge. Today we value it for beauty, shade and biodiversity.

Flowering Understory Forbs



Oakleaf Fleabane



Skipper on Wood Germander



Spotted Beebalm



Carolina Petunia

Vocab Words

- Maritime
- Canopy
- Midstory
- Understory
- Forbs
- Herbaceous
- Pupae

Discussion Questions:

- Why is structural diversity (canopy, midstory, understory) important? How do different species use these layers?
- What composes the organic matter on the forest floor? How thick is it? Can you tell a difference between it and the Pine forest floor? Can you see various levels of decomposition in the leaf litter?
- Why might the Sparkleberry and Live Oak tend to grow together? How does this benefit the Oak Hairsteak?

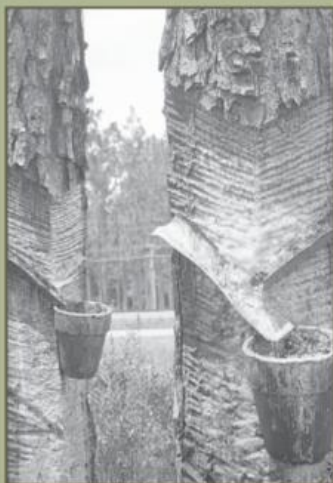
Pine Flatwoods



This row of planted Loblolly Pine trees defines the edge of a remnant Pine Flatwoods ecosystem. Pine Flatwoods exist on the low outer Coastal Plain. They often have very dry soils in the summer and wet soils during the winter and times of heavy rainfall. This upland spot where you now stand drains into a series of freshwater wetland habitats that flow into Cay Creek.



The original flatwoods forest was a mix of Longleaf and Slash Pine on higher ground towering above a carpet of grasses and flowering plants. Moist forested areas supported Pond and Spruce Pines. An abundance of moisture-loving species, such as hibiscus or pitcherplants inhabited sunny, wet bogs and isolated wetlands.



The combination of periodic fire and a high water table created a uniquely open habitat over thousands of years that supports special bird and butterfly species. You may see the very small, yet striking, Little Metalmark butterfly nectaring in low, moist spots. Its caterpillar, however, uses host plants that grow on high, well drained soil. These host plants, Deer's Tongue and Yellow Thistle, also provide nectar for many pollinators.

Sap was collected from Longleaf and Slash pines to produce tar and turpentine which were used to waterproof boats. This industry was called "Naval Stores". The sides of trees were cut to release the sap, forming "catfaces." Herty Pots made of clay were first used to collect the sap.

Fire Ecology

Natural and human-applied fire have shaped the natural communities of Pine Flatwoods. Longleaf and Slash Pines are adapted with thick bark to withstand fire, out competing less fire-resistant hardwoods.



Many grasses and flowering forbs evolved with the combination of fire and alternating wet and dry seasons. Without fire to maintain an open, light filled forest, the high biological diversity will disappear.



Bachman's Sparrow by Giff Beaton

Bachman's Sparrow is one of many bird species that requires an open Pine Flatwoods habitat where it may forage in the grassy understory.

Vocab Words

- Remnant
- Upland
- Bogs
- Naval stores
- Catfaces
- Herty pots
- Human-applied
- Adapted
- Fire-resistant
- Outcompete

Discussion Questions:

- Why do Longleaf and Slash Pines like a different type of soil than Pond and Spruce Pines?
- What is the difference between a Pine Flatwoods and a Pine Plantation?
- What adaptations do some trees have that allow them to withstand fire?
- What are ways other than humans that fires might start?
- What negative and positive effects do fires have on an ecosystem?

Where Creek Meets Tide

Here begins the tale of how freshwater from upland streams makes its way to the salty sea. The interplay between freshwater and saltwater systems is maintained by natural forces. They can be as powerful as the moon and the tides, or subtle as how a grass grows. At Cay Creek, you will encounter a series of freshwater and brackish natural communities that play a role in sustaining the biodiversity and health of Georgia's marine resources.



Sugar cane Plume grass

Salinity is the measure of salt that is dissolved in water. It is measured in parts per thousand (ppt). Drinking water typically has less than 0.05 ppt, while sea water has about 32 ppt salt, and estuaries are anywhere in between.

Cay Creek is connected to upland fresh water sources and the ocean. The salinity of the water along the boardwalk gradually increases as you walk towards tidally influenced Cay Creek.



Salt-marsh Bulrush

Some plants and animals can tolerate a range of salinity while others must have fresh water. They can tell you if water is fresh or salty.

Sugar cane Plume grass grows in freshwater. In the fall, large purple plumes make it easy to spot in the first freshwater wetland you encounter to your right.



Smooth Cordgrass

Salt-marsh Bulrush has the ability to withstand some salt and some fresh water. Because it is so tolerant, it can do well in places where few plants grow.

Smooth Cordgrass is the main grass of our vast salt marsh system. It grows right next to Cay Creek letting us know that saltwater reaches this far inland. This grass grows quite well in fresh water but it thrives in very salty places where no other grass can grow.



Spartina Salt Secretions
photograph by Sandy Richard

Salt & Air

Smooth Cordgrass, also called Spartina, has special glands equipped to secrete salt particles from water. Although its roots are always wet, they do not rot because it has a system of internal tubes to transport air from leaves to roots.

Syzygy & Tides

Syzygy is a Greek word meaning "yoked together," and it describes the alignment of three celestial bodies. We have new and full moons when the sun and moon are lined up with the Earth. From an earthling's perspective, the moon is new when the sun and moon are on the same side of the Earth. A full moon appears when the Earth is between the sun and the moon.



Georgia experiences "semi-diurnal" tides, or two high tides and two low tides every day. Especially high and low tides occur when the moon is new or full. These tides of extreme range are called Spring Tides. Each half-moon brings a Neap Tide, which has a smaller range between high and low tides.

High tides in Georgia can be over 9 feet high! This is a result of the deeply curved coast of Georgia, called the Georgia Bight, and a shallow off-shore Continental Shelf. Together they funnel tremendous tidal energy to the coast of Georgia.



Ebb & Flow?

A falling tide "ebbs"
and a rising tide "flows."

Vocab Words

- Freshwater
- Saltwater
- Salinity
- Communities
- Estuaries
- Tidally influenced
- Salt tolerant
- Tides
- Semi-diurnal
- Spring tide
- Neap tide
- Syzygy
- Georgia Bight
- Continental Shelf

Discussion Questions:

- What natural systems are at play in this landscape?
- How do plant and animal species adapt to daily, monthly, and yearly changes in the environment?
- How have plants adapted to be salt tolerant?
- Can you see the shift in grasses as the water gets more salty?

History and Culture of Cay Creek

The history of Liberty County and the Georgia Coast is a story of how humans and nature interact.

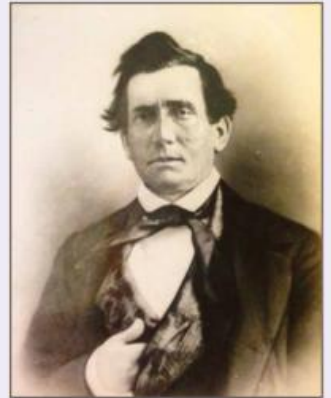
American Indians lived on the coast as long as 11,500 years ago. They traveled the waterways, finding ample sustenance in native animals and plants for food and medicine. The Guale were here when the Spanish began to explore Georgia in the 16th century.

The Spanish and colonists from France, Germany and England introduced exotic species, such as hogs and horses, that continue to adversely 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, indigo and sugar were dominant crops. This area was home to many 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. Tidal fluctuations and river currents created the forces upon which agriculture, fishing and gathering were, and still are, dependent.



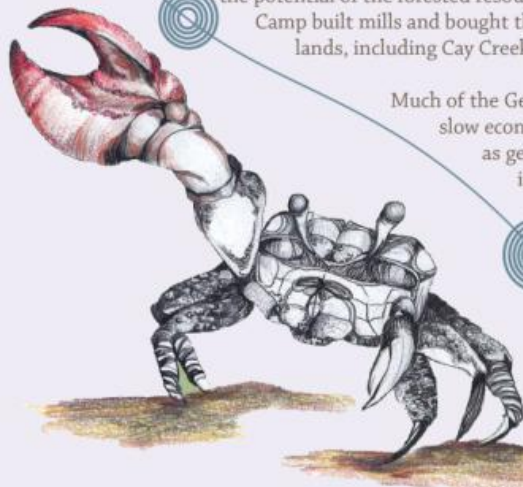
After the American Civil War, the pine tree became a main commercial resource along with shrimping, fishing and oystering. Pine trees were abundant. Their sap was gathered for naval stores and their logs for lumber. The large estuarine system of coastal Georgia supports a myriad of marine life, providing a constant economic base for the region.



Raymond Cay

During the 20th century the paper industry became an economic power. Paper companies, such as Union Camp Corporation, saw the potential of the forested resources in the South. Union Camp built mills and bought thousands of acres of pine lands, including Cay Creek.

Much of the Georgia coast remains undeveloped, due to slow economic growth following the Civil War as well as geography. The shallow continental shelf and inward curve of the coast create the Georgia Bight and land that is suitable for growing few crops other than rice and pines. 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 our coast.



Vocab Words

- Sustenance
- Guale Indians
- Exotic species
- Commercial resource
- Geography
- Conservation
- Recreation
- Tourism

Discussion Questions:

- How can conservation, recreation, and tourism combine to achieve the goals of each?
- What resources were used by the people who have inhabited this area and how can their impact be seen today?
- What does a sense of place teach us about environmental stewardship?

Cay Creek Plant Communities

The lists and photographs below describe many of the plants found in each habitat at Cay Creek.

- Forbs are herbaceous perennial plants that do not have woody stems. Forb is synonymous with the term "herb."
- "Grasses" refer to any grass or grass-like plant, including sedges and rushes. Remember: "Sedges have edges; rushes are round; grasses are hollow right up from the ground."
- Also- Spanish Moss is neither Spanish nor a moss! It is a Bromeliad related to the pineapple and is native to this region!

Upland Maritime Forest

TREE
Southern Magnolia- *Magnolia grandiflora*
SHRUB
Witchhazel- *Hamamelis virginiana*
VINE
Summer Grape- *Vitis aestivalis*
FERN
Resurrection fern- *Polypeltis polypodioides*
FORB
Caldicraft fleabane- *Erigeron quercifolius*
Coral Bean- *Erythrina herbacea*
Spotted Beebalm- *Monarda punctata*
Carolina phlox- *Phlox carolina*
Lyreleaf sage- *Salvia lyrata*
Wood Germander- *Teucrium canadense*
Spanish moss- *Tillandsia usneoides*



Coral Bean Summer Grape Resurrection Fern Southern Magnolia Carolina Phlox

Upland Pine Flatwoods

TREE
Slash Pine- *Pinus elliottii*
Loblolly Pine- *Pinus taeda*
SHRUB
Winged Sumac- *Rhus copallinum*
VINE
Cross Vine- *Bignonia capreolata*
FORB
Maryland Golden Aster- *Chrysopsis mariana*
Woolly Ragwort- *Packera ionactina*
Blackeyed Susan- *Rudbeckia hirta*
Helmet flower- *Scutellaria integrifolia*



Winged Sumac Helmet Flower Woolly Ragwort Loblolly Pine Maryland Golden Aster

Open Wetland

SHRUB
Virginia Sweetpire- *Itea virginica*
VINE
Groundnut- *Aptos americana*
FORB
Bonaset- *Eupatorium leucolepis*
Floating Marshpenwort- *Hydrocotyle ranunculoides*
Seashore Mallow- *Kosteletzkya virginica*
Anglsten Primrose- *Ludwigia leptocarpa*
Pickersweed- *Pontederica cordata*
Lizard's Tail- *Saururus cernuus*
Bladderwort- *Utricularia* sp.
GRASS
Swamp Flatsedge- *Cyperus distinctus*
Common Rush- *Juncus effusus*
Sugarcane Plumegrass- *Saccharum giganteum*



Seashore Mallow American Wisteria Anglsten Primrose Herbwilliam Swamp Flatsedge

Freshwater Tidal Swamp

TREE
Red Maple- *Acer rubrum*
Bald Cypress- *Taxodium distichum*
SHRUB
Dwarf Palmetto- *Sabal minor*
Southern Swamp Dogwood- *Cornus stricta*
VINE
Climbing Aster- *Ampelaster carolinianus*
Climbing Hydrangea- *Decumaria barbara*
FERN
Sensitive fern- *Onoclea sensibilis*
Royal Fern- *Osmunda regalis*
Netted Chainfern- *Woodwardia areolata*
FORB
Southern Blue Flag- *Iris virginica*
Blacksage Arrowhead- *Sagittaria lancifolia*
MOSS
Sphagnum Moss- *Sphagnum* sp.



Dwarf Palmetto Red Maple Climbing Hydrangea Royal Fern Southern Blue Flag

Marsh Hammocks and Shrubby Upland Edge

TREE
Dahoon Holly- *Ilex caxinae*
Southern Red Cedar- *Juniperus virginiana silicicola*
Cabbage Palm- *Sabal palmetto*
SHRUB
Wax Myrtle- *Morella cerifera*
FORB
Hammock Snakeroot- *Ageratina pumida*
Marsh Elder- *Iva frutescens*



Wax Myrtle Hammock Snakeroot Dahoon Holly Southern Red Cedar Cabbage Palmetto

Brackish Tidal Marsh

SHRUB
Groundsel Bush- *Baccharis halimifolia*
FORB
Sweet-scent- *Pluchea odorata*
Seaside Goldenrod- *Solidago sempervirens*
GRASS
Salt Marsh Bulrush- *Bolboschoenus robustus*
Black Needle Rush- *Juncus roemerianus*
Smooth Cordgrass- *Spartina alterniflora*
Big Cordgrass- *Spartina cynosuroides*
Saltmeadow Cordgrass- *Spartina patens*



Seaside Goldenrod Sweet-scent Salt-marsh Bulrush Black Needle Rush Big Cordgrass

Vocab words

- Grasses
- Sedges
- Rushes
- Native plants

Discussion Questions:

Why do plants often live in association with other plant species, aka "communities"?

What are characteristics of each habitat type that determine which plants are suitable for growing there?

When do these plants flower, fruit, and complete any other phenological (life cycle) stages?

Benign Bugs

Many people are afraid of bugs, and their natural inclination is to run from or swat at them. Although we may not want them crawling on our skin, insects and arachnids are fundamental contributors to a balanced, healthy world. If all the insects in the world disappeared over night, our world would unravel. Insects are predators and prey, engineers and decomposers, pollinators and honey makers.



Cicadas live underground as juveniles and feed on roots. After a long life in the dark—up to seventeen years!—they emerge, shedding their exoskeletons in the process of becoming adults. They climb upwards, their loud, mesmerizing calls hearkening mates from tree to tree.



Dragonflies also experience a change of scenery as they grow up. After eggs hatch in or near freshwater pools, they become wingless nymphs that use jet propulsion to travel through the water. Finally, they become air cruising, gnat eating dragonflies.



This brightly colored dancer is actually a grasshopper! Many people do not realize that grasshoppers have wings to help "hop" and fly.

Pollen is necessary for flowering plants to make fruit and seeds. Though some pollen is carried by wind, many plants depend on insects to transport it from one plant to another.

When an insect visits a flower looking for nectar or pollen to eat, the architecture of the plant is such that the pollen-bearing stamens brush up against the insect.

The pollen sticks to the insects feet or body. If all goes well, the pollen rubs off on the ovaries of the next flower, fertilizing that plant.

The Golden Orb Weaver, also known as a Banana Spider, can be found around swampy areas on the coast where there are plenty of flying insects. Females spin webs that are six times stronger than steel relative to their thickness! The Latin name, *Nephila clavipes* describes them as a hook-footed creature that love to spin webs. Male Orb Weavers are much smaller than females.



A dewdrop Spider sneaks in to nab an Orb Weaver's prey. Dewdrop spiders live on the outside of the Orb Weavers webs and practice kleptoparasitism. They steal prey caught in the larger spider's strong silky web and eat it for themselves. The genus name, *Argyrodes*, means "silver-like" in Latin.



Imperial Moth

The Imperial Moth lays its eggs on Bald Cypress, among other plants. It is a member of the family Saturniidae and is related to the mint green Luna Moth.

Luna Moths lay their eggs on Sweetgums but may hang their cocoons on other plants.



Luna Moth Cocoon



The taxonomic order of dragonflies and damselflies, Odonata, comes from the Greek word meaning "toothed". Odonates are adaptable and adventurous; you can easily find them darting throughout Cay Creek's freshwater and brackish environments.

Odonates keep mosquito and other insect populations in check by eating them. Dragonflies and damselflies, in turn, serve as protein-rich food for larger animals, like birds and frogs.

Skimmers are a type of dragonfly that have touching eyes. They are abundant at Cay Creek.

Skimmers vary widely in size and color. Many skimmers enjoy flaunting their flashy colors as they poshly pose on public perches, using emergent vines, dead twigs, or tips of sedges and rushes. Skimmers can be highly territorial. They use these perches to defend their space and patrol for available mates and prey. These acrobatic flyers eat many a mosquito and gnat at Cay Creek.

Vocab words

- Insect
- Arachnid
- Predators
- Prey
- Decomposers
- Pollinators
- Juvenile
- Exoskeleton
- Nymphs
- Flowering plants
- Stamens
- Ovaries
- Fertilizing
- Kleptoparasitism
- Cocoons
- Emergent

Discussion Questions:

What ecosystem services do insects provide in the food web and as pollinators? What would happen to the Earth if there were suddenly no insects?

How do plants and insects co-evolve to suit each other's needs? What are some examples?

An Edible Landscape



Beautiful Savory Swimmer

The blue crab has long been revered for its delicious meat. Its Latin name, *Callinectes sapidus*, translates to "beautiful, savory swimmer." Blue crabbing is a popular business and hobby in Georgia. It is the second largest fishery, behind shrimping, in the state.



Crab shells are made of many thin layers of calcium and protein. Cooking breaks down proteins of the outside blue layer, exposing a red layer below. Local people used a plant native to Cay Creek to season their crab boils before commercial spice mixes were available. Red Bay is common in maritime forests and on marsh hammocks. Red Bay leaves make steamed blue crab a truly delectable dish.



Vegetable Proteins: Groundnut Beans & Hickory Nuts



The Georgia Coast conjures up images of beaches and sea turtles, expanses of salt marsh, sleek-backed dolphins, and lots of seafood to enjoy- from Georgia White Shrimp to Blue Crabs and Sea Trout.

American Indians used many natural resources to please their palates, from catching fish to gathering edible plants like hickory nuts and Groundnuts. Hickory nuts were boiled to separate shells from meat and valuable oil. Groundnut is a relative of the peanut. Its beans and roots are edible.



Groundnut

In 1583, John White traveled from England to document the natural resources of the Southeast and Indian culture. His illustrations show how early people enjoyed the coastal harvest as much as we do today.



The boardwalk at Cay Creek gives us easy access to wetlands that link land to ocean and food to our table.



Rice flourishes when it is periodically covered with fresh water and then drained. Colonial era rice cultivation took advantage of the dynamic push and pull of tides against fresh water to achieve the right growing conditions. You can see the remnants of rice cultivation at Cay Creek. Long, mounded ridges are visible all along the boardwalk. They are likely the remains of dikes and dams from old rice fields.

Bobolinks (above from A. Wilson) nest in the tall grasses of northern prairies. They migrate in large flocks to South America each fall, following wetlands. They arrive on our coast just as rice and native grasses ripen. Alexander Wilson called them Ricebirds in his book *American Ornithology* (1808 - 1814).

Vocab Words

- Rice cultivation
- Dikes
- Crustacean

Discussion Questions:

What are some edible plants you know that grow wild in this area?

What are some poisonous plants that grow wild in this area?

Open Wetland



Virginia Sweetspire

This open, sunny expanse is a great area to view birds, butterflies, dragonflies, stealthy snakes, and even occasional otters.

This habitat provides food for animals that feast on a variety of edibles—from berries to flower nectar, green leafy vegetation to roots, nuts to detritus (a fancy name for dead leaves and other matter), and fishes to gnats. Hungry yet? Nature provides bounty for all!

Many moisture loving plants grow here. A few are seen below. How many different plants can you spy?



Blue Dasher Dragonfly & Pickerelweed



Woolgrass Buds



Swamp Flatsedge



Possumhaw Viburnum



Elderberry Bloom



Anglestem Primrose



Seashore Mallow

Some of the higher places you see are old rice dikes. They still block the flow of water from tidal pulses, capture rainwater, and also water that seeps through the soil from higher ground. All of the water collects here in this wetland depression.

Vocab words

- Moisture loving
- Detritis
- Wetland depression
- Rainwater
- Tidal pulses
- Rice dike
- seep

Discussion Questions:

How does the presence of water shape this ecosystem? Think about the characteristics of plants here.

Can you see the mounded higher places where rice dikes once stood? How has that slight rise changed this ecosystem? What does this tell us about a human's impact on the environment?

Find the Flora and Fauna



1. Wild Groundnut
2. Painted Bunting (female)
3. Sparkleberry
4. Golden Orb Weavers
5. Common Buckeye
6. Virginia Sweetspire
7. Barred Owl
8. Southern Toad
9. Possumhaw Viburnum
10. Broad-headed Skink
11. River Otters
12. Netted Chainfern
13. Green Anole
14. Bulltongue Arrowhead
15. Queen Caterpillar



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Discussion Questions:

How many of these common names have you heard of? How many do you recognize? Do you call these animals and plants by any other name?

Freshwater Tidal Swamps



Bald Cypress Buttress



Trumpet Vine



Cypress Knees



Understory Fern



Southern Swamp Dogwood



Leopard Frog Pollywog



Leopard Frog



Virginia Sweetspire

This forested wetland is a Freshwater Tidal Swamp. Freshwater flows from here into Cay Creek and beyond to the brackish estuary. Twice daily, high tides push the fresh water back into the Tidal Swamp. Amazingly, even though the ocean's tides play a role in keeping this swamp wet, the salinity stays very low (<0.5 ppt).

Plants and animals here are adapted to constant wetness and fluctuating water levels. The dominant canopy trees are Bald Cypress and Water Tupelo. Trees growing in this soggy soil develop swollen bases, called buttresses, for stabilization. Bald Cypress also has domed root extensions, called knees, popping out of the water. Can you see them?

The midstory is decorated with flowering and fruit producing shrubs, such as Southern Swamp Dogwood and Virginia Sweetspire. Trumpet Vines weave their way up these shrubs, adding another food source for birds and insects.

Ferns use spores instead of seeds to reproduce. Wind and water disperse the spores. Look between the rich green tufts of ferns and glowing patches of Iris for Leopard Frogs. They depend on this watery habitat for every stage of their life, from juvenile pollywog to adult frog.



Fiddleheads are tightly curled new fronds. They have this shape because the lower surface of the frond grows faster than the upper surface. Many ferns have edible fiddleheads!

Swamp Glimmers

Light glimmers and glows in the shadowy world of the swamp. Sunlight reflects off the water, the backs of Ibis, and the brilliant breast of Swamp Canaries. Swaths of Iris and Sweetspire catch a ray of light to dazzle us with each returning spring.

Dense vegetation can make Ibis hard to see, but look for them "probing" the water for slow-moving snacks, like snails and crabs. Fluctuating water levels provide a ready source of food.



Ibis (by Giff Beaton)



Swamp Canary (by Giff Beaton)

The bright Swamp Canary (Prothonotary Warbler) builds its nest over water. Males will pack moss into several tree cavities and invite a female to pick her favorite for a home.



Lace-winged Roadside-Skipper

Yellow landing strips gleam from the throats of Virginia Iris. Insects, like this Lace-winged Roadside-Skipper, use them to navigate towards nectar.

Vocab words

- Buttresses
- Cypress knees
- Spores
- Seeds
- Fiddleheads
- Fronds
- Vegetation
- Cavities
- Edible

Discussion Questions:

- What different levels of the forest can you see in the swamp?
- How do the plants here cope with the saturated soil conditions?
- Do you see any hidden or camouflaged animals here?

Open Canopy

Storm events, the fall of an ancient tree, constant standing water, or human hands can open a forest canopy. Sunny openings bring life to a forest. Plants may wait patiently in the shade until they find themselves in a gap of light. Suddenly, they burst into bloom and fruit.

Skinks, turtles and snakes, all cold-blooded reptiles, bask in the sun to increase their metabolism and stimulate enzymes that digest food.



A Yellow-bellied Slider is ready to slide into the water if alarmed.



Basking Broadheaded Skink



Common Box Turtle - the red eyes tell us it is male.



Exotic-invasive plants also take advantage of canopy openings. Japanese Honeysuckle is rampant in this spot, and is strangling our Climbing Aster along with other native plants.

Beautiful to see, this native Water Hemlock is very toxic. It is related to the poison hemlock Socrates drank.



The Climbing Aster and Saltmarsh Aster tell us where the water transitions from fresh to salty. Climbing Asters bloom at the edges of this open, sunny place in the Freshwater Tidal Swamp.

Saltmarsh Aster tolerates saltier water. Look for them among marsh grasses as you walk towards the tidal creek.



Both asters bloom in the fall.

Many people confuse harmless Banded Watersnakes with venomous Cottonmouths. Each snake species has its place in nature, so it is best to leave all of them alone when we visit their home.



Like other non-venomous snakes, the eyes of Banded Watersnakes have round pupils.



Venomous vipers, such as Cottonmouths, have vertical pupils.

*Herp photos by Dirk Stevenson

Vocab words

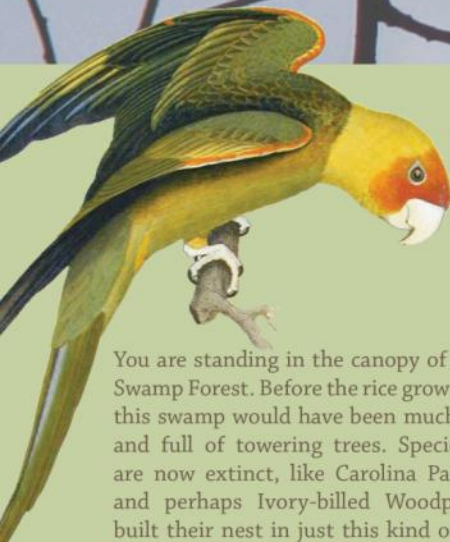
- Storm events
- Cold-blooded
- Reptiles
- Bask
- Metabolism
- Enzymes
- Digest
- Toxic
- Transition
- Exotic-invasive
- Venomous
- Poisonous

Discussion Questions:

What does the location of the saltmarsh aster compared to the climbing aster indicate about salinity levels here?

How are exotic-invasive species sometimes harmful to native ones?

Canopy Voices



You are standing in the canopy of a Tidal Swamp Forest. Before the rice growing era, this swamp would have been much larger and full of towering trees. Species that are now extinct, like Carolina Parakeets and perhaps Ivory-billed Woodpeckers, built their nest in just this kind of place. Huge trees afforded cavities for nesting and nearby, open Pine Flatwoods provided plentiful food.

Although this is a young forest returning to its wilderness heart, it already has a diverse suite of birds, reptiles, amphibians, insects and mammals- telling us it functions as a rich, productive habitat.

Here is a good place for quiet thought and awe- a place to contemplate our impact on the gift of this beautiful earth and celebrate a bounty of frog calls and owl voices.



Barking Treefrog (by Mark Wallace)



Southern Cricket Frog (by John Jensen)



Green Treefrog (by Kevin Stohlgren)



Cope's Gray Treefrog (by Dirk Stevenson)

Georgia has 31 species of frogs. Almost half (15) are in the treefrog family (*Hylidae*). Sticky pads on the ends of their toes and an extra joint help them climb trees and hold on to small twigs. Many Treefrogs have vocal sacs to amplify the sound of their call.



Squirrel Treefrog (by Walter Knapp)

Squirrel Treefrogs are very small: 1 to 1.5 inches. Their call is fast (2 times per second!), duck-like *waaak* or *quank*. They are nocturnal but you may hear them on a rainy, summer day.

Barking Treefrogs are the largest treefrog in this region, reaching 2.7 inches. Choruses of males call out *doonk* or *boonk* every 1 or 2 seconds while floating on water.

Southern Cricket Frogs call out with a series of raspy clicks, as when two sharp rocks are struck together- *gick-gick-gick*. They may call from water's edge or floating on a water-lily pad. This is a very small frog that barely grows beyond an inch.

Green Treefrogs are sleek but can grow up to 2.5 inches. They call from plants and send out a relentless, ear-splitting *queenk*, *queenk*, *queenk* about 80 times a minute.

Cope's Gray Treefrog looks like a bit of lichen on the bark of a tree. They spend most of the year high in the forest canopy but sing by the water when courting.



"Who Cooks for You-oooo?"

Often heard before seen, owls add mystery and atmosphere to any forest. Fascinating Facts:

- Owls can rotate their heads 3/4 of the way around.
- Owl feathers act as camouflage and are very soft, making them soundless flyers. This adds an element of surprise when attacking prey.
- Owls have exceptional hearing and use their ears to hunt. Once potential prey is located, they fly in a soundless and straight trajectory with open talons.
- It takes 28 pounds of pressure to pry open the talons of a Great Horned Owl.
- Owls are farsighted. They have exceptional long-distance vision but use sound for closing a deal.



Eastern Screech Owls make a terrifying sound despite their small size. They eat many insects, like moths, as well as small mammals.



Barred Owls hoot the well-known song- "Who cooks for you?" Its is named for the brown and white vertical stripes- bars- on the chest. Mating couples perform a riotous duet, sounding like a band of monkeys.



The Great Horned Owl is named for its ear like tufts. This fierce predator will bring down animals larger than itself. Listen for 'hoo-h'HOO-hoo-hoo.'

Vocab words

- Nocturnal
- Lichen
- Nesting
- Bark
- Mammals
- Camouflage
- Amphibians
- Ear-like tufts

Discussion Questions:

- How many different ecosystems can you see from the top of the viewing platform?
- Why do some animals live higher up and some live down below? Why do some animals (like a cicada or a treefrog) travel up and down the trees during different life stages?
- What adaptations do treefrogs and owls have that allow them to survive?
- What are some reasons why the Carolina Parakeet and the Ivory-billed Woodpecker are extinct?

Ecosystem Engineers



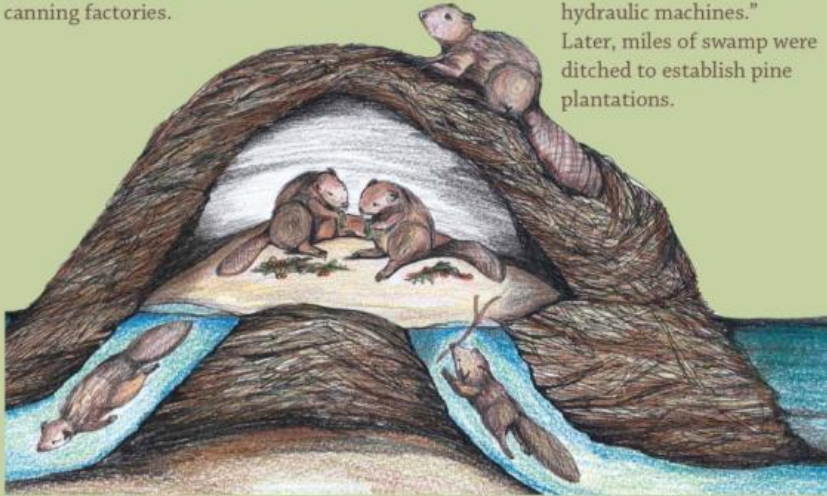
Blackwater Tannins

The natural water flow of surface water in coastal Georgia has been engineered with ditches, dikes and canals for as long as people have lived here. Early inhabitants blocked small freshwater streams with oyster shell to create pools free of saltwater, farmers dug ditches to drain land for crops, and canals were dug from creek to creek to quickly transport oysters to canning factories.

Starting in the 1700s, the onset of large scale agriculture for rice production resulted in large scale changes to the landscape. Rice fields have been referred to as "massive hydraulic machines." Later, miles of swamp were ditched to establish pine plantations.

The water that meanders along this boardwalk comes from a Tidal Swamp that drains into Cay Creek. Tannins leached from roots, fallen leaves and other organic matter give these languid waters their chocolatey color.

Tannins are compounds in plants that are used for defense against pests by making the plant tissue bitter and difficult to digest. Humans use tannins to make leather and stain wood. Bald Cypress is renowned for its high tannic content. The tannins make Bald Cypress wood very rot-resistant.



Humans are not the only animals that alter the natural environment. Beavers have obeyed their instincts and built dams on Cay Creek, the largest of which can be seen to your left. The impoundments constructed by these water-loving mammals create unique freshwater pools in the tidal marsh. American Indians called beavers the "sacred center" of the land because they add diversity to the landscape by creating habitats for plants and animals that prefer still, low salinity water.



Tannin contributes to the dazzling displays of deciduous foliage in the autumn. Their pigments contribute to leaf color through a chemical process. The warm browns and deep yellows that accent the fall landscape are a result of tannic activity.

Beaver Fun Facts:

- Beavers slap their tails on the water to alert others when they sense danger.
- Beavers gnaw on hard things to keep their teeth from growing into their chin. Their teeth never stop growing!
- Water-lily roots are their favorite food.
- Beavers have webbed hind feet.
- They are the largest rodent in North America and are related to squirrels.



Vocab words

- Canals
- Meander
- Tannins
- Organic matter
- Languid
- Plant tissue
- Pests
- Rot-resistant
- Rodent

Discussion Questions:

- How are beavers both a benefit and a detriment to native ecosystems?
- What are some changes you observe in the plant species and structure here?

Hammock Havens

The hammocks at Cay Creek Wetland Park are slightly elevated pieces of land surrounded by marsh. Hammocks occur in the large salt marsh system between the mainland and barrier islands but also in small wetlands like these at Cay Creek.

Hammocks are islands bursting with diversity in a grassy sea. They play an important role in creating an edge, which is a space where two habitats meet. Plant and animal species richness is higher in these dynamic transition areas.

Common hammock species include hearty Wax Myrtle, Red Bay, and Southern Red Cedar. They provide food and refuge for many birds- such as Cardinals, Carolina Wrens, and the colorful Painted Bunting- and for migrating Monarch Butterflies.



American Indians left large deposits of shell on some of the hammocks. These deposits are called middens. Hammocks with middens have soils with high calcium content due to the decaying shell. Plants that grow here are called “calciophytes” because they prefer calcium-rich soils. Southern Red Cedar is a common calciophyte.

Seeds dispersed by wind or bird droppings create the forests that now grow on these hammocks.



Monarch on Red Cedar



Swamp Bay Berries



Wax Myrtle Berries



Red Cedar Roots & Shell

Songs, Snags & Sea Level Rise

Many trees at the marsh edge die because of salt water overwash. What is left are standing dead trees, called snags. Because of changes like sea level rise, trees that once had access to fresh water are surrounded by salty marsh. Polar ice caps are melting due to our warming climate as our coast loses ground.

Nothing goes to waste in nature. Birds use these standing dead trees as lookout perches. This Egret ponders climate change from his loft.



It is a magical thing to hear the song of the Painted Bunting. They depend on marsh edges with lots of native vegetation. Hammocks provide cover from predators and near-by access to plenty of insects in the marsh.



Male Painted Bunting by Giff Beaton

A group of Painted Buntings is called a “mural” because of their colorful plumage.

Vocab words

- Hammock
- Dynamic
- Refuge
- Middens
- calciophytes

Discussion Questions:

How are beavers both a benefit and a detriment to native ecosystems?

What are some changes you observe in the plant species and structure here?

Brackish Marsh Species



Great Egrets & Graminoids

Tidal marsh channels like those flowing into Cay Creek are ideal hunting grounds for wading birds. Tall grasses, rushes and sedges (graminoids) at the marsh edge shade and shelter the water, eliminating the reflection and ripples that may obscure the vision of these long-legged hunters.

One of the most striking wading birds is the Great Egret. Male and female birds are nearly identical in appearance. These pure white birds stand 3 feet high with a wing span of more than 5 feet.

Their plumage changes during breeding season to become beautifully ornate. These long, delicate feathers called "aigrettes," were once coveted to make fashionable plumes for hats. Hunting for hats brought Egrets and other wading birds to the edge of extinction. Wading birds nest together in large colonies called rookeries, where they were easy targets.

Great Egrets are skilled hunters. Their skulls have indentations on each side that allow them to see down the length of their beak to a focal point in the water. They spear small animals, like frogs and fish, with their beak and gulp them down whole and head first.

To the right are some graminoids you can see from here. The Green Treefrog hunts in the marsh for prey, like small insects, and seeks shelter from hungry wading birds on grass stalks.



Big Cordgrass in bloom



Treefrog hiding in Big Cordgrass stalk



Salt-marsh Bulrush



Smooth Cordgrass

Vocab words

- Reflection
- Wading bird
- Breeding season
- Aigrettes
- Extinction
- Rookeries
- Focal point
- Graminoids
- Shelter

Discussion Questions:

What adaptations do Great Egrets have that make them skillful hunters?

How many different grasses can you see from here?

Tidal Travels

Soft-shell Shelter

Cay Creek is part of a tidally influenced waterway. Coastal waterways have provided food and transportation to humans and other animals for thousands of years. They are a nursery for many seafood species escaping the danger of the open ocean. Rich in nutrients and fortified with plants for protection, the creek is great habitat for young fish, shrimp and molting crabs.



Long years ago, the easiest way to get around was by boat. American Indians made canoes from Cypress trees because the wood is rot-resistant. They built small fires to burn out the inside of logs and scraped them hollow. Kayak and canoes may not be made from Cypress these days but they are still a great way to travel the creeks.

The shallow waters of the Georgia Bight and abundant fresh water from creeks like this one, create excellent shrimp habitat.

White Shrimp is one of Georgia's valuable resources. They spawn from May to September when ocean temperatures rise. One female might lay up to a million eggs that will descend to the ocean floor. Tides and currents carry larvae inland to brackish marsh systems.

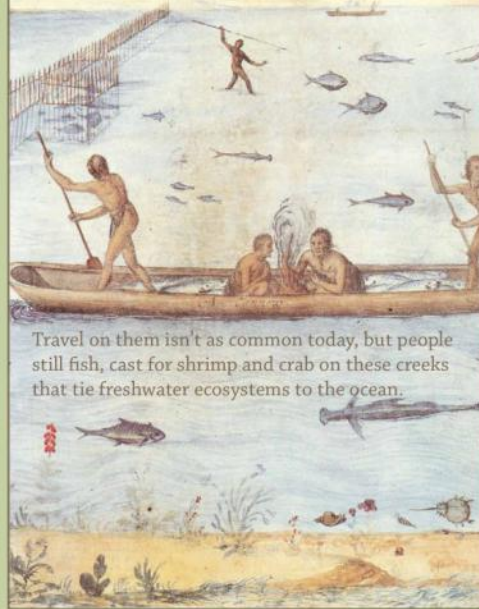


Swallow-tailed Kite by James Holland

Swallow-tailed Kites use blackwater tidal rivers like fast food places. They do not stop to eat, as you can see in Audubon's painting to the left. They eat while flying, wasting not a moment before diving down for the next morsel.

Swallow-tailed Kites skim the water surface, plucking off dragonflies and water bugs with their talons. They hunt the tops of trees for small snakes, lizards and insects.

These beautiful birds almost became extinct from loss of floodplain nesting habitats. The conservation of riverine forests has stabilized their population and brought them back to southeastern rivers.



Travel on them isn't as common today, but people still fish, cast for shrimp and crab on these creeks that tie freshwater ecosystems to the ocean.



Georgia White Shrimp

Crabs start their life cycle as larvae in the ocean. Their larvae use tides to move into less salty marsh waters where they find more shelter and fewer predators.

Adult male and female crabs tolerate both fresh water and ocean water. However, females prefer deeper, saltier waters while males remain in brackish, estuarine areas. Females join the males in brackish tidal creeks when it is time to molt and breed.



Blue Crab

The soft-shell season is traditionally marked with the first full moon in May. Blue crabs molt, shedding their hard shells for a soft ones to accommodate their larger size. It takes from one to three hours for a crab to shed its old shell. Marketable soft-shell crabs must be harvested quickly before they shells harden.

Discussion Questions:

- How might tides and yearly cycles affect the location of a blue crab or white shrimp?
- How might land conservation help Swallow-tailed Kite populations to grow?

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.
- Calciphytes:** 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 or 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.