

Beneath the Surface in Florida's Springs



A guidebook to common creatures and
plants in Florida's freshwater springs.

Photographed and Written by Jennifer Adler

Walking  on Water

Table of Contents

Introduction	1
Fish	2
Reptiles	8
Invertebrates	10
Mammals	12
Plants	13

Introduction

This guide was created for the "[Walking on Water](#)" springs environmental education program. It includes photos and descriptions of 46 common creatures and plants that make their home in Florida's springs, along with tips to help you identify them. This is by no means an exhaustive list of spring species, rather a guide to many of the things you may find during our swim at Blue Springs Park in Gilchrist County, Florida.



Look for the snorkeler logo throughout the guide. This logo tells you which species we are most likely to see. Keep your eyes peeled!

Each species has its own entry, which includes the following infor-

Genus species (Latin name)



Common name



Photo of the organism in the wild.



Sternotherus minor – Loggerhead musk turtle 

These little turtles have big jaws for crunching snails and crayfish, but they grow to only a maximum length of 5 inches. They are called "musk" turtles because they release a bad smell when they are threatened. Not frequently found basking out of the water.



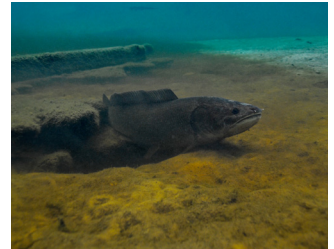
Description and helpful ways to identify the animal or plant.



The springs are home to a large diversity of fish species. You will often see mullet swimming around in open water and big schools of sunfish will swim right up to your mask, but many of the fish are relatively **cryptic**, meaning they tend to hide. If you wait quietly in the shallow water near the edge of the spring, you may be lucky enough to spot some of these unique and harder-to-find fishes in the underwater vegetation and in the dark shadows of the spring.

Amia calva – bowfin

The bowfin is the last remaining species in the Amiidae family of fishes, which lived during the Jurassic Period (with the dinosaurs!). Bowfins are shy and tend to hide in vegetation. Their **dorsal fin** (fin on the top) moves like a ribbon underwater when they swim.



Dasyatis sabina – Atlantic stingray

A ray in freshwater? Yes! This is the same species of stingray found along beaches in Florida, but it has adapted to life in freshwater and is commonly found in the St. Johns River and associated springs. This particular population of Atlantic stingrays is the only one known to have its complete life cycle in freshwater. About half of their diet is made up of snails - fun fact: they eat only the body of the snail... they crush the shell with their jaws and expel it through their gill slits!



Fish Fact #1

Fish that live part of their lives in fresh water and part of their lives in salt water are called **diadromous**. They must be specially adapted in order to survive in both environments!

Esox niger - Chain pickerel

Has yellow eyes and a duckbill-like snout and a chainlike pattern on its sides with a vertical black line beneath its eye. All pickerel species are voracious predators, feeding on many different kinds of fishes.



Fundulus seminolis – Seminole killifish



One of the biggest species in the *Fundulus* genus. They eat small aquatic insects called **chironomids**. Often found hiding in the grasses.



Gambusia holbrooki – eastern mosquitofish



Mosquitofish are almost always near the surface and are much smaller than Seminole killifish. They are **livebearers**, which means they give birth to live young. Pregnant females have large bellies, which hold their young, called **fry**. Some mosquitofish are covered in black spots like a Dalmatian.



Lepomis spp. - Sunfish

There are several species of sunfish in the springs. Many of them are not scared of people and will swim right up to your mask!



Lepomis auritus – redbreast sunfish

Lepomis macrochirus – bluegill

Lepomis microlophus – redear sunfish (also called "shell-crackers" because they eat snails)

Lepomis punctatus – spotted sunfish





Lucania goodei - Bluefin killifish

Small fish with black horizontal stripe and red tail. Similar size and shape as the redeye chub, but has different fins, including a brilliant blue fin, especially visible on males during mating season.



Lepisosteus osseus - Longnose gar

There are 3 species of gar in Florida – longnose, Florida, and spotted gar. Gar are prehistoric fishes that get their name from the Anglo-Saxon word for spear. Longnose gar grow to 3-5 feet as adults and tend to be a bit larger than the Florida gar (*Lepisosteus platyrhincus*), which is shorter, stockier, and has a lot of dark spots. Male longnose gar also have spots, but usually they only develop during spawning season. [But, don't confuse this with the spotted gar (*Lepisosteus oculatus*), which only occurs west of the Apalachicola River!] All gar species can tolerate low oxygen and **saline** (salty) conditions but must migrate upstream to clean, fresh water to lay their eggs, called **spawning**. They are often found hiding in the dark shadows of springfed rivers.



Micropterus salmoides – largemouth bass



The largemouth bass is the Florida state freshwater fish. It is the most popular fish for anglers to catch in all of North America. They can grow very large - the Florida state record is 17 pounds! Males use their fins to fan out the sand and make a nest, which they then guard after the female lays the eggs. The baby fish eat zooplankton (microscopic animals that drift in the water column) and adult bass eat other fish and crustaceans. The Suwannee bass (*Micropterus notius*) looks similar but is a bit smaller (usually a maximum of 12" long) and its mouth doesn't extend beyond its eye like that of the largemouth bass.

Minytrema melanops - Spotted Sucker



Spotted suckers belong to the Catostomidae Family, a family of freshwater fishes known as “suckers” because of their oddly-shaped mouths and the way they feed. They use their sucker mouths to sift through the sand to eat crustaceans and aquatic insects. Those pictured here are juveniles, which are common at Blue Spring during certain times of the year.



Mugil cephalus – striped mullet



Mullet are commonly seen in large schools eating algae like spaghetti, slurping it up and swimming around with it hanging out of their mouth. They often jump out of the water - if you hear a splash, it's likely a mullet! They can survive in a wide range of **salinity** (a measure of how salty the water is), meaning they are found in freshwater springs and also out in the salty ocean. The image at the start of the fish chapter (p. 2) shows mullet in a large school - this is likely how you will see them in the spring.



Notemigonus chrysoleucas – golden shiner



Young golden shiners are often a more silvery color, but adults are in fact golden. They sometimes dart up to the surface to grab food - they are **omnivorous**, eating everything from plants and algae to insects. Their small mouths are high on their snout and appear to be upside-down.



Notropis harperi – Redeye chub



Small fish found hiding in schools in the grasses. They eat insects, crustaceans, and smaller fishes. Scientists think they may spawn in underwater caves. They are very abundant at Blue Spring - look closely in the grasses.



Percina nigrofasciata - Blackbanded darter



They're called darters for a reason! There are definitely some at Blue Spring, but you'll have to really look closely to find them -- they're fast, small and have amazing camouflage. They feed on small insect larvae and vary in color depending on their habitat.



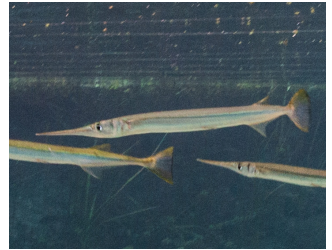
Fish Fact #2

All small fish are NOT minnows (and all minnows are NOT small fish!). When we see a small fish, we are often tempted to call it a "minnow," but this isn't always true. For example, chubs (such as the redeye chub) are minnows, but other small fish called darters (like the blackbanded darter) are not minnows. Carp are minnows, but they can grow up to 3 feet long! If you've ever had a pet goldfish, it was a minnow.

Strongylura marina – Atlantic needlefish



These fish are saltwater visitors and are also found in the Atlantic Ocean from Maine to Southern Brazil. They resemble mini gar (with a beak-like bill and hundreds of little sharp teeth), but they are actually more closely related to flying fishes! Adult needlefish eat other fish and are found in small schools near the surface. Underwater, Atlantic needlefish are practically indistinguishable from redfin needlefish (*S. notata*). The main difference is in the number of fin rays, which involves capturing the fish and counting in the lab.



Trinectes maculatus - Hogchoker



Tiny flounder-looking fish that are actually part of the sole family (they are not flounders!). They are well camouflaged with the bottom -- if you look closely at the sand, you may see one, but probably only for a second before it flutters along the bottom to escape you. They eat mainly small insect larvae.



Can you guess which kind of fish is on the front cover?

Spring Invaders

Caution: foreign invaders! Although we will not see them at Blue Spring in Gilchrist County, there are many springs throughout Florida that now have **exotic** fish species, which are species not native to the ecosystem. In Florida, some fishes have been accidentally released from aquariums or were originally introduced to control an invasive plant or other fish. If exotic species become established and change how the natural ecosystem works, they are called **invasive**. Invasive species can harm an ecosystem in many ways, such as by competing with native species for habitat and food and by altering the food web. Here are just 2 examples of many exotic fishes in the springs:

Oreochromis aureus - Blue tilapia

Native to Africa and the Middle East. First introduced in Florida in the 1960s for aquatic plant control, aquaculture, and sportfishing. Lake Alice in Gainesville is home to the northernmost population in the state. Tilapia can grow to almost two feet long and have huge lips and bouncy-ball-sized eyes. They displace bass and other native species such as sunfish, competing for breeding territory and food. They create circular nests by picking up stones and sand with their mouth and by moving sand with their body and fins. The nests have a crater-like appearance, with a rim of sand, pebbles, and shell fragments lining the circumference of a depressed hole about two feet in diameter. Males guard the nests, which hold a couple hundred eggs each.



Blue tilapia nests at Silver Glen Spring.

Pterygoplichthys spp. – South American suckermouth armored catfishes

Scientists first spotted these foreign invaders in the Santa Fe River in 2009. These fish were previously documented farther south in Florida (in the St. Johns River and Alexander, Wekiva, and Rock Springs). These catfish can be hard to identify because many are **hybrids** (a cross between two different species that mated to form a mixture of the 2). They are covered by big bony plates and have barbels and a sucker mouth, which they use to maintain their position in the current. They eat algae and invertebrates and they burrow into riverbanks to make nests. Their ability to breathe air allows them to survive in water with low dissolved oxygen. *Pterygoplichthys* cannot survive in cold water, so they seek refuge in the springs during the chilly winter months.



Photograph by Leo G. Nico, U.S. Geological Survey (Volusia Blue Spring, 2009)

Reptiles

The Santa Fe River (where the Blue Spring run leads to, about 1/4 mile down the boardwalk) is home to 15 species of turtles. More than 25% of all North American freshwater turtle species live in the Santa Fe River basin! In 2013, more than 500 turtles (Suwannee cooters) came into Blue Spring at once and ate most of the hydrilla, an invasive plant that lives in the spring. Suwannee cooters are the most common turtles you will find in Blue Spring, but keep an eye out for the smaller loggerhead musk turtles too!

Alligator mississippiensis – American alligator

Alligators may look big and scary, but they spend most of their time during the day sunning themselves on the banks of rivers and on logs. When they do feed, scientists recently found that they eat everything from snails and insects to turtles, fish, birds, and raccoons.



Don't worry!

Alligators don't frequent Blue Springs -- in fact, they tend to be pretty afraid of people. They prefer dark, warmer water where they can sneak up on their prey and bask in the sun along the river banks. The dark water that flows in some Florida rivers is called **tannic** water. Tannins from leaves stain the water like tea.

Pseudemys suwanniensis – Suwannee cooter



Herbivorous (they eat plants) freshwater turtles, very common at Blue Spring. They are large turtles and females can weigh up to 22 pounds (males are smaller). They have a black V on their **plastron** (which is a fancy word for bottom of their shell!) near their neck, like a tuxedo. The top of the shell is called the **carapace**.



- 8 How do you tell a male from a female turtle? Look at their nails! (MALES have long nails, not the females!) Females are also much larger than males.



Sternotherus minor – Loggerhead musk turtle



These little turtles have big jaws for crunching snails and crayfish, but they grow to a maximum length of only 5 inches. They are called “musk” turtles because they release a bad smell when they are threatened. Unlike Suwannee cooters and sliders, they are not often found basking out of the water.



Trachemys scripta – Yellow-bellied slider

How to tell from a Suwannee cooter? These are much less common at Blue Spring and they don't have a black V on their plastron - instead, they have 2 dark spots on the front of their plastron.



Apalone ferox – Florida softshell turtle

Softshells are relatively hard to find and sport a distinctive “snorkel nose.” They can reach their long necks almost to the back of their shell. They are one of the largest turtle species in the springs, second only to alligator snappers. They are carnivores and grow to about 1 foot long.



Chelydra serpentina – Common snapping turtle

Usually hides near the bottom. It eats almost anything, from snails and crayfish to fish, other turtles and snakes. Not to be confused with the larger Suwannee alligator snapper (*Macrochelys suwanniensis*). Scientists found an alligator snapper in the Santa Fe River that weighed 123 lbs.!



Nerodia taxispilota - Brown water snake

Brown water snakes are non-venomous (Remember: snakes can be venomous, but not poisonous!). Of 50 species of snakes in Florida, only 6 are venomous. Brown water snakes are commonly found basking in trees over the water and feed on fishes, frogs, and dead animals. Don't confuse this snake with the venomous cottonmouth, which has oval-shaped pupils (water snakes have round pupils).





Invertebrates

Did you know that there are left-and right-handed snails? When you look at a snail with the shell opening towards you, you will see that it is either on the left or right of the shell. By looking at the types of **macroinvertebrates** (large invertebrates, those that you can see without a microscope) present in the water, we can get an idea of what the water quality is like. For example, right-handed snails have gills, so they are sensitive to pollution and need water with a lot of oxygen in order to survive. Left-handed snails do not have gills (they breathe air at the surface), so they can live in water that is more polluted or has lower oxygen levels. So, if there is a high proportion of left-handed snails in a spring or river, it may be in trouble.

Besides the few listed here, there are many, many macroinvertebrates that are small in size but hugely important to the ecosystem!

Elimia floridensis – Elimia snails



Most common snail at Blue Spring. They are important in springs because they eat algae. Look closely and you will see that their bodies are speckled black and bright orange. Look in the sand, on logs, and on the blades of underwater grasses and you'll see tons of them.



Gerris remigis - Common water strider

Water striders walk on water! They look like giant mosquitoes but they won't bite. Like all insects, they have 6 legs: the short front legs grab prey, the middle legs push them forward, and the hind legs steer. Baby water striders are called **nymphs**.



Pomacea paludosa – Florida apple snail

There are 4 species of apple snails in Florida, but only this one is native. They are the largest aquatic snails in Florida and are the only food source for an endangered bird called the snail kite. Apple snails lay clusters of eggs just above the water line - can you guess why? Native apple snails lay large, white or light pink eggs; smaller dark pink or green eggs are invasive.



Did you know?

There are tiny snails in many springs, called hydrobiids, that are usually about the size of a grain of rice. The Ichetucknee silt snail is a species of hydrobiid silt snail that lives in only one spring along the Ichetucknee River! The spring is named Coffee Spring and it even has a sign at the spring that says "Home of the Ichetucknee Silt Snail":



Procambarus spp. – Cave crayfish

There are several different species of cave crayfish in Florida, and many of them are endangered. The species that live in caves are **troglobitic**, meaning they are specially adapted for life in a dark environment. They look like tiny white lobsters - they are white because they lack pigments. They can't see but have great senses of hearing, smell, and touch.



Procambarus spiculifer – White tubercled crayfish

Although they are the most abundant type of crustacean in the springs, they are very cryptic and like to hide in limestone holes or tree roots underwater. They look like a lot like the lobsters you see in the ocean. They come out at night to scavenge on decaying plants and animals.



What do you think made these mysterious trails in the sand?



Mammals



We likely won't see either of these species at Blue Spring, but they are both important parts of springs ecosystems! Other mammals that live around springs are beavers and raccoons. Black bears are also often spotted near many of the springs in the Ocala National Forest (many miles to the south of where we will be at Blue Spring).

Lontra canadensis – River otter

You're lucky if you see otters out at the springs! They are often found in pairs or families (young stay with their mother for 1 year). Baby otters don't open their eyes until they are 1 month old. They have whiskers that help them locate prey underwater, which consists of everything from fish and crayfish to turtles.



Trichechus manatus – Florida manatee

Manatees are common in the springs during the winter months, when the ocean is colder than the springs. Manatees are **herbivores**, meaning they eat only vegetation. One manatee can eat more than 100 pounds of vegetation per day and weigh around 1,000 pounds! Their closest relative is the elephant.



Did you know?

Despite their large size, manatees do not have a blubber layer like whales, so they must find warm water when the ocean drops below ~68 degrees F. Between November and March, they congregate in Florida's springs. They have no natural predators, so they spend most of their time grazing, sleeping, and migrating from place to place in search of food and warm water. Sadly, the main threat to manatees is humans - many manatees are killed or injured by boat propellers every year.

Plants

The springs are home to a wide variety of plant species. Looking beneath the surface in the springs is like peering into an underwater garden! This is just a small list of the huge diversity of plants that grow in the springs, but it covers all of the species we will see at Blue Spring. Examine each plant closely, because several plants appear to be very similar and are distinguished by only a few minor differences. Also, if you look closely at the plants, you will likely see a lot of fish and snails too - fish like to hide in the waving leaves of the vegetation and snails often graze algae on the blades of grass and leaves of other aquatic plants.

Hydrilla verticillata – Hydrilla



Hydrilla is an invasive exotic plant. People brought it to FL in the 1950s as an aquarium plant and it is now abundant in many springs. It can grow up to 1 inch per day and shades out other native plants. It has small, pointed green leaves that grow in whorls around the stem. Underground, hydrilla has tubers that resemble small potatoes - one single tuber can give rise to >6,000 new tubers in just 1 square meter!



Hydrocotyle umbellata – Water pennywort



Each leaf looks like a little umbrella, with the stem joining at its center. The circular green leaves are about the size of a half dollar. Large mats of hydrocotyle are common in Blue Spring.



Can you guess what kind of invertebrate is hanging on the edge of this hydrocotyle leaf?

Hymenocallis rotata – Spring-run spiderlily



This plant is **emergent**, meaning it grows with its roots and part of the plant in the water while the top part of the plant is out of the water. Underwater, they have onion-like bulbs and above water, their green leaves and big, white flowers are easily noticeable. They bloom in late spring/early summer.



Lemna spp. – Duckweed

There are 3 types of duckweed in FL, found in still or slow-moving waters (they are often found covering sink-holes or retention ponds). They are **angiosperms** (flowering plants), NOT algae... even though they may look slimy, they are not! Each plant is made up of 2 tiny shoe-shaped leaves (about 1/16th of an inch each) and a single root.



Ludwigia repens – Red ludwigia

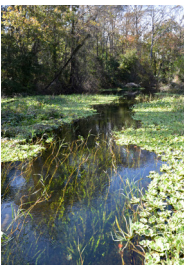


Can have green to reddish leaves that vary in shape from spatula-shaped to more elliptical. Leaves are arranged opposite from one another and are about 1 inch long. Commonly grow as large bushes underwater in the springs.



Nuphar advena – Spatterdock

Large floating, green heart-shaped leaves with yellow flowers attached to thick, long stems. Flowers can be at or above the water's surface. Spatterdock is more common in spring-fed rivers and spring runs than in the spring itself.



Pistia stratiotes – Water lettuce



Looks like a floating head of lettuce! Has thick green ridged leaves and feathery roots that grow a few inches into the water. Does not attach to the bottom. Often forms large, floating mats at the edges of slow-moving water.



Spring grasses -- how to tell the difference??

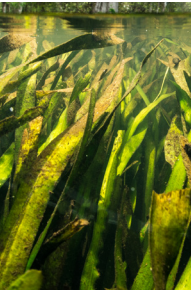
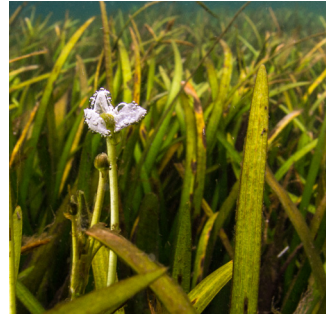
Sagittaria and *Vallisneria* are the 2 most common grasses in the springs. They often look very similar underwater and can be hard to identify. The width of the leaves in both types of grasses varies from place to place. Here are some tips and tricks to help you figure out which is which. The flowers are very different, but remember they only flower for a short time every year!



Sagittaria kurziana –
Strap-leaf sagittaria



- Long, ribbon-like leaves
- 3-5 parallel raised ridges on each leaf
- Leaves have **pointed tips**
- White flowers are three-petaled and have long, straight stalks



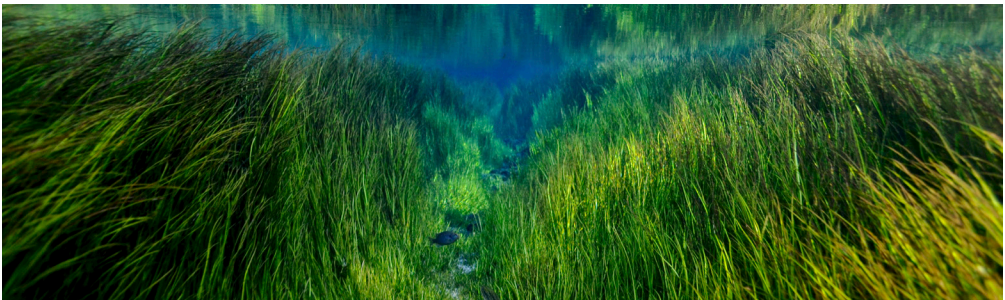
Vallisneria americana –
Eelgrass



- Long, ribbon-like leaves
- NO raised ridges on leaves
- Leaves have **rounded tips**
- Small, white flowers reach the surface on long, curly flower stalks



Most of what we will see at Blue Spring is *Sagittaria kurziana*. This is an example of a large underwater meadow of *Sagittaria* in the Blue Spring run:



Algae



There are many types of algae in the springs, but the 2 most common and noticeable are *Lyngbya* and *Vaucheria*. There has been an increase in algae in the springs since the 1990s, and scientists are hard at work studying the algae, the organisms that eat it, and what causes it to grow and outcompete other native vegetation.

Lyngbya wollei – Lyngbya



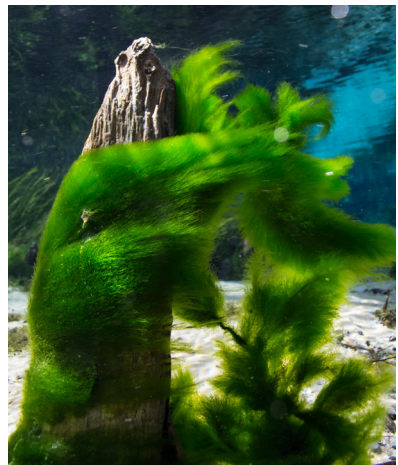
- Cyanophyte (blue green algae)
- Turns white when it dies
- Can grow quickly and shade native plants
- Attaches to sandy bottom or other plants
- Can produce toxins
- Can grow in dark or low light



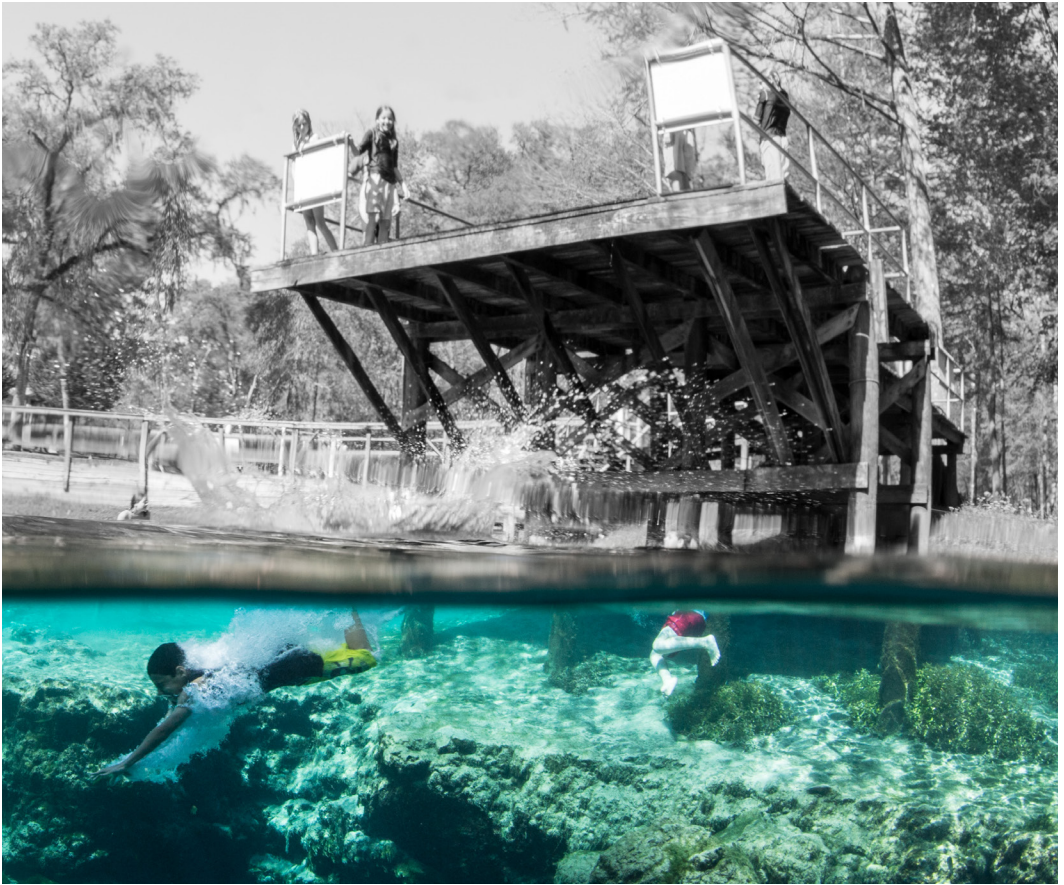
Vaucheria spp. – Water felt



- Xanthophyta (Yellow-green algae)
- Green colored
- Does not produce toxins like lyngbya



Only 2.5% of the water on earth is freshwater, and most of it is locked up in glaciers or hidden underground in aquifers. In Florida, we have a unique opportunity to experience the clear freshwater in the aquifer because we have the highest density of freshwater springs in the world, fed by the aquifer beneath our feet. A whole new world awaits just beneath the surface, right here in your backyard...



...dive in!

This little guide is dedicated to my parents...

...who instilled in me a profound love for the ocean and who have unwaveringly supported my curiosity to seek what lies just beneath the surface, even as it has carried me far away from home and into the once foreign freshwater realm.

This guidebook was compiled, written, and photographed by Jennifer Adler for the “Walking on Water” environmental education program.

Special thanks to Dr. Ken Sulak and Dr. Steve Walsh of the U.S. Geological Survey in Gainesville, Florida, for reviewing the guide and sharing their many years of expertise studying spring ecosystems, to Dr. Leo Nico at USGS for use of his armored catfish photo and information about invasive fishes, and to Cynthia Barnett for editing the final draft.

This guide may be reproduced for nonprofit educational purposes, *with written permission from the author.*

Please contact jennifermadler@ufl.edu.



The “Walking on Water” program and all associated materials are made possible by a graduate fellowship from the University of Florida and grants from the National Geographic Society, Florida Sea Grant, and the Cottonwood Foundation.

For more information about “Walking on Water,” visit www.walkingonwaterFL.org and to view more of Jennifer’s underwater photographs, visit www.jenniferadlerphotography.com

