



Photo by Mark Pollitt



ORLANDO EASTERLY WETLANDS RECLAMATION PROJECT: From Experiment to Success

Orlando Easterly Wetlands Reclamation Project: From Experiment to Success

With over a quarter century of demonstrated performance, the Orlando Easterly Wetlands proves large-scale, created wetlands remain resoundingly successful on a long-term basis for both the advanced treatment of wastewater and beneficial reuse.

PREEXISTING CONDITIONS

The Iron Bridge Regional Water Reclamation Facility went on-line in 1982 to serve the City of Orlando's rapidly growing northeastern communities. The plant was designed to treat sewage from 400,000 people in the cities of Orlando, Winter Park, Maitland, and Casselberry, and unincorporated portions of Orange and Seminole Counties. The plant discharged treated nitrogen-rich reclaimed water directly into the sensitive Little Econlockhatchee River and soon overshot EPA regulated effluent nutrient levels. A Consent Decree was issued, forcing Iron Bridge to reduce nitrogen concentrations in the effluent. The plant was already operating at nearly full capacity, 24 mgd, and had no opportunity to increase its existing waste load allocation.

Studies identified the use of a wetlands treatment system as a viable solution for accepting treated wastewater. At the time, there were no existing large-scale wetland treatment systems to serve as an example for the City Environmental Services staff, consultants, or permittees. With the cooperation of all parties, work began on a 1200



Orlando Easterly Wetlands Aerial Photo

acre, man-made wetland to provide advanced nutrient removal for up to 20 mg of treated wastewater effluent.

The site selected for creation of the Orlando Easterly Wetlands was located on 1,650 acres in east Orange County, Florida, approximately two miles west and southwest of the main channel of the St. John's River. Surveys performed in 1848 indicate that portions of the site had once been a wet prairie, with smaller areas consisting of hardwood swamps and hammocks. During the 1940's, the land was ditched and drained for agricultural development, redirecting the water straight into the St. John's River. This drainage system diminished the groundwater table so that wetland vegetation could no longer be sustained throughout the site.



PROJECT DESIGN

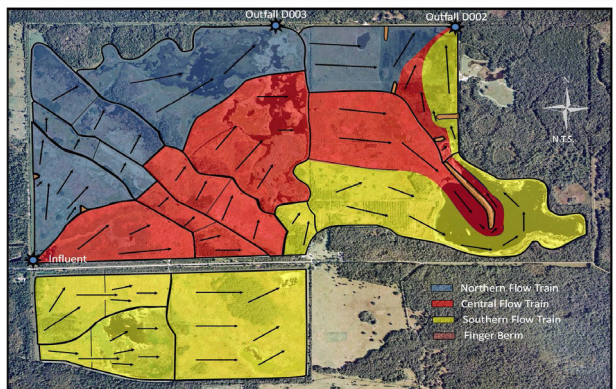
The Orlando Easterly Wetlands began as a project of the City of Orlando, Florida as an effort to reuse treated effluent from the Iron Bridge Regional Water Reclamation Facility for environmental enhancement. The placement of a 17 mile, 48-inch diameter pipeline established the connection between Iron Bridge and the Orlando Easterly Wetlands. The construction of over 18 miles of earthen berms created 18 cells designed to facilitate the flow of water. The city planted 2.1 million aquatic plants to “polish” the reclaimed water before discharging it into the St. John’s River system.

The Orlando Easterly Wetlands contains three vegetative communities. A 410-acre deep marsh, comprised primarily of cattail and bulrush, accomplishes a majority of the nutrient removal. A 380-acre mixed marsh, comprised of more than 60 submerged and emergent herbaceous species, provides additional nutrient removal and wildlife habitat.

The third community, a 400-acre hardwood swamp, was planted primarily to increase wildlife habitat. The City planted more than 100,000 tree seedlings

along with an herbaceous understory to create the hardwood swamp. A 90-acre lake located within the swamp provided the necessary fill material for the construction of the wetland berms and now provides excellent wildlife habitat.

Water entering the wetlands from the Iron Bridge Facility divides into thirds at the influent control structure and is routed through three separate flow pathways within the wetland system. With a 15 foot drop in elevation from start to finish, gravity controls the flow of water. 67 water control structures regulate water levels and direction of the water flow. Water leaving the wetlands is channeled in a ditch along the north property boundary to the St. John’s River. Control Structures allow the water to flow through the ditch to the St. Johns River or across natural marshes.



Orlando Easterly Wetlands – Flow Train Schematic



WATER QUALITY

As part of its permit requirements, the City established and continues a stringent monitoring program within the wetland system. The 29 year (December 1988 - December 2017) average concentration of total nitrogen (TN) and total phosphorus (TP) within the discharge is consistently below permit limits of 2.31 mg/L TN and .20 mg/L TP. More than 75 percent of the TN and TP removal appears to be occurring within the first 10-20% of the wetlands. Studies conducted within Cell 1 in 1994 demonstrated that most of the TN removal occurred within 2,000 feet of the influent structure. Most of the TP removal occurred within 2,900 feet of the influent structure. Studies performed in 1997 and again in 2012 indicated that the Orlando Wetlands Park could successfully treat flows in excess of 40 mgd.

Concentrations in water leaving the created wetlands have also been below the TN and TP concentrations measured in the receiving water body, the St. John's River. Samples are collected in the river upstream and downstream of the Orlando Wetlands Park.

WILDLIFE HABITAT

With the consistent performance of the OEW in nutrient removal, the City focused on providing wildlife habitat. Nearly two-thirds of the Orlando Easterly Wetlands project was designed to encourage and maximize wildlife usage. Continued vegetation management activities provide more

open water habitat and have resulted in an increase in wildlife utilization. As shown in Table 1, numerous species that are listed by the state or federal government as threatened, endangered or special concern utilize the habitat. Copious numbers of other animals include resident river otters, white-tailed deer, bobcats and alligators.

TABLE 1- LISTED WILDLIFE OBSERVED AT OEW

BIRDS		
American oystercatcher	Haematopus palliatus	SSC
Audubon's crested caracara	Polyborus plancus audubonii	FT
Black skimmer	Rynchops niger	SSC
Brown pelican	Pelecanus occidentalis	SSC
Florida sandhill crane	Grus canadensis pratensis	ST
Least Tern	Sterna antillarum	ST
Limpkin	Aramus guarauna	SSC
Little blue heron	Egretta caerulea	SSC
Roseate spoonbill	Platalea ajaja	SSC
Snowy egret	Egretta thula	SSC
Southeastern American kestrel	Falco sparverius paulus	FE
White ibis	Eudocimus albus	SSC
Wood stork	Mycteria americana	FE
REPTILES		
Gopher tortoise	Gopherus polyphemus	ST
Sand skink	Neoseps reynoldsi	FT
MAMMALS		
Sherman's fox squirrel	Sciurus niger shermani	SSC

Federally-designated Endangered (**FE**),
 Federally-designated Threatened (**FT**),
 State-designated Threatened (**ST**)
 State Species of Special Concern (**SSC**).

TABLE 2-SUMMARY OF ANNUAL AVERAGE OEWE EFFLUENT TOTAL NITROGEN AND TOTAL PHOSPHORUS CONCENTRATIONS

Year	TN (mg/L)			TP (mg/L)		
	HS10(a)	SJR1(b)	SJR5(c)	HS10	SJR1	SJR5
1988	0.84	0.87	0.87	0.1	0.14	0.15
1989	0.92	0.88	0.89	0.08	0.07	0.07
1990	0.93	1.08	0.89	0.09	0.1	0.08
1991	0.8	1.05	1.09	0.09	0.05	0.12
1992	0.74	1.25	1.05	0.06	0.09	0.11
1993	0.76	1.14	1	0.06	0.07	0.09
1994	0.68	1.16	1.06	0.05	0.07	0.08
1995	0.73	1.35	1.23	0.05	0.07	0.08
1996	0.69	1.46	1.3	0.05	0.11	0.09
1997	0.84	1.45	1.28	0.04	0.07	0.07
1998	0.84	1.5	1.39	0.05	0.08	0.09
1999	0.84	1.93	1.44	0.06	0.1	0.11
2000	0.84	2.47	1.93	0.06	0.11	0.09
2001	0.88	2.23	1.91	0.07	0.07	0.11
2002	0.77	2.16	1.77	0.075	0.083	0.116
2003	0.78	1.98	1.51	0.07	0.071	0.078
2004	0.92	1.98	1.49	0.06	0.099	0.092
2005	0.84	1.78	1.37	0.088	0.077	0.08
2006	0.94	2.19	1.76	0.129	0.087	0.104
2007	0.98	2.28	1.73	0.066	0.116	0.1
2008	1.2	2.68	2.35	0.062	0.113	0.106
2009	1.16	2.87	2.14	0.041	0.106	0.093
2010	1.01	2.84	1.92	0.041	0.12	0.088
2011	1	2.58	2.1	0.036	0.093	0.088
2012	0.96	2.31	1.99	0.036	0.085	0.084
2013	0.89	2.07	1.86	0.037	0.072	0.073
2014	0.88	1.65	1.42	0.079	0.086	0.088
2015	0.95	1.83	1.19	0.075	0.08	0.046
2016	0.8	1.55	1.28	0.051	0.082	0.075
2017	0.87	1.66	1.42	0.068	0.109	0.106
Average	0.88	1.81	1.49	0.064	0.089	0.092



WETLAND RENOVATION

After numerous research efforts and studies, it was determined that the time had come where it was necessary to remove the decayed biomass which had accumulated in the wetlands over the years. In August of 2002, the OEW underwent its first wetland renovation. Renovations have continued ever since. During each renovation, approximately 18" of muck is removed from the bottom of the treatment cells.

Once the muck is removed, it is landfilled on the OEW property and then used commercially as topsoil/ fill material. Once final grading has been achieved, aquatic plants are reinstalled. Typically, beneficial plants such as giant bulrush, pickerelweed, duck potato and other native plants are sought after for their phosphorus removal abilities and usefulness to wildlife.



Bulldozers begin to pile up the vegetation and accumulated muck



Muck is piled into rows and allowed to dry out



The muck is loaded into trucks and removed from the cell.



The renovated wetland cell is re-flooded.

COMMUNITY PARTICIPATION AND EDUCATION OUTREACH

The Orlando Easterly Wetlands is open as a City of Orlando park 365 days of the year, from sunrise to sunset. It is estimated that over 44,000 people visit the park annually. Over the past decade there has been a 165% increase in visitorship.

The park offers many passive recreational opportunities including hiking, nature photography, bicycle riding, and equestrian trail riding. The City of Orlando began sponsoring the Orlando Wetlands Festival in 1999 and it has since grown into a large community event drawing crowds of between 3,000-6,000 people.

The park offers an abundance of scenic views for visitors who wish to enjoy the beauty of Florida wildlife in a natural habitat. Environmental organizations participate in various activities within the park, such as semi-annual butterfly surveys, native plant hikes and bird counts. The Orange Audubon Society frequently sponsors bird watching tours. The Florida Native Plant Society sponsors park planting projects and contributes to education programs and events.

Community participation at the park also involves volunteer support from the Friends of the Orlando Wetlands who work to enhance wildlife habitat and provide educational tours including free public tram tours on the weekends. It is estimated that volunteers give tours to over 3,800 people per year. The Friends of the Orlando Wetlands volunteers annually contribute over 3,500 hours of their time. That equates to a labor cost savings to the City of approximately \$72,000 annually!

Every year, almost 2,000 people from schools, educational special interest clubs, and professional organizations participate in the Park's educational, hands-on guided tours and outreach programs. Students and researchers from University of Central Florida, Rollins College and University of Florida also use the park as a natural laboratory, research facility, and an example of the current trend towards socially responsible environmental management. Additionally, tours are routinely given to government officials and foreign delegates interested in economical alternatives for the treatment and disposal of reclaimed water.

Over the years, Eagle Boy Scouts have completed their Eagle Scout projects by generously donating their time and talents to the Park. Some of the projects have included construction of a Chimney Swift Tower, Bat Houses, Bluebird Houses, a Wildlife Garden Bridge, and Native Plant Landscaping areas.



Lake Silver Elementary
Photo credit: Sandy Bauerschmidt



ORLANDO WETLANDS PARK

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