

## **Constructed Wetlands for the Regeneration of Water Supplies**

**Dr. Ronald F. Turco, Dr. Zac Reicher Dr. Jon Harbor**

### **Purdue University**

#### **Goals:**

Our over all goal is to evaluate the use of a "closed-loop" constructed wetland treatment system to improve urban water quality.

- Develop the use of a golf course constructed wetlands to improve residential runoff;
- Assess the ability of a constructed wetlands to protect adjacent and highly sensitive natural wetland environment;
- Evaluate the Regeneration of water supplies for golf course use.

Previous USGA-funded studies have documented the chemical makeup of water formed during golf course runoff and leaching events. Our work goes beyond monitoring to assess how innovative golf course water quality management, based around a constructed wetland, can not only reduce golf course water quality concerns but how this approach can be made part of a system that reduces water pollution concerns from adjacent non-golf course sources. Not only do the wetlands accept water originating from the golf courses but also runoff from a watershed that includes a gas station, retail businesses and parking lots, over 500 residences, and 2 major city highways. The quality of water will be monitored throughout the system for nutrients, pesticides, salt, automobile fluids, and other possible contaminants. From earlier results from across the country, the quality of water originating from the golf course is expected to be good. We have established an innovative management scheme in which golf course runoff and urban runoff are passed through created wetlands and then used as the primary water source for golf course irrigation. This arrangement is designed to both reduce impacts from the golf course and commercial / residential runoff, on an important wetland adjacent to the golf course and to provide a reliable source of water for golf course irrigation. This approach will provide a blueprint that allows for a reduction in golf course nutrient applications and groundwater withdrawals for irrigation. USGA funds are will providing for the research efforts to develop and disseminate information on performance of this system.

This project is a model for any location where a golf course interfaces with natural areas or other high value property. The ability of the constructed wetland to remove contamination is being evaluated and documented. The use of the wetland system to clean and remediate roadway water and water from commercial and residential areas is also being followed. For locations where water is expensive or not available, this approach may prove to be an extremely useful way to improve water supply. This approach will add environmental value to the golf course, as roadway water that would have been directly discharged, untreated, to surface water will be treated before release.

**Testable points:**

- 1.) Water treatment on a golf course can be a valuable contribution to the adjacent landowners and protect surface water quality.
- 2.) The regenerative ability of the constructed wetland will eliminate both organic and nutrient contamination preventing harm to the adjacent wetland.
- 3.) The use of a constructed wetland provides a simple and acceptable approach to stabilizing the irrigation water supply for the golf course.

**Progress Report:**

Work to date has concentrated on the integration of the constructed wetland and the golf course. Purdue University's athletic department constructed the Kampen Golf Course which opened in the Summer, 1998 adjacent to the new Turfgrass Research and Diagnostic Center. The Kampen Golf Course is a Pete Dye designed facility intended to display state-of-the-art environmentally sensitive golf course management as well as providing an excellent playing surface. In order to meet real and anticipated environmental problems, the Kampen golf course design includes a series of constructed wetlands between the course and the adjacent natural wetland. Moreover, the course is constructed to capture water from the adjacent city highway and residential area. The constructed wetlands will intercept and process runoff, tile water directly from golf course, and also the water captured from the adjacent urban road, commercial, and residential areas.

We have completed installation of sampling equipment (flow meters, samplers, infield chemical detection systems) at five of the six sites established as part of this project on the constructed wetland. The samplers began running in September of 1998. However, we have not had a significant enough storm to allow for water collection. It is fully anticipated that most of our run off collections will be starting within the next five weeks.

**Description of sample sites:**

- Site 1. Evaluation of the "typical" water flowing from a mature residential and light industrial setting to the golf course.
- Site 2. By subtraction (site 1 from 2), water quality and quantity from a greens-fairway complex.
- Site 3. The treatment ability of a single wetland cell for municipal water as well as golf course materials (site 2 from 3).
- Site 4. Water quantity and quality as affected by treatment in cell series (site 1 from 4).
- Site 5. Water volume and quantity for untreated conditions. By subtraction (site 4 from 5), the impact of a wetland series on the quality of discharge waters.

We are presently employing a technician on the project. To date, the funds for the technician have come from matching monies on the project. We are presently search for a student to be employed on the project. We have several excellent applications and hope to have someone in place by January of 1999.

**Project Timetable**

<b>Item</b>	<b>Finish Date</b>	<b>Projected Finish Date</b>
Finish Construction of Created Wetlands	March 1998**	
Secure Funding	June 1998	
Hire technician	June 1998	
Installation of sampling structures, wiers, etc	Aug 1998	
Installation of samplers	Sep 1998	
Begin water quality sampling		Oct 1998
Hire MS, PhD student		Jan 1999
1st complete year of data		1999
2nd complete year of data		2000
3rd complete year of data		2001
4th complete year of data		2002

**Funding:**

**Start Up**

\$35,140	Pete Dye	Water sampling
<u>\$56,900</u>	Pete Dye	Installation, 1st year salary etc
\$92,040		

**Annual support**

\$25,000	USGA	Graduate stipend, etc.
\$31,500	Heritage Environmental	Water testing
<u>\$36,000</u>	Pete Dye	Technicians Salary etc
\$92,500		