

W A T E R R E S O U R C E S

IMPACT

July 2009 | Volume 11 | Number 4



**LANDFILL AND
LANDSPREADING
HAZARDS**



AWRA

Community, Conversation, Connections

AMERICAN WATER RESOURCES ASSOCIATION

AWRA ASSOCIATE MEMBERSHIP

VISIBILITY | DISCOUNTS | IMPACT

AWRA INTRODUCED THE ASSOCIATE MEMBERSHIP IN 2007 FOR ORGANIZATIONS AND COMPANIES THAT WANT TO BE VISIBLE AMONG AWRA MEMBERS AND CONSTITUENT GROUPS. THERE IS NO BETTER WAY TO GET THE WORD OUT ABOUT YOUR COMPANY THAN TO BECOME AN AWRA ASSOCIATE MEMBER!

JOIN TODAY!

ALREADY A REGULAR MEMBER? ADD AN ASSOCIATE MEMBERSHIP AND GAIN *UNPARALLELED VISIBILITY!*

HERE'S WHAT YOU'LL GET:

YOUR CORPORATE LOGO ROTATING ON AWRA'S HOMEPAGE

EXTENSIVE LISTING IN AWRA'S EXCLUSIVE *VIRTUAL EXHIBIT HALL*

(MORE THAN 12,000 VISITS IN JUNE ALONE!)

DISCOUNTS ON EXHIBIT SPACE

DISCOUNTS ON JOB POSTINGS

DISCOUNTS ON PUBLICATIONS

DISCOUNTS ON ADVERTISING IN *WATER RESOURCES IMPACT*

WATER RESOURCES IMPACT FOR YOU AND UP TO 10 OTHER EMPLOYEES

VISIT WWW.AWRA.ORG TO JOIN NOW!

FULL YEAR (JAN 1 DEC 31) ASSOCIATE MEMBERSHIP \$500 | HALF YEAR (JUL 1 DEC 31) ASSOCIATE MEMBERSHIP \$250

EXHIBIT SPACE AVAILABLE!

AWRA HAS LIMITED SPACE AVAILABLE AT ITS UPCOMING CONFERENCES
TAKE ADVANTAGE OF THE MANY EXHIBITOR PERKS AND RESERVE YOUR SPACE TODAY!

2009 AWRA ANNUAL WATER RESOURCES CONFERENCE

NOVEMBER 9 12, 2009 | SEATTLE, WASHINGTON

2010 AWRA SPRING SPECIALTY CONFERENCE

GIS AND WATER RESOURCES VI

MARCH 29 31, 2010 | ORLANDO, FL

AT AWRA CONFERENCES, EXHIBITORS ARE AN INTEGRAL PART OF THE CONFERENCE EXPERIENCE. EXHIBITS ARE NEAR THE CONFERENCE ACTION, AND THE OPENING NETWORKING RECEPTION, ALL COFFEE BREAKS, AND POSTER SESSIONS TAKE PLACE AMONGST THE EXHIBITS.

YOUR EXHIBIT INCLUDES:

ONE COMPLIMENTARY REGISTRATION (A SECOND BOOTH REP CAN ATTEND FOR ONLY \$200)

LISTING IN THE AWRA *VIRTUAL EXHIBIT HALL*

LISTING ON THE CONFERENCE WEBSITE AND IN THE FINAL PROGRAM

REGISTRANT MAILING LIST AFTER THE CONFERENCE

CONTACT TERRY MEYER AT TERRY@AWRA.ORG OR CALL 540.687.8390 WITH QUESTIONS OR TO RESERVE YOUR SPOT TODAY!
OR, VISIT THE CONFERENCE WEBSITE AT WWW.AWRA.ORG AND DOWNLOAD THE EXHIBITOR PROSPECTUS.

LANDFILL AND LANDSPREADING HAZARDS

Laurel E. Phoenix ~ Associate Editor
phoenixl@uwgb.edu

Eric J. Fitch ~ Associate Editor
fitch@marietta.edu

A variety of human activities affect the quality of our surface and ground waters, but none are so poorly understood as the effects of where we dump municipal, industrial, and agricultural wastes. It is an “out of sight, out of mind” issue for most urban dwellers, since we tend to view the issue as simply household garbage, picked up weekly to go to a landfill “somewhere else.” Urban citizens aren’t even aware of the generation and disposal of industrial waste, much less the fact that their local sewage plant produces an “end product” of sludge that must be disposed of somehow. This issue opens a window on the mysteries of where all of this waste is going, the hazardous and unregulated compounds in it, and its effects on our soil, water, and food.

FEATURE ARTICLES

3 Landfills, Ground Water Quality, and the Future of Waste Management in America ... Eric J. Fitch

Recounts a fascinating history of how we have dealt with waste through the ages, the associated regulations adopted to deal with some waste problems, and what is yet to be done.

7 Landspreading Hazardous Wastes in the United States ... Laurel E. Phoenix

Explores the mostly hidden transfer of industrial and sewage plant wastes from urban to rural areas and the consequences of these unregulated compounds being applied to agricultural lands.

11 Pharmaceuticals and Personal Care Products in Biosolids ... Sara C. Monteiro and Alistair B.A. Boxall

Identifies many of the medicines and other chemical compounds found in sewage sludge and how these compounds interact with the environment they are spread on and the plants and animals that come in contact with them.

14 Livestock Manure Management in the American Pacific Islands ... Carl I. Evensen

Highlights the unique problems of manure management on small islands with high rainfall and limited land for manure landspreading.

18 Effects of Animal Waste Spreading on Ground Water and Challenges for Water Resources Education ... Kevin Masarik

Describes the relationship of declining rural well water quality to landspreading sewage sludge and livestock manures, and the growth of more rural wells being drilled as some agricultural land is converted to residential use.

WATER RESOURCES

IMPACT

VOLUME 11 • NUMBER 4 • JULY 2009

Other features in this issue ...

▲ **AWRA BUSINESS**

- 10 Highlights of June 2009 JAWRA Papers
- 25 President's Message ... *Gerald Sehlke*
- 26 AWRA's 2009 Spring Specialty Conference Student Presenter Competition Winners
- 27 Send Us Your Feedback
- 27 Scheduled Topics for Future Issues of *IMPACT*
- 27 Request for Opinions on *IMPACT* Topics
- 27 Advertising Opportunities in *IMPACT*
- 29 AWRA 2009 Membership Application
- 30 AWRA Future Meetings ...2009/2010

▲ **OPINION COLUMNS**

- 21 **The New Economy of Water ... Las Vegas Ready's Water Pipeline Plan ... Clay J. Landry**
- 22 **What's Up With Water ... Fools for the Cities: The Global Urban Transition ... Eric J. Fitch**
- 23 **Legal Issues ... Leatherbacks, Loggerheads, and Stimulus ... Michelle Henrie and J. Brian Smith**

(Opinions expressed by our columnists are their own and do not represent the opinion or position of AWRA.)

▲ **PROCESS OF REGIONAL COLLABORATION**

- 24 **Building Strong Collaborative Relationships for a Sustainable Water Resources Future ... Ada Benavides**

▲ **WATER RESOURCES PUZZLER 20** Answers27

▲ **ADVERTISERS**

- Campbell Scientific5
- RS&H (Reynolds, Smith, & Hills, Inc. . . .13
- Wiley Blackwell28
- Associate Membership Info & 2009/2010 Exhibit Space Available ... Inside Front Cover



AWRA

Community
Conversation
Connections

**A Bi-Monthly Publication of the
AMERICAN WATER RESOURCES ASSOCIATION**

AMERICAN WATER RESOURCES ASSOCIATION
4 West Federal Street • P.O. Box 1626
Middleburg, VA 20118-1626
(540) 687-8390 / Fax: (540) 687-8395
E-Mail: info@awra.org • Homepage: www.awra.org

EDITOR-IN-CHIEF**N. EARL SPANGENBERG**

College of Natural Resources
University of Wisconsin-Stevens Point
Stevens Point, WI 54481
(715) 346-2372 • Fax: (715) 346-3624
E-Mail: espangen@uwsp.edu
(Support for Dr. Spangenberg is provided by the
College of Natural Resources
University of Wisconsin-Stevens Point)

TO PLACE AN AD IN THIS PUBLICATION CONTACT**CHARLENE E. YOUNG**

Phone/Fax: (256) 650-0701
E-Mail: charlene@awra.org

Water Resources IMPACT is owned and published bi-monthly by the American Water Resources Association, 4 West Federal St., P.O. Box 1626, Middleburg, Virginia 20118-1626, USA. The yearly subscription rate is \$80.00 domestic and \$95.00 for international subscribers. For the International Priority Shipping Option, add \$50.00 to the subscription rate. Single copies of *IMPACT* are available for \$15.00/each (domestic) and \$20.00/each (international). For bulk purchases, contact the AWRA Headquarters office.

IMPACT is a magazine of ideas. Authors, Associate Editors, and the Editor-In-Chief work together to create a publication that will inform and will provoke conversation. The views and conclusions expressed by individual authors and published in *Water Resources IMPACT* should not be interpreted as necessarily representing the official policies, either expressed or implied, of the American Water Resources Association.

Mention of any trademark or proprietary product in works published in the *Water Resources IMPACT* does not constitute a guarantee or warranty of the product by the American Water Resources Association and does not imply its approval to the exclusion of other products that may also be suitable.

Contact the AWRA HQ Office if you have any questions pertaining to your membership status. For information on advertising rates and deadlines, contact Charlene Young at the e-mail address or phone number given above.

POSTMASTER: Send address changes to *Water Resources IMPACT*, American Water Resources Association, 4 West Federal St., P.O. Box 1626, Middleburg, VA 20118-1626. Copyright © 2009 by the American Water Resources Association.

• VOL. 11 • NO. 4 • JULY 2009 •
ISSN 1522-3175

ASSOCIATE EDITORS**FAYE ANDERSON**

(fayeanderson23@gmail.com)
Graduate School, USDA
Washington, D.C.

ERIC J. FITCH

(fitche@marietta.edu)
Marietta College
Marietta, Ohio

MICHELLE HENRIE

(michelle@mhenrie.com)
Michelle Henrie | Attorney • Leed AP
Albuquerque, New Mexico

JONATHAN E. JONES

(jonjones@wrightwater.com)
Wright Water Engineers
Denver, Colorado

CLAY J. LANDRY

(landry@waterexchange.com)
WestWater Research
Boise, Idaho

RICHARD H. MCCUEN

(rhmccuen@eng.umd.edu)
University of Maryland
College Park, Maryland

LAUREL E. PHOENIX

(phoenixl@uwgb.edu)
University of Wisconsin
Green Bay, Wisconsin

ADDITIONAL CONTRIBUTORS**TECHNICAL DIRECTOR****RICHARD A. ENGBERG**

(dick@awra.org)
American Water Resources Association
Middleburg, Virginia

LEGAL CORRESPONDENT**J. BRIAN SMITH**

(brian@jones-smithlaw.com)
Jones & Smith, LLC
Albuquerque, New Mexico

**Front Cover ... Bulldozer working at a landfill site.
Cattle grazing in a canal.
(www.istockphoto.com)**



**AWRA . . . Community,
Conversation,
Connections**