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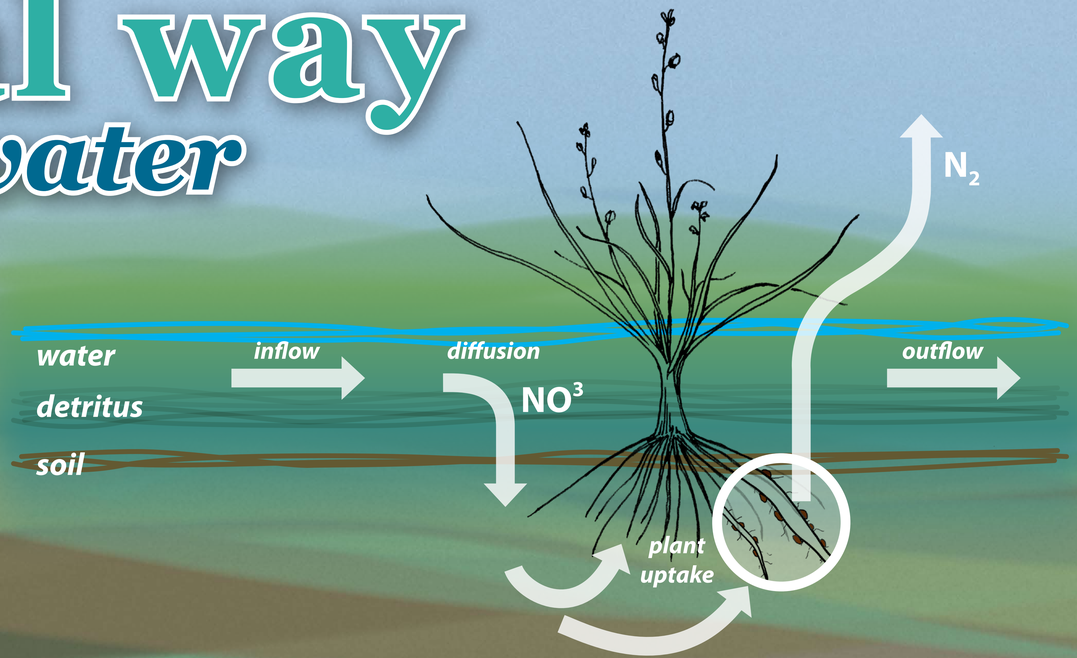
a natural way to treat water

How do natural wetlands treat water?

You are now standing in the Enhancement Wetland—an emergent marsh that is actively removing nutrients and pollutants. The plants of emergent marshes are particularly adept at removing nitrate-nitrogen, a nutrient that flows from wastewater treatment operations, septic tanks, and fertilizer.

Marsh plants support bacteria necessary for "denitrification" or the conversion of nitrate-nitrogen to nitrogen gas—a harmless gas that escapes from the wetland to the atmosphere.



Why are enhancement wetlands so cost-effective at cleaning water and improving water quality?

Unlike conventional wastewater treatment technologies, enhancement wetlands use free sunlight and water to power treatment. Incoming solar radiation and ample water combine to create high plant productivity (organic carbon). There is no costly fossil fuel energy or chemical inputs required!

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life with wet feet

Alligators have acquired many adaptations that allow them to live and feed in the water… and to be the dominant predator in their environment.

Alligators can hold their breath under water for almost an hour! When it is cold and they are inactive, they can hold their breath even longer.

How might this help them capture their prey?

Alligators' eyes, ears, and nostrils are on the top of their head. Their eyes have a transparent third eyelid.

How are these adaptations useful under water?

What other adaptations do alligators have to help them survive in these wetlands?

Birds that live and feed in wetlands have acquired their own unique adaptations.

Wading birds

The American white ibis uses its long beak to probe for crawdads and other creatures in shallow water. Egrets and herons wait patiently in shallow water for fish and amphibians and then grab their prey using their long necks and sharp pointed bills.

photographs by Dominic Martino

Birds of prey

Ospreys and bald eagles have keen eyes and sharp talons, allowing them to spot fish from high in the air and then swoop down and grab their prey with their talons.

What types of wetland adaptations can you see in birds' bodies and their behaviors?

Swimming birds

Birds such as anhingas and cormorants swim underwater and stab or grab fish with their bill. Like alligators, they have a third eyelid that opens and closes horizontally and helps them see underwater.

photograph by Claudio Dias Timm

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+2 upland

0

littoral

-2

-4

-6 emergent

-8

-10

Cabbage palm
Sabal palmetto

Crinum lily
Crinum americanum

Red root
Lachnanthes caroliniana

Blue flag iris
Iris versicolor

Maiden cane
Panicum hemitomon

Cattail
Typha sp.

Pickerelweed
Pontederia cordata

American lotus
Nelumbo lutea

How deep is the water today?

a few inches makes a difference

How do plants take up oxygen and breathe when their roots and stems are covered with water?

They have airspaces galore. *Many aquatic plants have air-filled cavities in the leaves and stems that facilitate uptake and translocation of oxygen throughout the plant.*

They harness the wind. *The tall, narrow leaves of many emergent plants are exposed to the wind. Just like the cooling effect when you sweat, wind blows across the leaves and helps pull air and water up and through the plant.*

They float. *Floating plants, such as water lilies, have air spaces throughout their tissue to help keep their leaves afloat, allowing them to take up oxygen and sunlight.*

The plants at work in this wetland are adapted to an aquatic lifestyle, *but they are still very sensitive to the depth of the water.* Water in this wetland is controlled at an average depth of 8–12 inches to favor the wetland plants you see. Deeper water would suffocate plants. With less water, upland plants would encroach and displace the wetland plants.

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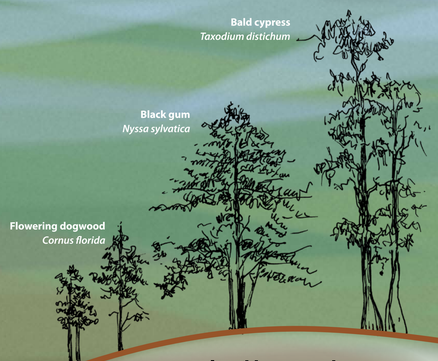
life in a hammock

photograph by
Dominic Martino



Why are there trees in the enhancement wetlands?

The tree hammock island was specifically designed to provide greater habitat diversity for the wildlife that lives in and around this wetland. Trees adapted to wet soils, such as bald cypress, flatwoods plum, and flowering dogwood, occur on the tree islands, providing vertical structure and habitat so important to birds and other animals.

Dead trees in the form of snags also provide structure for habitat, both standing and once they have fallen.

You might see some familiar species that use both the wet and the dry areas—look carefully for alligators resting on the island and for birds that are foraging for food in the trees—and you might see some new species that live only in the hammock.

upland hammock

Cabbage palm
Sabal palmetto

Dog fennel
Eupatorium capillifolium

Marsh fern
Thelypteris palustris

emergent marsh

deep pool

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in deep water

Living in the deep

In addition to providing a very important water purification function, the deep water zone adds habitat diversity to the wetland ecosystem. This zone is home to a very different suite of animals than the emergent wetland.

Few plants can grow in deep water, but coontail and water naiad thrive as long as there is light.

Look for cormorants and anhingas that swim underwater to catch fish, for ducks, pied-billed grebes, and turtles that dive or dabble underwater in search of food, for fish that may reveal themselves at the surface of the water, and for the omnipresent alligator who is stealthily looking for its next meal.

Release and nourish

After multiple levels of cleansing, the stormwater and wastewater pollutants have been reduced to harmless concentrations. Now, clean water flows onto Paynes Prairie in a sheetflow manner and rehydrates more than 1,300 acres of marsh that were previously altered. The prairie plants and animals benefit from this renewed water source, along with the Floridan Aquifer.

emergent marsh

deep pool

emergent marsh

Paynes Prairie

Water lily
Nymphea odorata

Water naiad
Najas guadalupensis

Coontail
Ceratophyllum demersum

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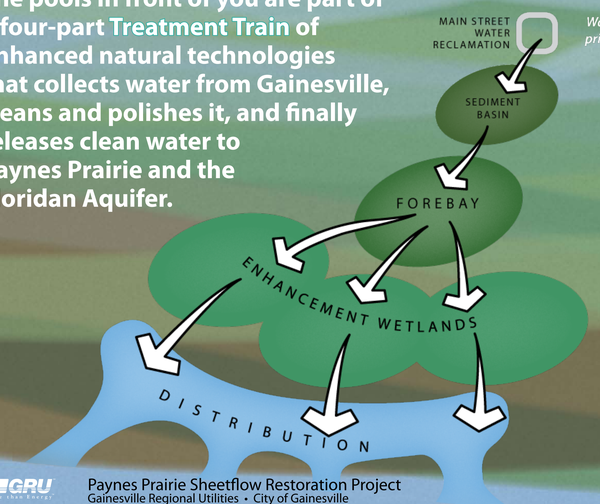
collect, clean, polish, release

The pools in front of you are part of a four-part Treatment Train of enhanced natural technologies that collects water from Gainesville, cleans and polishes it, and finally releases clean water to Paynes Prairie and the Floridan Aquifer.



1 *Water collection and primary treatment in Gainesville*

2 ***trash*** *and* ***sediment*** *removal*

3 ***fine sediment*** *removal*

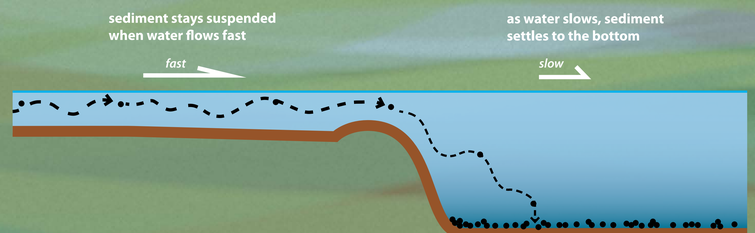
4 ***water polish*** *and release*

distribution as sheetflow *to prairie*

Part 1 (Upstream):
Water Collection in Gainesville.
Upstream of the Sedimentation Basin, the first unit of the Treatment Train is Gainesville Regional Utilities' Main Street Water Reclamation Facility. Recent upgrades at the facility function to remove solids and dissolved pollutants—primarily phosphorus—to the lowest level possible prior to discharge into Sweetwater Branch. Even with only this first step of improvements, the treated wastewater that now flows down Sweetwater Branch to Paynes Prairie contains far fewer pollutants than it did historically.

Parts 2 & 3:
Sedimentation Basin and Forebay.
The primary role of the series of pools in front of you is to remove trash and sediment before water flows into the working wetlands downstream. The Sedimentation Basin is designed to remove the majority of floating trash and suspended sediments from stormwater. Collected trash and sand are periodically removed from this pool and disposed of at a landfill. The still waters of the Forebay allow any fine sediment in the overflow from the Sedimentation Basin to gradually settle out before water flows into the Enhancement Wetland cells.

Part 4 (Downstream):
Enhancement Wetlands.
The Enhancement Wetland is the final step in the Treatment Train.



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