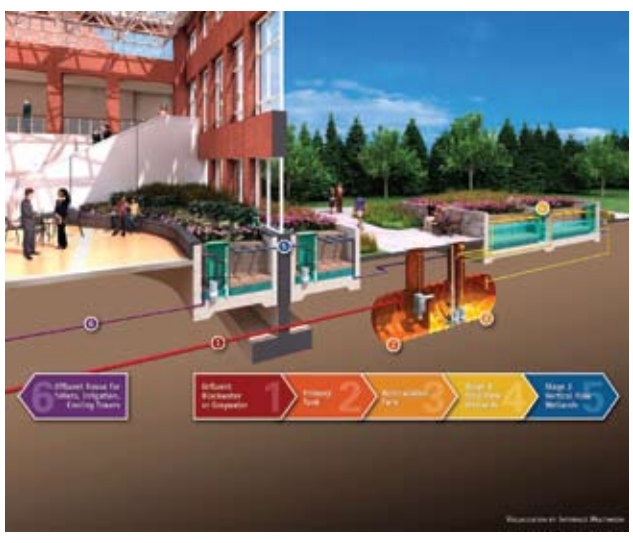
treat&teach

By Will Kirksey

YMCA of Silicon Valley is a volunteer-led nonprofit committed to strengthening communities through youth development, healthy living and social responsibility. At YMCA Camp Campbell—a wilderness resident camp in Boulder Creek, Calif., in the Santa Cruz Mountains—the Y is fostering a sense of social responsibility through a recently installed Living Machine wastewater treatment system that protects the environment, teaches children about nature and strengthens the foundations of community.

YMCA camp uses wastewater treatment system as an environmental teaching tool

The Living Machine serves as a teaching tool for YMCA Camp Campbell's science program.



The system is designed to process up to 5,000 gal of wastewater each day.

In 2005, when YMCA Camp Campbell had to upgrade an existing wastewater treatment system to meet Santa Cruz County requirements, connecting to the sewer system was not an option due to its rural location. The leadership at YMCA Camp Campbell, however, wanted to select a wastewater treatment option that would create a healthy environment for campers, reflect the high environmental standards of the camp and ultimately enrich children through the camp's Outdoor Science School and summer camp program. When looking at onsite systems, YMCA Camp Campbell opted for the Living Machine wastewater treatment system, an ecological system based on tidal wetland ecosystems that is designed to process up to 5,000 gal of wastewater every day.

The latest generation of Living Machine systems applies cutting-edge environmental science and information technology to enhance and accelerate the processes of natural tidal wetlands. This advanced ecological technology allows improved performance and reduced system footprint while retaining of the beauty and the energy efficiency of wetland-based treatment. In addition, the current systems have the added advantages of eliminating exposed wastewater surface and odor, so they can be used in educational settings and integrated into public and indoor locations.

Lesson Plan

YMCA Camp Campbell decided to place its Living Machine in a space surrounded by Redwood trees. It eventually will cover the system with a greenhouse to create an outdoor learning lab. The camp plans to outfit the outdoor learning lab with benches, a podium and accessibility for people with disabilities.

"Students and their teachers can gather around the Living Machine system, touch the plants and talk about the water cycle," said Jill Gary, executive director at YMCA Camp Campbell. "They'll learn valuable lessons like what happens when you flush your toilet, how wastewater gets naturally cleansed in a tidal wetland system and the role plants play in breaking down waste."

What will the students learn? When the toilet is flushed, wastewater is collected in a buried primary tank and pumped into a series of wetland basins. The wastewater treatment system introduces high-strength wastewater (blackwater) to a dense, diverse microecosystem contained in a series of cells with densely packed gravel. The cells fill with water, allowing microorganisms to begin consuming the nutrients.

When the cells drain by gravity, oxygen is passively brought to the wastewater at atmospheric concentration. This allows microorganisms that favor these conditions to complete the nutrient removal process. The alternating anaerobic and aerobic conditions make tidal wetlands nature's most productive ecosystem.

Because wastewater flow always is below the surface of watertight cells in the pore spaces between rock particles, there is no smell, mosquitoes or potential of contamination for children or wildlife, providing a hands-on experience of the ecological processes at work in an environment that is safe for student contact.

System Features

Key attributes of the newest-generation ecological wastewater treatment systems include:

- Lower operating costs than most traditional onsite systems;
- High-quality treated water suitable for nonpotable reuse (e.g., irrigation, surface and equipment washing, display ponds and landscape features);
- Sustainability by using completely natural processes and creating no secondary byproduct wastes;
- A small footprint yet ready scalability for high volumes in the hundreds of thousands of gallons per day;
- Low energy consumption and minimum greenhouse gas emissions; and
- An aesthetic quality, integrating the beauty and complexity of nature into the structure of buildings and communities.

Unlike other wastewater treatment options that have to be placed out of the way, the system at YMCA Camp Campbell is a centerpiece. It is designed to look like an outdoor garden, with a variety of emergent hydrophytes.

Moving forward, YMCA Camp Campbell plans to take the high-quality clear water discharged by the wastewater treatment system and recycle it on site. "We are going to prepare an area for a playfield on the campsite, and we would like to use the recycled water for irrigation," Gary said.

The system is a milestone in onsite decentralized wastewater treatment, demonstrating the ability of engineered ecological systems to integrate blackwater reuse with beautiful landscape design. It also reflects a transition to the design of wastewater treatment that can help integrate natural water cycles with human and environmental needs—with the added bonus of serving as a living, learning lab. WWD

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