Innovative Water Quality Management Utilizing Wetlands Construction on a Golf Course

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Objectives:

1. Use a golf course wetland to improve residential runoff.
2. Protect and improve a sensitive wetland environment.
3. Regenerate water supplies for golf course use.

Start Date: 1998
Project Duration: 5 years
Total Funding: $125,000

When applied properly to golf course turf, pesticides and fertilizers do not move off-site through runoff or leaching to any large extent. 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 constructed wetlands on Purdue's Kampen Golf Course can improve water quality 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 natural wetland.

The Kampen wetland system is now coupled to the irrigation supply pond for the golf course as a whole. This has created a recycle water supply for the golf course that minimizes the need to pump groundwater for use in irrigation. This should reduce the operations cost as the well pump will be run much less.

The wetland system has proved to be highly effective at protecting the adjacent natural areas for two reasons: 1) chemical retention and degradation within the constructed wetland is significantly high and 2) the connection of constructed wetland with the irrigation system has kept the water discharged into the natural areas at a low level.

Kampen Golf Course wetland system has proved to be highly effective at protecting the adjacent natural areas.

Detailed water flow studies are being finalized and chemographs are being developed that relate water flow to the distribution of potential pollutants as indicated by the use of dye tracers. In these studies, tracers (blue and red food dyes) were released and their progress through the wetland monitored.

To follow the progress of the dyes at other than the exit point, a network of water sampling points were established across the wetland cell. Thirteen water sampling points formed a grid system that could be monitored without disturbing the sediments or the ambient water flow. This approach allows us to develop a map of dye movement as related to water flow, time and water volume. Samples are collected using peristaltic pumps.

Our data indicate that water flow direction within a small wetland is not uniform process. These data indicate that for what looks like a uniform water body within a wetland cell, there are regions where the water is flowing at different speeds. While the major mass of the applied chemical tends to move towards the exit point, a significant portion of the water (dye) will be redistribute across the wetland cell often in the opposite direction of the major water flow.

Our data also indicate that the water (dye) exiting the wetland may spend many days in the cell before it leaves the wetland. For shallow wetland systems, wind speed and direction may also be a major factor dominating water flow direction. Slower regions are significant in that biological reactions will have time to occur as the biological profile in these slower locations are different from the faster regions. These data indicate that retention on soils, sediments and plants is playing a major role in retaining the chemical.

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Summary Points

- Recycled water, water that has been treated in the wetland, is now being used for golf course irrigation lessening the need to pump groundwater.
- The wetland system is very effective at removing nitrogen from incoming runoff water. This confirms the value of the wetland as a treatment system.
- Dye tracer studies indicate that water takes from three to five days to traverse even a small cell, and the wetland cell needs to be designed to increase the resident time of the water in the cell.
- Dye tracer studies indicate that in small wetland systems wind can have a significant affect on the distribution of materials.