



## CONSTRUCTED WETLANDS

### Filtering Naturally

When you think about a water treatment facility do you picture a conventional wastewater treatment facility or strategically designed wetland? You may be surprised to learn that constructed wetlands are currently in use both in North America and abroad to treat an array of industrial, municipal and residential wastewater including: municipal effluent, agricultural runoff, storm water, animal wastewater, mining runoff and landfill leachates. In 2004 the US Environmental Protection Agency (EPA) estimated that as many as 6000 constructed wetlands were in operation across Europe and the United States. Furthermore these systems are in use across Canada, with over 100 systems found in Ontario alone.

### What is a Constructed Wetland?

Simply put a constructed wetland is a treatment system designed to mimic the natural process of filtration that occurs in wetlands. These complex systems function as a result of the interaction between water, plants, microorganisms, light, air and the substrate, or underlying gravel or soil.

Constructed wetland treatment systems come in many shapes, forms and sizes. The design of these systems are dictated by the nature and volume of wastewater they will be used to treat. Wastewater can be divided into two broad categories: **Grey** or **Blackwater**. Greywater constitutes the majority of wastewater produced in the average household. It is water that has been used for activities such as laundry, washing dishes or bathing and as such it is relatively easy to treat. Conversely Blackwater, or water containing untreated sewage, contains pathogens and high concentrations of organic material making it more complex to treat.

### *Did you know...?*

*Since the constructed wetland at the Camp Kawartha Environment Centre only needs to process a limited amount of Greywater it was built inside. By locating it close to the washrooms it was not necessary to install a pump to move the water from the sink to the holding tank: instead the tank was positioned underneath the sink and gravity moves the water for us.*

### How do They Work?

Naturally occurring and constructed wetlands work to purify water in the same way. As water slowly moves through the wetland, pollutants, organic material and nutrients become trapped by the root system of aquatic plants. Nutrients, such as nitrogen and phosphorus, are absorbed by plants through their root system. Bacteria also plays an important role in the filtration process by transforming or rendering contaminants into less soluble or inactive forms.

### *Did you know...?*

*Water flows into the constructed wetland at a rate of less than 40 mL per minute so it takes over two days for water to move the length of the wetland system.*

### Why Build a Constructed Wetland?

There are numerous economic and environmental reasons to use a constructed wetland system to treat wastewater. Strengths of the constructed wetland system include an ability to maintain water quality even in less than ideal conditions, they are inexpensive to operate and maintain compared to convention facilities and depending upon design they can have high esthetic appeal.

### Water Quality

Constructed wetlands have been shown to maintain water quality despite sudden changes in volume or organic content. Additionally research is increasingly showing the superior ability of wetlands to neutralize complex compounds such as pharmaceuticals or pesticides over conventional chemical or mechanical methods.

#### *Did you know...?*

*Although the Camp Kawartha Environment Centre has a septic tank it requires minimal maintenance as the water draining into it has already been treated by the wetland.*

### Cost

Since constructed wetlands have few, if any, electrical components they are not prone to malfunction. In fact the organic components (i.e. plants or substrate) of some constructed wetland systems have been in consistent use for over 30 years without needing to be replaced. Furthermore as these systems are largely self-sufficient, requiring no chemicals or electronic systems to operate, they require only minimal staffing.

### Esthetic Value

Constructed wetlands are incredibly adaptable and as such come in many forms, such as solar aquatic installations which can be found in numerous greenhouses across the country. These systems not only purify water but can also improve indoor air quality. Larger scale projects, such as the 12 acre Tres Rios Project in Arizona are also in use. This system, built to treat municipal wastewater, was constructed in anticipation of stricter water quality regulations in the 1990's. Small residential systems, such as the one at the Camp Kawartha Environment Centre, can also be built. However home owners need to be aware of city building codes and by-laws before starting construction.

#### *Did you know...?*

*The constructed wetland at the Camp Kawartha Environment Centre contains Red Bog Lily, Society Garlic, Spider plants and 3/4 inch clear gravel, all of which house colonies of important microorganisms vital to the filtration process.*

<http://www.campkawartha.ca/environmentcentre/>

Photo Credit: Shelby Parker



For more information about constructed wetlands check out these resources;

Kadlec, Robert & Wallace, Scott. (2009). *Treatment Wetlands: Second Edition*. Boca Raton: Lewis Publishers

<http://www.epa.gov/owow/wetlands/watersheds/cwetlands.html>

<http://ag.arizona.edu/azwater/arroyo/094wet.html>

<http://www.constructedwetlands.org/>

<http://www.epa.gov/wetlands/construct/>

### Bibliography

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([www.epa.gov/owow/wetlands/pdf/ConstructedW.pdf](http://www.epa.gov/owow/wetlands/pdf/ConstructedW.pdf))

Fleming Centre for Alternative Waste Water Treatment  
([www.flemingc.on.ca/CAWT/index](http://www.flemingc.on.ca/CAWT/index))

**THE CAMP KAWARTHA**  
Environment Centre



February 12, 2010