

# Lake Apopka

## A decade of improvement now accelerating

### FAST FACTS

Once a world-class bass fishery, 50 years of abuse tagged Lake Apopka with the infamous title of Florida's most polluted large lake.

In response to the District's efforts, water quality has improved for more than a decade.

Phosphorus levels in the lake are down 56 percent, and water clarity is 54 percent better than earlier conditions.



### Location

Located in northwest Orange and southeast Lake counties, Lake Apopka is the headwaters of the Ocklawaha Chain of Lakes.

Fed by a natural spring, rainfall and stormwater runoff, water from Lake Apopka flows through the Apopka-Beauclair Canal and into lakes Beauclair and Dora. From Lake Dora, water flows into Lake Eustis, then into Lake Griffin and then northward into the Ocklawaha River, which flows into the St. Johns River.

### The lake's decline

Lake Apopka, once considered Florida's most polluted large lake, suffered a century of abuse beginning in the 1890s when construction of the Apopka-Beauclair Canal lowered lake levels by a third.

The decline of Lake Apopka can be traced to

- The loss of 20,000 acres of wetlands along the lake's north shore to farming operations beginning in the 1940s
- Agricultural discharges laden with phosphorus until the late 1990s
- Treated wastewater discharges from shoreline communities prior to the 1980s
- Discharges from citrus processing plants prior to the 1980s

The increase in nutrients discharged into the lake led to a chronic algal bloom, and Lake Apopka's waters turned pea green. The cloudy water prevented sunlight from reaching underwater vegetation critical to fish and wildlife habitat.

The continual settling of dead algae created a thick layer of soupy muck, which also destroyed the habitat necessary for fish and wildlife to thrive. The bass population significantly declined as gizzard shad became the predominant fish species in the lake. Once the bass disappeared, all the fish camps closed.

Downstream to the north, the pollution spread throughout the Ocklawaha Chain of

Lakes. To protect the Ocklawaha Chain, the flow of pollutants from Lake Apopka had to be stemmed.

### The restoration of Lake Apopka

The Lake Apopka Restoration Act of 1985 and Florida's Surface Water Improvement and Management (SWIM) Act in 1987 paved the way for restoration work to begin.

The primary goals for the restoration of the lake's ecosystem are to

- Reduce the amount of phosphorus going into Lake Apopka
- Remove phosphorus and other suspended sediments from the lake (by filtration through the Marsh Flow-Way and by mass removal of gizzard shad)
- Improve the food-web structure by removing gizzard shad
- Restore habitat through restoration of the shoreline (known as the littoral zone), increased fluctuation in lake levels and restoration of the north shore farmlands to wetlands

### Reducing the amount of phosphorus entering the lake

More than 85 percent of the phosphorus going into Lake Apopka was from farms on the lake's north shore. To combat this problem, the St. Johns River Water Management District and the U.S. Department of Agriculture (USDA) purchased almost all of the farms for restoration over the past decades, reducing discharges of excessive nutrients from those sites. The District then spread an alum residual over a portion of the former farms it purchased. The "soil amendment" acts like a magnet, trapping excess phosphorus as it leaves the soil, before it enters the water column. As of 2008, more than 55 percent of the former farm area is being restored.

In addition, the District's Governing Board approved a rule in 2002 limiting the amount of phosphorus that can be discharged into Lake Apopka or its tributaries as a result of new construction in the lake's watershed.

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## Harvesting gizzard shad

Removing gizzard shad from the lake removes the phosphorus contained in the shad's bodies as well as reduces the internal recycling of phosphorus within the lake. This improves water clarity by reducing the number of algae, which depend upon phosphorus for growth.

Harvesting shad from other lakes has resulted in an improved food web, reduced algae, improved water clarity and improved conditions for game fish populations. This procedure may produce the same results in Lake Apopka.

From 1993 through 2007, the District removed almost 15 million pounds of gizzard shad from the lake.

## Restoring aquatic habitat

The District has planted wetland plant species behind protective barriers in Lake Apopka to provide habitat for fish and wildlife. These planting efforts are becoming less necessary as the lake's water quality and clarity improve and native aquatic plants reestablish themselves.

An ongoing effort is under way to map the locations and extent of more than 350 native submersed plant beds.

Improved water clarity has also made it possible for the nonnative invasive plant hydrilla to grow in the lake. Hydrilla can quickly outcompete native plants, so staff efforts are focused on locating and treating these undesirable plants with herbicides.

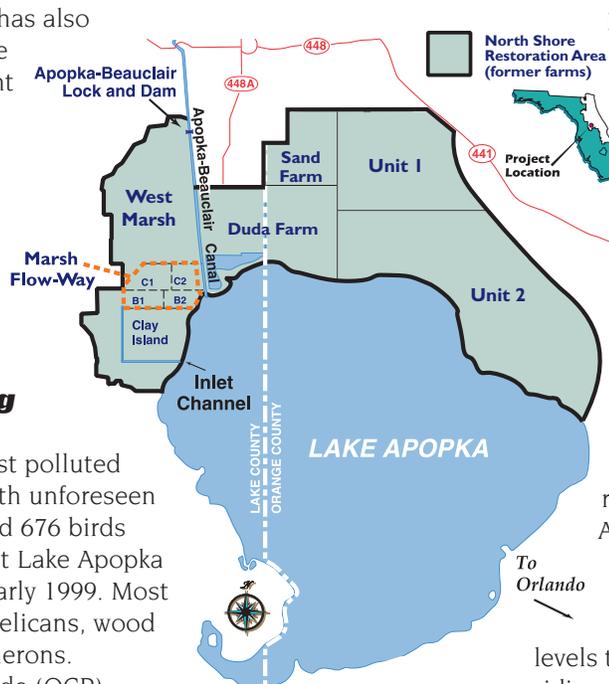
## Challenges along the way

Restoring Florida's most polluted large lake has come with unforeseen problems. An estimated 676 birds died on former farms at Lake Apopka during late 1998 and early 1999. Most were American white pelicans, wood storks and great blue herons. Organochlorine pesticide (OCP) residues remaining from agricultural practices were primary causative factors in, or the cause of, the death of many of these birds. Birds accumulated OCPs by consuming contaminated fish. The District has conducted research to better understand the accumulation of OCPs through the food chain, from contaminated soil to fish, and from fish to fish-eating birds. The knowledge generated guides restoration of the former farmlands at Lake Apopka and is also applicable to other projects designed to restore ecosystems impacted by agriculture.

## Major accomplishments

The District has partnered with local, state and federal agencies to

- Purchase more than 19,000 acres of agricultural land along the lake's north shore, reducing the discharge of phosphorus from the farms and providing an opportunity to restore the former marshes to wetlands
- Reflood 2,500 acres of the former Duda Farm to expand wetland restoration
- Operate the marsh flow-way since November 2003 and, in the process, filter 1.7 times the lake's volume — resulting in the removal of 30.9 million pounds of suspended solids, 685,800 pounds of nitrogen and 19,842 pounds of phosphorus
- Harvest almost 15 million pounds of gizzard shad, removing more than 100,000 pounds of phosphorus with their bodies and preventing them from recycling phosphorus by feeding in the lake sediments
- Replant six native wetland species of vegetation in the water along the lake's shoreline, which helps restore fish and wildlife habitat
- Work with the Friends of Lake Apopka and the East Central Florida Regional Planning Council to develop a plan to ensure that future development does not negatively impact the lake



Lake Apopka's water quality has improved for more than a decade in response to the District's efforts. Phosphorus levels in the lake are down 56 percent, and water clarity is 54 percent better than earlier conditions. The continued improvement, despite back-to-back years of busy hurricane seasons, is even more impressive. In response to these improvements, native submersed plants have re-established themselves at almost 350 locations around the lake. The control of invasive hydrilla is emerging as a critical part of the restoration program.

Future improvements are anticipated as more former farms on the lake's north shore are reflooded. District staff have developed a remediation plan for the North Shore Restoration Area consisting of infrastructure improvements to reestablish independent flooding blocks. Recent soil testing shows that about 3,000 acres need mechanical remediation to reduce contaminant levels to safe levels for fish and wildlife. The USDA is providing matching funds in two cost-share agreements to complete this work by 2010. As areas are reflooded, fewer nutrients will be pumped into the lake, accelerating expected improvements in water quality.

## Related topics

For additional information related to Lake Apopka, visit the District's Web site at [www.sjrwmd.com/publications/factsheets.html](http://www.sjrwmd.com/publications/factsheets.html) for the following downloadable fact sheets:

- Lake Apopka Marsh Flow-Way
- Harvesting gizzard shad

