A story of the St. Johns River

The big picture

The lower St. Johns River meanders through north Florida.

FAST FACTS

Untreated stormwater runoff, wastewater discharges and agricultural runoff pose significant challenges to the attainment of good water quality of the St. Johns River.

The St. Johns River Water Management District and its various partners have completed or are pursuing dozens of restoration and cost-share projects, extending from the headwaters of the St. Johns River to its mouth, 310 miles to the north, with the goal of improving water quality in this American Heritage River.

A diverse water body

How can one describe the St. Johns River to someone who has never experienced it? Certainly not with simple, sweeping statements, for this 310-mile-long waterway takes a variety of forms as it flows lazily north from Indian River County through northeast Florida and into the Atlantic Ocean.

In Indian River County, the river's headwaters encompass a vast marsh supporting fish, alligators and waterfowl. In Brevard County, marshes coalesce into a navigable river, gently twisting as it meanders north. Surprises abound as the river reveals multiple personalities on its journey north: a tapestry of sawgrass lakes, bottle-clear spring runs and darkwater tributaries. As the river moves past Putnam County for Clay and St. Johns counties it widens considerably, in some locations exceeding 3 miles across. This broad region is where it mixes with salt water to form one of the most productive estuaries in the state. The river estuary passes through Jacksonville, before the longest river contained in the state of Florida ends its journey at the Atlantic Ocean in Mayport.

Threats to the river

Today the St. Johns River remains an invaluable part of Florida, but development has challenged the unique environment that the early European explorers and inhabitants first encountered.

For decades, river water quality and floodplain habitat have declined from human activities and rapid development. In particular, stormwater runoff from burgeoning metropolitan areas, domestic and industrial wastewater discharge and agricultural runoff added nutrients to the system. Other challenges included the draining of wetlands, especially those within the river's floodplain and major diversions of water flow from and around the river.

Nutrient-rich discharges to the river have increased the severity and frequency of algal blooms and subsequent fish kills and degraded in-river and shoreline habitat. As a result, by the end of the 20th century significant portions of the St. Johns River failed to meet state and federal water quality standards.

Fixing the problems

There is no single solution for improving the condition of this celebrated and storied river. The St. Johns River Water Management District aggressively engages in habitat restoration and water quality protection all along the river. Each basin is an interconnected part of the whole river. Improving water quality at the headwaters ultimately benefits downstream watersheds as the river flows north.

Basin by basin, here are highlights of the benefits of restoration projects by the District and various federal, state and local partners.

Upper St. Johns River Basin

The 2,000-square-mile basin that makes up the St. Johns River's headwaters succumbed to decades of degradation as the marshes were drained to grow citrus and row crops and to raise cattle on the rich soils that were exposed.

Since 1988, the District and the U.S. Army Corps of Engineers (USACE) have restored and enhanced more than 166,000 acres of marshes in Indian River and Brevard counties as part of a jointly funded flood protection project. The $200 million project calls for the District to fund all land acquisition and USACE to fund all construction.

While flood protection was its primary purpose, ancillary benefits include fish and wildlife habitat restoration, improved water quality, expanded water supply, enhanced public recreation and reducing stormwater discharges into the ecologically diverse Indian River Lagoon.

Blue Cypress Conservation Area in the Upper St. Johns River Basin.

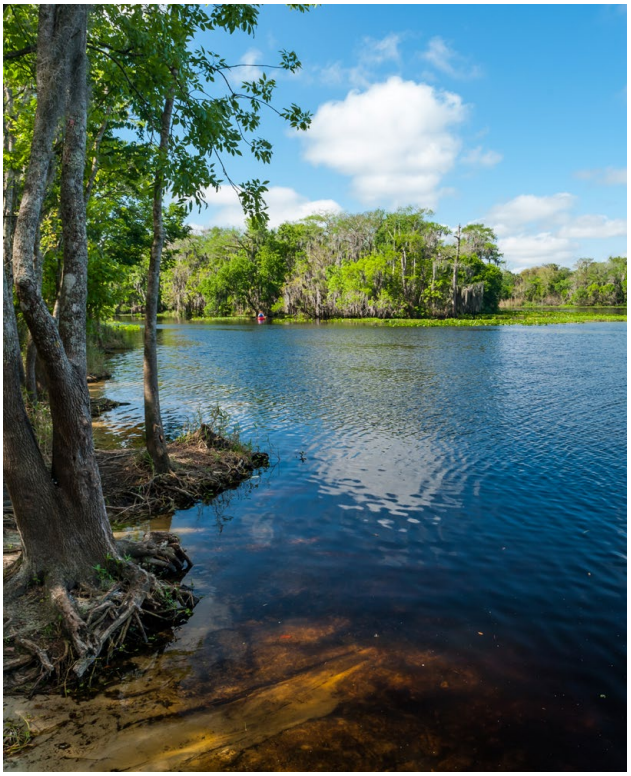
In recent years, legislation to protect south Florida's waterways had the unintended consequence of decreasing water quality within portions of the upper basin's watershed through increases in phosphorus concentrations. While the flood protection project provided numerous environmental benefits, some land use changes present concerns. The Florida Department of Environmental Protection (DEP) is funding the District to conduct research needed to improve phosphorus management.

Middle St. Johns River Basin

Spanning more than 1,200 square miles in east-central Florida, the Middle St. Johns River Basin encompasses a network of connecting lakes and tributaries fed by flow from the Upper St. Johns River Basin, underground springs, surface runoff and rainfall. The middle basin is situated within Orange, Lake, Seminole and Volusia counties — a highly urbanized corridor boasting more than 3.3 million residents who place ever-increasing demands on its natural resources.

The middle basin Is composed of the watersheds for the Econlockhatchee River, Deep Creek, Lake Harney, Lake Jesup, Lake Monroe and the Wekiva River. Each watershed is unique, so management of water resources requires variable and adaptive approaches. The District works with DEP, local governments and other stakeholders throughout the middle basin to address some key problems from a regional perspective. DEP, the District and local governments work together in the development and implementation of Basin Management Action Plans. These plans are roadmaps for water quality improvement born out of the total maximum daily load (TMDL) process spelled out in the federal Clean Water Act and are a fundamental tool in this restoration endeavor.

Accomplishments in the middle basin include the acquisition and management of environmentally significant land, especially the rivers' floodplain wetlands, elimination of untreated wastewater discharges, tighter stormwater and wetland protection regulations implemented in development permitting, adoption of minimum flows and levels



The St. Johns River flowing by Blue Spring.

(MFLs) for the river and Florida Priority Springs (Wekiva, Blue, Gemini, Alexander), reduced erosion in the Little Wekiva River, nutrient reduction efforts in key springsheds and partnerships with local governments to improve water quality and flood control in problem areas.

Upper Ocklawaha River Basin (including Lake Apopka) and Orange Creek Basin

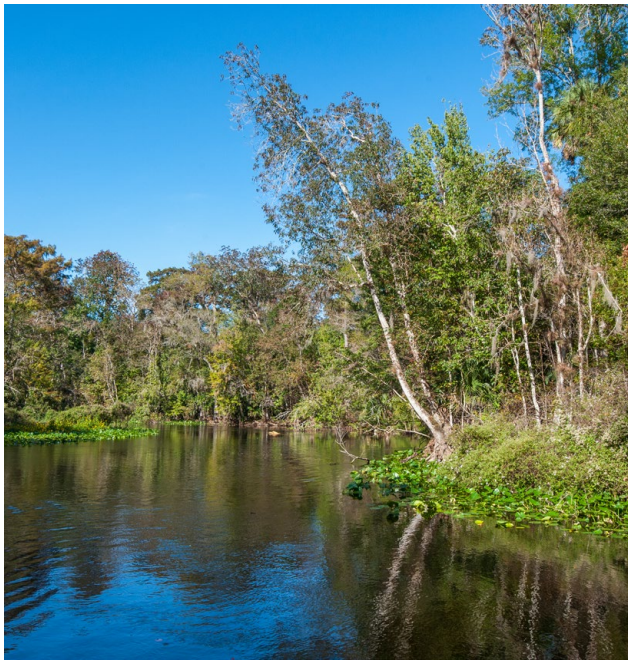
The Ocklawaha River is the largest tributary entering the St. Johns River. Like the St. Johns River Basin, the Ocklawaha River Basin has undergone drastic declines in water quality and loss of river and marsh habitat over the last century.

Since the late 1800s, portions of the Upper Ocklawaha River Basin have been manipulated to accommodate farming and industry. The Ocklawaha River itself was dredged to improve riverboat navigation, and canals were dug to drain floodplain sawgrass marsh for muck. Similar draining occurred at Emeralda Marsh on Lake Griffin, at Lake

Apopka and along the Ocklawaha River itself. For more than 40 years, farms established on former marshes pumped water loaded with fertilizers into the lakes and rivers of the Upper Ocklawaha River Basin. Excessive nutrients in the water caused algal blooms and fish kills, and native submersed aquatic vegetation declined. Deep organic sediments rich in nutrients accumulated on the lake bottoms as dead algae settled.

Orange Creek, another major tributary of the Ocklawaha River, was impacted by draining activities. Orange, Lochloosa and Newnans lakes are the major watersheds in the Orange Creek Basin.

Since the 1980s, the District has worked to restore water quality and fish and wildlife habitat in the Upper Ocklawaha River Basin through Florida's SWIM (Surface Water Improvement and Management) program, Florida Forever and other state and federal initiatives. A key District effort has been the acquisition and restoration of over 47,000 acres of "muck farms" in the basin. The restoration of wetlands on these areas has dramatically reduced external phosphorus loading to the adjacent water bodies, resulting in much improved water quality and recovery of submerged aquatic vegetation.



Ocklawaha River.

In cooperation with state and federal agencies, the District has:

- Harvested more than 31 million pounds of gizzard shad from lakes Griffin and Apopka to remove more than 260,000 pounds of phosphorus
- Removed 135 million pounds of suspended solids and 63,000 pounds of total phosphorus from Lake Apopka water by filtering water through the Marsh Flow-Way
- Completed or begun construction on several parcels that will enhance restoration of more than 47,000 acres of muck farms to natural marshlands
- Begun replanting native vegetation in Lake Apopka
- Began development of revised regulation schedules for Upper Ocklawaha lakes

Lake George Basin

Lake George is a vast 46,000-acre lake that lies within portions of Putnam, Lake, Marion and western Volusia counties. Lake George is the second largest lake in Florida and the head of the St. Johns River estuary. It is fed by several large artesian springs along its western banks and at least one submerged spring just downstream of the lake's outlet.

It is the nutrient storage area of the unique aquatic ecosystem that is the lower St. Johns River, transforming water quality as it flows through the lake from south to north.

Lake George has exhibited significant algal blooms. One unfortunate feature of these blooms is that they are dominated by species of algae that have the capability to extract nitrogen from the air and incorporate it into biomass for growth. As a result, the average nitrogen load exiting the lake exceeds that entering by more than 600 tons per year.

To address the problem of algal blooms in Lake George, the District and DEP developed a nutrient pollution limit for the lake. This limit, called total

The eastern shoreline of Lake George.

maximum daily loads (TMDLs), was finalized in 2018.

Similar to lakes Apopka and Griffin, the District has been engaged in selectively harvesting gizzard shad in the lake. In this unique restoration approach, phosphorus contained within the biomass of this detrimental "rough" fish is removed, with the added benefit of reduced in-lake nutrient cycling and improved aquatic food chain effects. Between 2013 and 2019, 61,000 pounds of phosphorus was removed by the harvest of 7,400,000 pounds of rough fish.

Lower St. Johns River Basin

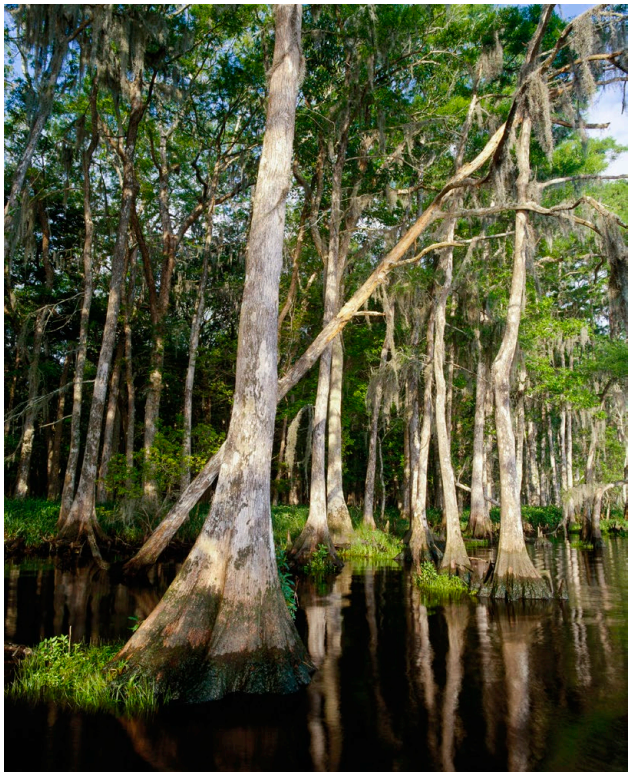
Work in the Lower St. Johns River Basin began in the 1980s with the District's development of the basin's SWIM plan, which focused on water quality, biological health, sediment management, remediation of toxic substances, public education and intergovernmental coordination.

The goals of the basin's SWIM plan were furthered in the 1990s by the creation of the River Agenda, a five-year cooperative plan among several partners. The River Agenda incorporated other actions of partnering agencies into the work already begun by the District, including reducing point source and stormwater pollution, eliminating bacteria in tributaries, restoring degraded aquatic habitat, increasing water quality compliance and enforcement, and increasing public awareness of the river and what individuals can do to improve its health.

In 2006, the District, in collaboration with DEP, the city of Jacksonville, JEA and other local government partners, entered into the River Accord by committing millions of dollars toward river restoration activities — primarily wastewater treatment facility improvements and reclaimed water system expansion projects. JEA, Clay County Utility Authority, the U.S. Navy, the cities of Atlantic Beach, Neptune Beach, Jacksonville Beach, Orange Park, Green Cove Springs and Palatka have completed projects committed to under the Accord.

The turning point for water quality in the lower St. Johns was the adoption of the TMDL in 2008, the first in the state to incorporate the process established in the impaired waters rule and the Florida watershed restoration act. The lower St. Johns River TMDL pioneered the pollution credit trading system and the marine waters dissolved oxygen criteria, which has since become the statewide standard.

As a result of all the effort expended by local partners, the lower basin has seen significant



Cypress trees along St. Johns River (Lower Basin).

water quality improvements and reductions in the frequency, duration and severity of algal blooms. Still, there are challenges to continued improvement. Historically, algal blooms were most prevalent during times of dry weather when wastewater discharges were a large portion of flows. However, with decreased wastewater flows resulting from increased reclaimed water use, the majority of bloom activity has shifted to periods of wet weather when surface water runoff is dominant and seasonal conditions tend to favor algal growth. This places additional importance on efforts to treat surface (nonpoint) runoff from urban and agricultural land uses.

Freshwater submerged aquatic vegetation (SAV) commonly occupies shallow water near the banks of the lower St. Johns River in nearly all sections upstream of downtown Jacksonville. Tides bringing in salt water from the Atlantic Ocean prevent these freshwater plants from settling closer to the river mouth while the naturally dark water limits light and prevents growth beyond the river's shallow margins. Saltwater intrusion and decreases in light availability from many factors, including algal blooms and runoff, contribute to SAV stress and natural spatial variation in the river.

Following Hurricane Irma in 2017, there was widespread, severe loss of SAV throughout the Lower St. Johns River Basin. In large sections of the river the extent of SAV beds fell by almost 60% and plant height of remaining grass beds decreased from over two feet to less than two inches. In the years since the die off, bed extent has generally recovered but the plants remain extremely small. The reason for the slow recovery is still under investigation, but low light availability from deeper-than-normal water and grazing by aquatic herbivores are potential limiting factors.

Moving ahead, local governments are working to implement stormwater projects to address urban runoff. The District, DEP, the Florida Department of Agriculture and Consumer Services, and the U.S. Natural Resources Conservation Service are providing cost-share funding to implement improved fertilizer and irrigation practices on farms in the Tri-County Agricultural Area (TCAA) in Flagler, Putnam and St. Johns counties. The goal of these improved management practices is to reduce fertilizer-laden farm runoff from reaching the river.

Through the TCAA Water Management Partnership and the District's agricultural cost-share programs, growers have implemented a variety of best management practices that have resulted in more than 1.7 billion gallons per year in water conservation savings, a nutrient loading reduction of more than 300,000 pounds per year of total nitrogen and more than 66,000 pounds per year of total phosphorus since 2012.

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