

# Southwest HYDROLOGY

The Resource for Semi-Arid Hydrology

Volume 5/Number 1

January/February 2006



## Constructed Wetlands

Southwest Hydrology  
University of Arizona - SAHRA  
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# Southwest The Resource for Semi-Arid Hydrology HYDROLOGY

A bimonthly trade magazine for hydrologists, water managers, and other professionals working with water issues.



From the  
Publisher

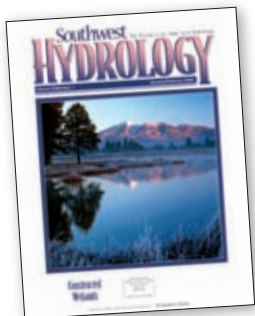
Happy New Year! This issue begins Volume 5 of Southwest Hydrology. The survival rate for magazines beyond the first year or two is discouragingly low, so we are grateful for the enthusiastic response and support we have received from our audience and advertisers – and the National Science Foundation – that has enabled us to reach our fifth year of publication with still-expanding readership.

We're starting the year with a feature on constructed wetlands, which are capable of removing a variety of contaminants from water, in many cases while simultaneously offering ecosystem, educational, and recreational benefits. Our feature articles discuss the use of constructed wetlands to treat municipal, industrial, agricultural, and landfill runoff, as well as acid mine drainage. And we didn't forget about mosquitoes: they like wetlands too, but there are ways to manage their numbers.

Upcoming issues will feature aging water infrastructure (March/April 2006); basic data, including its collection, collectors, distribution, funding, integration, and quality control (May/June 2006); and decision-support systems (July/August 2006). We welcome ideas and suggestions regarding coverage of these topics.

Our thanks to all the contributors to this issue, as well as to all our advertisers. We look forward to your feedback and ideas.

Betsy Woodhouse  
Publisher



Constructed wetlands operated by the Kachina Village Improvement District in Coconino County, northern Arizona, are used to dispose of wastewater effluent by providing storage during winter and evaporation during summer. Photo: Alex Carpenter.

#### Omission

The book image on page 22 of the Nov/Dec 2005 issue of *Southwest Hydrology* was obtained from the History of Sciences Collections at the University of Oklahoma Libraries.

## Southwest Hydrology

#### Publisher

Betsy Woodhouse

#### Technical Editor

Howard Grahn

#### Editor

Mary Black

#### Art Director

Kyle Carpenter

#### Graphic Designer

Mike Buffington

#### Knowledge Transfer

Gary Woodard

#### Software Review Coordinator

Eileen Poeter

#### Contributors

Pamela J. Beilke	Robert A. Gearheart	Bryan Plude
Carla Bitter	Steve Gloss	Eric M. Roudebush
Ronald W. Crites	Michael Gooseff	Jennifer Follstad Shah
Cliff Dahm	James J. Gusek	Vincent W. Uhl
Marilyn Ethelbah	Ray Harris	Roland D. Wass
Joan Gable	Stephen Lyon	Elizabeth Willott

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#### CONTACT US

Southwest Hydrology, The University of Arizona, SAHRA  
PO Box 210158-B, Tucson, AZ 85721-0158.  
Phone 520-626-1805. Email [mail@swhydro.arizona.edu](mailto:mail@swhydro.arizona.edu).



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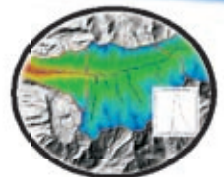
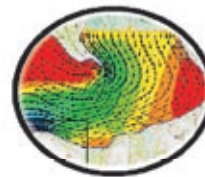
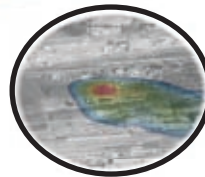
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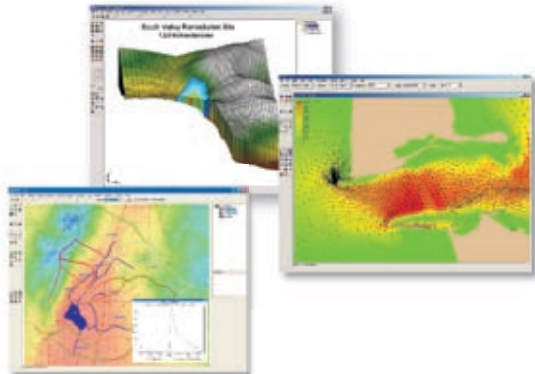
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## Constructed Wetlands

The concept of using constructed wetlands for water treatment arose from observations of natural wetlands' ability to remove contaminants from the watershed. In both systems, biological, physical, and chemical processes that reduce contaminants occur—including settling, microbial oxidation, anaerobic decomposition, denitrification, adsorption, and precipitation. This issue's feature articles describe a broad range of contaminants being treated by constructed wetlands, the suitability of different types of wetlands for different situations, and, importantly for both public relations and public health, how to keep the mosquitoes at bay.

### 16 Constructed Wetlands for Natural Wastewater Treatment

*Robert A. Gearheart*

How do constructed wetlands effectively mimic natural wetlands and what benefits do they offer? What treatment designs are available? Passive treatment systems can be used to treat wastewater from a variety of sources.

### 18 The Tres Rios Wetlands: From Demonstration Project to Full-Scale Facilities

*Roland D. Wass*

A demonstration project in metropolitan Phoenix proved successful in treating effluent to national standards, providing flow attenuation, and enhancing wildlife habitat. The full-scale facilities are expected to remove up to 1.25 tons of nitrogen per day.

### 20 Passive Treatment of Acid Rock Drainage

*James J. Gusek*

Acid rock drainage from mines is a costly and enduring problem. Passive treatment of ARD through aerobic cells and sulfate-reducing bioreactors is proving effective in immobilizing metals in substrate materials on a long-term basis.

### 22 The Apache Nitrogen Wetland: Groundwater Denitrification Using Constructed Wetlands

*Eric M. Roudebush and Pamela J. Beilke*

A nitrate-contaminated Superfund site in southern Arizona has been transformed into a 4.3-acre wildlife oasis after many challenges were overcome and the right chemical balance was found.

### 24 Approaches to Mosquito Management in the Southwest

*Elizabeth Willott*

Surface-flow wetlands are ideal breeding grounds for mosquitoes. However, drainage monitoring, vegetation management, use of bacterial larvicides, introduction of fish, and continued vigilance can keep the problem under control.

### 26 Subsurface-Flow Constructed Wetlands for Water Treatment

*Stephen Lyon*

Subsurface-flow constructed wetlands remove water contaminants, require little maintenance, and minimize problems of mosquito and odor control. Demonstration projects for treating dairy washwater and high-flow surface water have shown the concept to be sound and effective.

### 29 Constructed Wetlands for Landfill Leachate Treatment

*Ronald W. Crites and Bryan Plude*

Several types of wetlands can be used to treat landfill leachate, although vertical-flow wetlands are especially successful. Factors to consider in wetland design are leachate characteristics, land area requirements, topography, and climate.

### 30 Small Community Wetland Offers Large Benefits

*Joan Gable and Marilyn Ethelbah*

EPA Clean Water Act funds helped create a half-acre wetland to treat water impacted from agricultural and storm waters in a central Arizona Indian community. Not only has water quality improved, but salt cedar has been eradicated.

Publishing **Southwest Hydrology** furthers SAHRA's mission of promoting sustainable management of water resources in semi-arid regions.



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