

Created Wetland Wastewater Systems

For Use in Door County

A Homeowner's Guide To New Technology

Door County Environmental Council

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As a viable alternative to mound systems and as a replacement for failed or outdated septic systems, the new and innovative *created or engineered wetland* method of treating the effluent is now approved for use in Wisconsin. This system utilizes a conventional septic tank for basic bacterial treatment and replaces the conventional drainage field or mound that has been required in many instances.

The wetland system operates on the natural absorption of liquid by plants and the utilization of nutrients as the wastewater effluent moves slowly through the gravel media in the cell. The extensive root systems of these plants can convert amazing amounts of water and nutrients into plant growth above the cell.

HOW THE SYSTEM OPERATES

A wetland system consists of a rectangular cell (large flat area surrounded by a berm much like a wading pool) which contains a pea-sized gravel media bed through which the effluent migrates slowly.

As the wastewater effluent moves through the cell, the nutrients and much of the liquids are absorbed by the fast-growing plants on the surface, plants that are specifically cultured to consume water and nutrients. The cell is disconnected to the septic tank in the same manner as a drainage field or mound. A pump may be necessary to move the effluent to the cell if elevation problems require it.

Any water discharged at the far end of the cell can either be returned for re-treatment or continue on through a sand bed for dispersal. Another sometimes used option is a second small wetland without a liner. In most situations there would be no discharge during the fast growing season and this discharge if any is treated as cleaned water.

AEROBIC or ANAEROBIC

Most of the homeowners choose to keep their wetland systems as *anaerobic* which means that it operates without supplementary oxygen as a conventional septic and mound system does. This method of operation is superior in performance to a mound system, removing more of the natural ammonia/nitrates and is the most economical method of operating the system.

In locations where increased nutrient removal is necessary an alternative is to supplement the oxygen in the cell with applied air forced into the system by mechanical means, making the system *aerobic* (with air supplied). This method is more effective in removing ammonia/nitrates and creates even cleaner more complete removal of these compounds.

This method also requires a small air blower with a motor to inject air into the treatment cell and thus would require some added maintenance. In some instances it may be desirable to return any liquid from the discharge outlet of the cell. This can be easily returned to the input end of the cell and will go through the entire process again. This also will require a small float-controlled pump and additional pvc piping back to the inlet but removes even more of the ammonia/nitrates.

We are very fortunate in Wisconsin to have these systems operating and in place for several years. A large wetland system has been functioning at Riveredge Nature Center at Newburg, and another is in operation at the Kettle Moraine Lutheran High School in Jackson, WI.



Dave Flowers, PE Natural Water Solutions of Cedarburg, Wisconsin, has been engineering these systems along with **Tom Mellon**, Biology/Science Instructor at Kettle Moraine Lutheran School where Tom oversees the operation of that system along with students.

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WETLAND SYSTEMS IN OPERATION

DCEC has been involved in examining these systems for more than ten years, with field trips to the existing wastewater facility at Riveredge Nature Center near West Bend (Newburg) and in discussion with the staff at the Kettle Moraine Lutheran School, at Jackson, WI, where there is a recycling closed system in place. The Cross-roads at Big Creek has a segment of the demonstration project, engineered by Baudhuin Inc. of Sturgeon Bay, functioning as a small created wetland.

A proper created wetland system would be a very cost effective way for a neighborhood of failed system owners to solve their wastewater problems. By working together in a cooperative manner to find a suitable location for a large enough created wetland, they can meet all of their wastewater needs into the future with minimal impact on the local environment.



These new engineered wetland systems are especially adaptable to locations where the soil is shallow or marginal (preventing a conventional drainage field). They also can be used in areas where limited lot size and location, poorly drained location, or where a previously overloaded or failed drainage field prevent installation of a conventional system.

BUILDING THE WETLAND CELL

To visualize how a homeowner *Created (engineered) Wetland System* is constructed and to learn about its operation, we will need to begin with a conventional septic tank that has been approved for continued or new use. The effluent that normally would exit the septic tank into a drainage field is piped (under a controlled flow) to a newly constructed wetland cell that is engineered to allow large native plants to grow on the surface. These surface plants will have roots extending downward to absorb the nutrients and moisture from the effluent as it slowly migrates through the wetland cell. If the cell is designed large enough there will be very little cleaned water leaving at the far end of the cell. No one will ever come in contact with water as it is being cleaned. The water level remains below the surface.

The "cell" is constructed in any reasonable configuration; square, rectangle or long/narrow and is sized to accommodate the household being served. The "cell" begins as an excavated level area with a 1/2 % slope (one-half inch in ten feet) toward the exit end and with a berm around the perimeter. The depth usually will be about 24" depending on volume needed and the amount of soil that can be excavated. The berm can be utilized to establish the necessary depth. The size is variable, with a suggested size of the cell for an average home at 1,000 to 2,000 square feet (40 X 50) and almost any cell configuration is possible.

LINING THE WETLAND CELL

This cell is then lined with an **impervious (permanent and sealed) liner** to prevent leakage. With the entrance and exit piping in place, the cell is filled with pea-sized gravel to a depth of 18". (No fine material is allowed in the cell pea-gravel media) This is covered with a **pervious** covering membrane to allow plant root penetration, with another 6 or 8 inch layer of topsoil placed on top to support the plants that will be growing on top of the cell.

