

A Florida manatee (subspecies of the West Indian manatee) in the state's Ichetucknee Springs. The herbivorous 'sea cow' was designated the state's marine mammal in 1975.

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Wildlife
MAGAZINE

Photos by **Mac Stone**

Bubbling up in America's 'Sunshine State' are wildlife-rich waters. They're a fragile ecosystem that needs to be cherished, reports **Chelsea Wald**.

Spring *into* action

Pull off the highway to visit one of Florida's beautiful natural springs, and you might be treated to some oddly unnatural sights: an artificial waterfall, a colony of Asian rhesus macaques, an African hippopotamus named Lucifer, a mermaid show. These are leftovers from half a century ago, when the state's large springs were bustling roadside attractions.

"Back in the day, these places were built to make people pretend like they were somewhere else," says Chris Anastasiou, chief scientist and springs team lead at the Southwest Florida Water Management District. "It was all about bringing in a lot of exotic vegetation and a lot of exotic animals."

It's an odd thing, as if everyone had suddenly gone blind to the real magic of the springs: the turquoise waters themselves. Bubbling out of the Floridan aquifer with an extraordinary clarity and volume, they are like "the blue ether of another world," as the 18th-century English naturalist William Bartram put it. Still today, says photographer Mac Stone, "you put your head underwater and get to see all kinds of things – manatees and strange fish called gar and turtles and 'gators and sometimes even otters."

The quality and quantity of water comes as a result of the unique geology of the Floridan aquifer. A bedrock of limestone underlies the state; over millions of years it has partially ►



THESE GIN-CLEAR WATERS ARE HOME TO EXTRAORDINARY ANIMALS AND SWAYING FORESTS OF EELGRASS.

dissolved into a Swiss cheese. Water seeps down into this aquifer and then flows around for days or years or decades, depending on what gets in its way.

In the northern half of the state the aquifer is especially close to the surface, which makes for the highest concentration of naturally flowing springs in North America – more than 1,000 of them, in fact. The large ones have fanciful names like Rainbow, Weeki Wachee, Ichetucknee and Silver.

These gin-clear waters are home to extraordinary animals such as the longnose gar, limpkin, anhinga and snapping turtle, and swaying underwater forests of emerald-coloured eelgrass, but they are now in trouble. Even as people frolicked at the springs, they failed to safeguard the aquifer that feeds them from the effects of intensive agriculture, rapid development and changes in the climate. As a result, plant and animal life has suffered. “The water still looks nice, but if you know what you’re looking for, it’s pretty alarming,” Stone says. Since people depend on aquifer water for drinking, the changes bode poorly not just for ecosystem health, but human health, too.

Now Floridians are seeking solutions, and they are not alone. “Problems such as groundwater pumping, agricultural chemicals and recreation impact not just on

A sunfish swims through a shaft of light in the Chassahowitzka National Wildlife Refuge. The protected area was established in 1941 to conserve wildlife habitat.

Florida springs, but many springs around the world,” says Abraham Springer, a hydrogeologist at Northern Arizona University. “Springs are among the most threatened and important places on Earth.”

Florida’s springs have always been enchanted. American Indians considered some sacred, says Robert Knight, the director and founder of the Florida Springs Institute, an independent research and education centre. “It was magical that you could be in a dry landscape and come to a place where a river could show up out of nowhere.”

SEEING CLEARLY

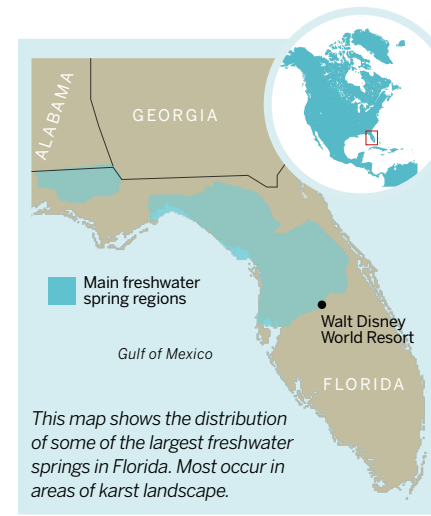
Fifteenth-century explorer, Juan Ponce de León, didn’t search Florida for his Fountain of Youth – that’s probably a myth. But conquistador Hernando de Soto did explore the area in the 16th century; white settlers followed, muscling out native populations over the next three centuries.

In the 1850s, scientists came not to conquer but to observe and describe. The waters were so transparent that, when American scientist John LeConte lowered a *New York Herald* newspaper 18m into Silver Springs, he could still make out words. The waters were so plentiful that 19th century anthropologist Daniel Brinton called Silver Springs one of the “grand hydrographical features



Above: a paddle steamer on Silver Springs in 1860. Before theme parks, Florida’s springs were its original tourist attractions. Right: a diver explores

Rainbow River springs, while an anhinga dries its wings. Below right: a yellow-bellied slider (called a terrapin in Britain) cruises past eelgrass.



Steam boat: Mary Evans Picture Library/Alamy

of the North American continent,” alongside Niagara Falls and the Mississippi River.

During the early 1900s, wealthy visitors, including US presidents Theodore Roosevelt and William Howard Taft, sought the springs for their supposed curative powers. As travel grew easier, tourists started arriving in droves.

In the 1980s, a new interstate highway that led directly to Walt Disney World siphoned off most of the tourists. The springs went from being Florida’s most popular destinations to being ignored by the hoards. But scientists grew increasingly fascinated with them. Studies of the ecosystems began in the 1950s, when ecologist Howard T Odum found that the clear, flowing water supercharges “a very productive food chain, comparable to a coral reef or tropical rainforest,” Knight says.

Grassy freshwater plants thrive on the sunlight-rich beds of the spring runs. Directly and indirectly, these provide food and shelter for a unique collection of fish, shrimps, crayfish, snails, insects, turtles, alligators, otters and birds. Manatees, the gentle grazers of the coast, swim to springs in the winter not only for the good food but also because the water comes out of the ground at a constant temperature. The springs, Knight says, are “their safe winter harbour”. ▶



FLORIDA SPRINGS

As development in Florida and worldwide proceeded apace, however, scientists witnessed the springs grow less and less safe for the animals that rely on them. A dam erected in the 1960s blocked manatees and other migratory species from going to Silver Springs. They still congregate at the base of the dam, drawn by the scent of the fresh water, Knight says. "They know that Silver Springs is upstream but they can't get to it. It's a really sad picture."

TOXIC WATER

Pollution has come to plague many springs. In some parts of the state, nitrates seep down from fertiliser and manure on farms; in others, from septic tanks. Since the spring waters naturally have very little nitrogen in them, these extra nutrients are a shock to the ecosystem, promoting the growth of non-native plant species. What's more, in high concentrations nitrates are toxic to some wildlife, as well as to people. "When I studied Silver Springs in the Seventies, every leaf had snails on it that were grazing," Knight says. "Those snails are gone, and they may be gone because the nitrate is actually toxic to the snail."

Many springs have also seen a marked decrease in flow – on average, 32 per cent between the 1930s and the 2000s, Knight says. One reason for the decline is that Florida has received less rainfall in the past decades, due to a mix of human-caused and natural changes in the climate, so the aquifer isn't getting fully recharged. But another factor is that people are pumping water out of the aquifer to support farms, industry (including bottling water) and a booming population, now at 20 million and still growing fast.

EBB AND FLOW

The result is that Silver Springs is no longer the biggest headwaters. Whereas around 23 cubic metres of water per second gushed out of the ground there before the 1970s, on average fewer than 14 cubic metres per second do so today. Some smaller springs have dried up or reversed their flows.

As aquifer levels drop, salt water that lies under the fresh water threatens to rise up. And along the coasts, climate change has resulted in a sea-level rise of 20cm in the last 100 years – a big number when you consider that the coast is very flat. That's changing the salt levels of the springs that run into the sea. On top of that, tropical storms send pulses of salty water up into the springs. "So it's a double whammy that's happening to these coastal systems," Anastasiou says.

This change in water quality and quantity is reflected in many of the springs' ecosystems: matted strings of algae are replacing the tresses of freshwater plants. The difference isn't always obvious to untrained eyes because the water still runs clear – although it may have a green instead of a blue tint. But scientists notice, as do all kinds of wildlife, who find the algae less palatable and protective than the grasses.

Floridians will eventually notice, too. The springs' ecosystems are like the canary in the coal mine for water quality, and 93 per cent of state residents rely on aquifer water for drinking. "This is us getting to see the future of our water," Stone says. "And if we can't take care of our springs, then we're going to be in a really tough spot." Unfortunately, there's no easy way out, especially as the trends that caused the problems – population growth, intensive agriculture and climate change – will only heighten in the coming decades.

But that didn't stop restoration ecologist Thomas Ries ▶

WINDOWS ON THE AQUIFER: 5 UNIQUE RESIDENTS

1 MANATEE

These gentle giants, sometimes known as sea cows, can move freely between the salty ocean and fresh spring headwaters. They migrate up rivers in winter to take advantage of the constant 22°C water temperature there. Once classified as Endangered, they were downlisted to Threatened by the US Fish and Wildlife Service earlier this year after 40 years of protection and population recovery.

2 AMERICAN ALLIGATOR

North America's largest reptiles, alligators are a common sight along Florida's springs and riverbanks. Their giant armoured bodies, sharp teeth and strong jaws help them capture a wide variety of prey from fish and snails to birds and mammals. The largest males can grow to up to 3.4m in length and weigh some 450kg.

3 LIMPKIN

Sole remaining member of an ancient family, this wading bird stalks springs and spring

runs for apple snails. It extracts its prey with a tweezer-like beak that has a slight gap near the tip. Its prehistoric-sounding wail was used as a sound effect for the magical hippogriff in the film *Harry Potter and the Prisoner of Azkaban*.

4 EELGRASS

This aquatic plant, which has long, ribbon-like leaves, thrives in the fast flowing, sun-drenched spring waters. It offers habitat to damselflies, snails, fish and other spring dwellers. Manatees graze on it. But in many springs eel grass is now losing out to algae.

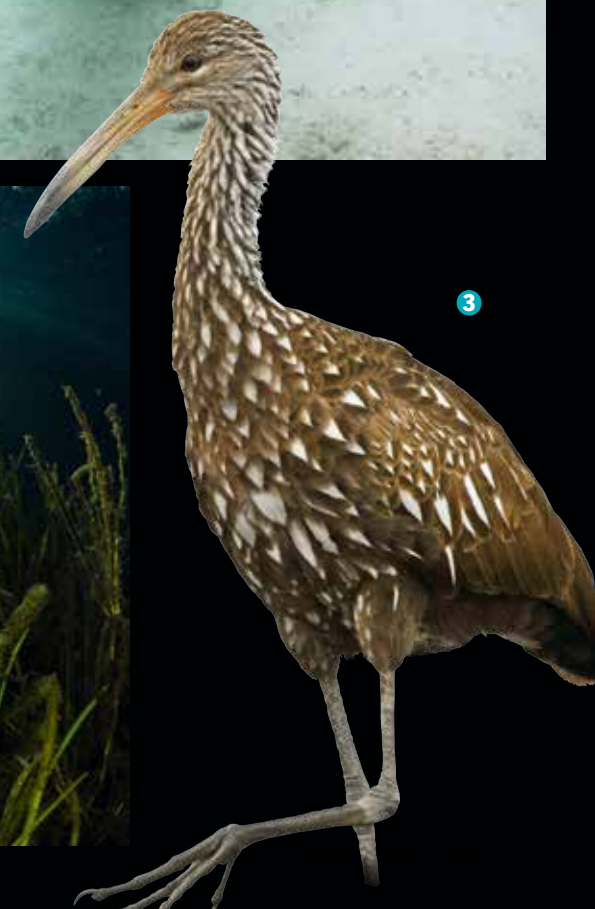
5 CAVE CRAYFISH

In the underwater cave systems that serve as the portal to the aquifer, blind, pigmentless cave crayfish have evolved into unique species that may each range only a few kilometres. In fact, more species of cave crayfish live in Florida than in any other US state. These are the rarest of the springs' critters, as well as among the first to be affected by changes in the springs' flow and chemistry.

THE MANATEES KNOW
SILVER SPRINGS IS
UPSTREAM BUT THEY
CAN'T GET TO IT.



Clockwise from above: two manatees play in Three Sisters Spring; the limpkin has an unmistakable cry; eelgrass in sunlight; one of 14 cave crayfish species; the American alligator, largest reptile in North America.



TODAY MOST OF THE MAJOR SPRINGS HAVE BEEN BOUGHT AND TURNED INTO STATE PARKS.



from rolling up his sleeves and getting to work. A few years ago he was surprised to learn from some “old timers” that there had once been a small spring in downtown Tampa, a city with a metropolitan area of 4.5 million people. In the early 1900s, in its rush to grow, the city just paved over the whole spring run, he says, and it was all but forgotten.

The city was planning to turn the area where the spring had once been into an urban park with restaurants. Ries convinced officials to allow his non-profit organisation, the Ecosphere Restoration Institute, to restore the spring as part of the park, offering to raise the needed \$600,000 himself.

Contaminated soil and underground pipes made the project challenging but, in 2014, the Ulele Springs started bubbling again. The water pools into a basin and flows to

Tampa Bay. Fish and blue crabs appear to like the basin’s mix of fresh spring water and salty Pacific Ocean water.

Even better, to the delight of the Tampa residents enjoying the new park, manatees swam in just two days after opening, shimmying over temporary barriers meant to keep them out. It would have been better had they waited, Ries laughs. With the voracious sea cows around, his team hasn’t been able to get seagrass to take root. “It’s like, guys, if you just let this stuff grow you’ll have permanent food.”

SPREADING THE WORD

It’s a small project in the scheme of things, but it’s helping Floridians to reconnect with the beauty and importance of their springs. Those connections bolster the political will for larger projects. Today, for example, most of the major springs have been bought and turned into state parks – Silver Springs as recently as 2013. And last year the state committed more than \$56 million to 35 springs-related restoration projects. Indeed, over the next 20 years, the state is set to devote about \$1 billion for springs restoration and protection, which has a shot at making a difference.

“The fact that you have this little spring park in the middle of Tampa is great because now you’ve got people that see it every day,” Anastasiou says. “The heyday of exotic tourist attractions is over and the focus has shifted to the natural beauty of Florida and restoring these wild places.” 🐾



CHELSEA WALD writes about science and the environment, and is based in the Netherlands. Follow her on Twitter @chelseawald.

Above: floating logs make ideal perches for double-crested cormorants, here on the Rainbow River in Dunnellon. **Left:** palms and cypress trees line the shallow emerald flows of Rock Springs Run State Reserve.

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Learn more about this precious habitat at www.floridaspringscouncil.org and www.myfwc.com/wildlifehabitats