

Water Quality Management on Purdue's Kampen Golf Course

Zachary Reicher, Vickie Poole, Ron Turco, Amanda Lopez and Jon Harbor

Objective

The objective of this study is to determine how effective created wetlands are in filtering water runoff from commercial, residential, and golf course areas before the water enters a highly valued environmental area. Our overall goals include:

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

Rationale

It is established that pesticides and fertilizers when applied properly to golf course turf do not move off-site through runoff or leaching. Golf courses may actually improve the water quality in streams and rivers flowing through the course. This project takes this idea one step farther to determine if the created wetlands on Purdue's new Kampen Golf Course can filter possible impurities in runoff from the adjacent neighborhood. The neighborhood includes two residential highways, parking lot of a motel, a gas station, and 200 residences. The water flowing through the Kampen Course eventually enters Celery Bog, a nature center that contains a natural wetland. Prior to reconstruction of the Kampen Course, residential runoff entered Celery Bog directly through drainage tiles and overland transport. This five-year study is part of a larger project monitoring the larger watershed including industrial, agricultural, and commercial sites.

How It Was Done

After construction of the Kampen Course was finished in 1998, water quality samplers were installed at six points throughout the created wetlands. The samplers were located to track the progress of water as it enters the east edge of the courses, through the wetland system, and exits the far northwest edge of the course. The water is sampled continuously for temperature, pH, oxygen content and other quality parameters. During storm events, water is sampled for contaminants such as nutrients, pesticides, salt, metals, petroleum products, etc. It is thought if any contaminants will be identified in the system, it will most likely occur during or immediately after a storm event. All water samplers were installed by Sep. 1998 and storm events were analyzed in Nov. 1998, June and Nov. 1999; Aug. and Nov. 2000; and June, Sep. and Dec. 2001. To further understand the system, water was sampled twice in 2002, only during non-storm periods.

Results to Date

- Nine storm events have been analyzed thus far and the created wetlands are efficiently improving the quality of water as it moves through the system. Specifically, key parameters like nitrogen, phosphorus, and oxygen demand are consistently decreased as the water moves through the wetlands.

- As the golf course and wetlands mature, they are becoming more efficient in improving the quality of the water as it flows through the course. For instance, 14 parameters or contaminants indicated a decrease in water quality from the urban runoff (Site 1) to the water exiting the golf course (Site 6) in Nov 1998 sampling while only 4 parameters or contaminant levels indicated an improvement in water quality between the urban input and the water exiting the course. But in the Dec. 2001 sampling, 13 parameters or contaminants indicated an improvement in water quality from the urban runoff to the water exiting the golf course while only 5 parameters indicated a decrease in water quality
- Most of the parameters that indicate a decrease in water quality as the water moves across the course are minor parameters that would be typical of leaching out of sand bunkers such as calcium and magnesium. However, concentrations of potassium have increased on six of nine 4 sampling dates. These sampling dates do not correspond with potassium fertilizer applications so the source of potassium is unknown. Thankfully, potassium is insignificant in its effects on water quality.
- No unusually high levels of any of a wide array of potential pollutants, including pesticides and metals were detected at the golf course sampling sites. However, atrazine was detected twice in the urban runoff, in June 1999 and April 2001. The level of atrazine was reduced on both dates between the urban input and the water exiting the course.
- Surprisingly, even from the urban runoff there is no measurable oil and grease. It is reassuring to note that heavy metals of concern, such as mercury and lead, are below detection limits in all samples.
- No unusual contaminants were found in the non-storm samples of 2002, and all contaminants were well below drinking water standards for IN.
- All of the flow data for the site is now available on CD-ROM and is currently being analyzed for patterns and characteristics.
- We are currently analyzing all of the data collected throughout the study for publication in both refereed articles and trade publications.

Acknowledgments

The work reported here would not have been possible without the support and assistance of numerous people and organizations. Thanks goes to Jim Scott, superintendent of the Birck Boilermaker Golf Complex for his patience and cooperation. Financial and in-kind support for water quality monitoring on the Kampen Course was provided by the United States Golf Association, Pete Dye, Inc, and Heritage Environmental.

Figure 1. Schematic of water sampling sites in Kampen Course water monitoring project (not to scale). Numbers inside boxes indicate sampling sites.

