Constructed Wetlands a Natural Water Filtering System for Conservation

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Abstract

Natural wetlands such as marshes, swamps and bogs protect water quality. Constructed or artificial wetland systems mimic the treatment that occurs in natural wetlands by relying on plants and a combination of naturally occurring biological, chemical and physical processes to remove pollutants from water. As of 1999, there were more than 500 constructed wetlands in Europe and 600 in North America. Constructed wetlands are a less energy intensive and more environmentally sound way of treating wastewater and conserving potable water. A small (20' x 20' x 4') constructed wetland can clean all black, gray and other runoff water for the average home. This will supplement harvested rain water. Harvested rain water that is used to flush toilets and for other cleaning uses can be reclaimed using a constructed wetland. The demonstrated effectiveness of constructed wetlands for wastewater treatment provides useful lessons to create buffer zones for various types of contaminated water. Constructed wetlands not only reclaim water but provide needed habitat for wildlife. Even a small one (20' x 20') will serve as a lush oasis, attracting birds, butterflies, toads and other animals.
The first single-family home constructed wetland in southern Nevada was completed eight years ago. This wetland has been regularly monitored since then and has shown excellent filtering capabilities. Two larger constructed wetlands, part of the school grounds and science projects in the Albuquerque, New Mexico School District, have had similar success.

Water facts:
Annually more than 4 million children die from water borne diseased worldwide. Each year 1.2 billion people suffer from diseases caused by unsafe drinking water or poor sanitation. Unsafe water is responsible for 80% of all diseases and 30% of the deaths in the developing world. The United Nations estimates that 2/3 of humanity will face shortages of clean freshwater by 2025. In and of themselves, these facts are appalling, yet they are even more so when you know that a simple wetland at a home or village town or other community venue can change that.

Wetlands are one of nature's most efficient and common ways to clean water. Constructed wetlands mimic the natural process that is both economical and environmentally sound. Constructed wetlands can filter and thereby conserve not only runoff water but also gray and black water. Because they rely on natural methods such as gravity flow and few if any chemicals, they are both energy efficient and environmentally

sound. No energy is needed to transport wastewater to the treatment facility and then to other areas to reuse it. Solar cells and batteries at a very reasonable cost can supply whatever energy is needed (such as aeration pumps). Less air pollution is realized because electricity from coal and oil fired generation plants are not used. Unlike traditional water treatment systems chemicals are not needed for the process. The vast amount of water used to clean wastewater in traditional ways is not used so less contamination of water results. Because a wetland is created to process, wasted water a natural habitat for wildlife is also created to benefit various species.

Constructed wetlands are low tech and low cost to create and maintain. For homes and small businesses (depending on rainfall if runoff is being filtered with gray and black water), a wetland is as simple as a lined pit-like area with gravel and plants. Small to medium sized communities and larger businesses and schools with 1 million gallons or less of wastewater a day can economically develop such recycling programs. The design is simple (see figures 1 and 2).

Strict rules are in place for any project involving wastewater because of the possibility that diseases or pests could make such an area home. It is important to have a qualified engineer familiar with wetland designs who can communicate to representatives of governmental agencies how constructed wetlands work, their benefits and safety factors. A small detail can make the difference between acceptance by a governmental agency and declining of necessary permits. The project in Las Vegas was stalled for over a year because the health department thought of wetlands as an area with standing surface water.

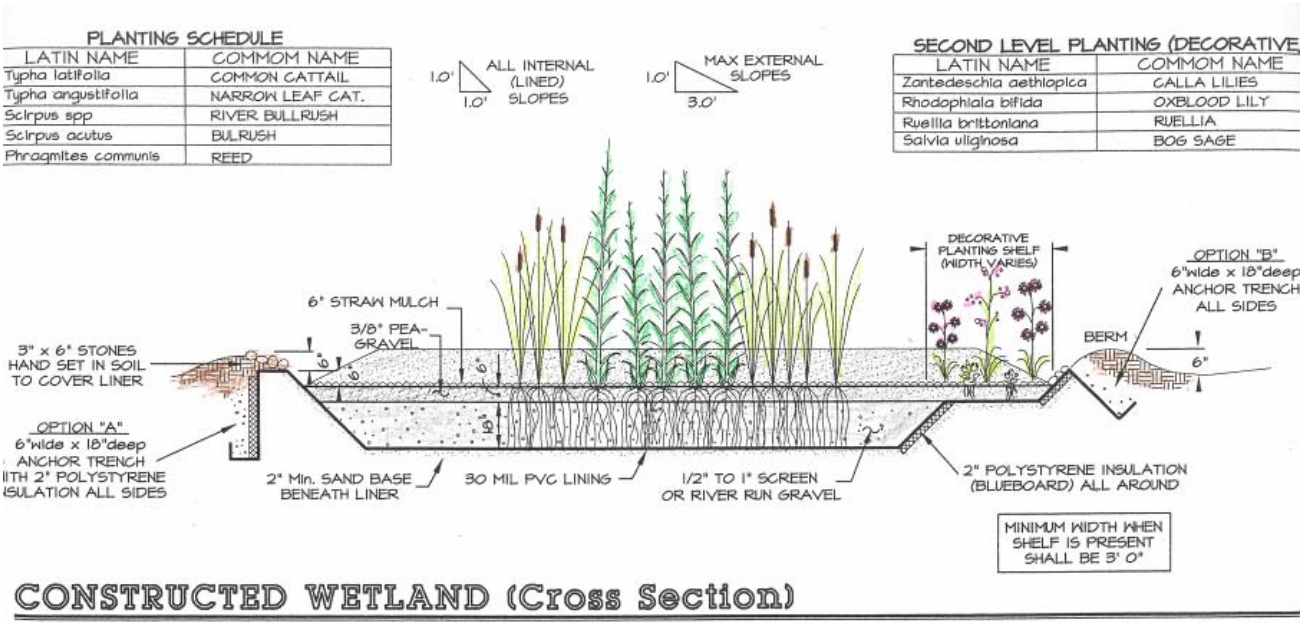

FIGURE 1

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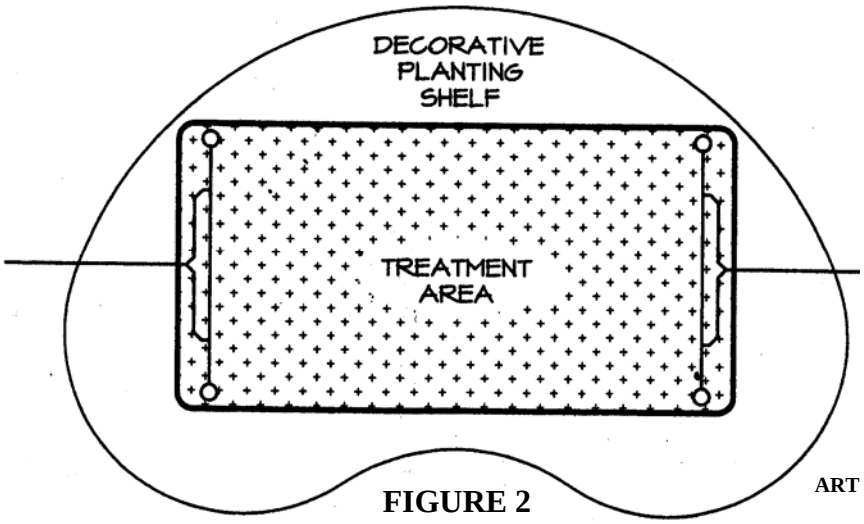

FIGURE 2

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A small home or business wetland can be as small as one cell 20 feet X 20 feet by 4 feet (7 meters X 7 meters X 1.5 meters) and cost from $8,000 to $15,000. A larger one for a school that can filter 7,500 to 25,000 gallons a day will have 3 to 4 cells 30 feet X 130 feet by 3 to 4 feet. It will cost $175,000 to over $200,000.

The Tres Rios pilot project in Arizona for a large community cost $3.5 million to build compared to the $625 million estimated to upgrade the existing facility, which employed standard water treatment technology. Only $80 million more was needed to turn the pilot project into a comparable full-scale treatment facility. This reflected a savings of over $542 million over upgrading. In addition, local aquifers were recharged and other water reuse opportunities such as wildlife habitat were provided.

An important part of constructed wetlands is the selection of plant materials. There are seven considerations for the selection of plants.

1. If an aeration system has been installed, and plants are not the primary source of aeration for the wetlands, then any plants adapted to the climate the wetland is in will do. Remember that water will be flowing through keeping the root zone oxygenated. This is especially true for aerated wetlands. Plant growth rates can be adjusted by increasing or decreasing air flow. The more air flow the faster growth. Even non-aquatic plants will survive.

2. When possible use native and noninvasive native-like plants. Remember some native plants like cattails can be very aggressive and must be harvested often.

3. Choose plants for both aesthetic beauties as well as to benefit wildlife.

4. If non natives are chosen use sterile hybrids that will not escape to natural wetlands and riparian areas.

5. Larger growing plants should be planted in the center with lower growing on the edges.

6. If the wetland is in a highly visible area, plant for seasonal color and beauty. Do not hide any water harvest project. Each is a great educational opportunity.

7. Avoid using large growing and overly aggressive plants. This would include large shrubs and trees.

Using wetlands as a filtering area is not a new concept. Constructed wetlands have been around for many years but are not as accepted as they should be. If we are going to make a difference and stave off the impending predictions of the United Nations and other organizations, it will not be with high tech methods, but simple proven natural ways. Catching rainwater is one of the components but constructed wetlands are an important foundation to filtration of any type of fresh water.

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