

# Waterworks

Kentucky Water Resources Research Institute at the University of Kentucky

Vol. 7, No. 3, 2001



*Christopher J. Matocha, Ph.D., an Assistant Professor of Environmental Soil Chemistry in the College of Agriculture at the University of Kentucky is working on a research project supported by KWRRI. Information about Dr. Matocha, including his research interests and a brief description of his KWRRI project, are on the back page.*

## Inside...

Public participation in the environment forum	2
Water Odyssey was a "fair" success	3
Environmental Systems Seminar Series	4
Meet the Researcher	6

## Assessing the TMDL approach to water quality management

**Kenneth H. Reckhow, Director  
Water Resources Research Institute  
North Carolina State University**

*The following is text of testimony delivered by Dr. Kenneth H. Reckhow, Chair of the National Academy of Sciences' Committee to Assess the Scientific Basis of the Total Maximum Daily Load Approach to Water Pollution Reduction, before the U.S. House Subcommittee on Water Resources and Environment, Committee on Transportation and Infrastructure, June 28, 2001.*

**A**s you know, in October 2000, Congress suspended EPA's implementation of the TMDL rules until further information

could be gathered on several aspects of the program. In particular, Congress requested that the National Research Council examine the scientific basis of the TMDL program. The National Research Council is the operating arm of the National Academy of Sciences, National Academy of Engineering, and the Institute of Medicine, chartered by Congress in 1863 to advise the government on matters of science and technology. The U. S. Environmental Protection Agency sponsored this study of the TMDL program. I am here today to report on some of the principal findings and recommendations in our

report.

Our central message can be summarized in a short sentence—we have the scientific capability to identify the polluted waters and develop plans for their cleanup. Underlying this general message are specific key points:

- (1) Current scientific knowledge and techniques are sufficient to proceed with the TMDL program.

*(Continued on page 5)*

# The 2002 Midwest FOCUS Conference

The National Ground Water Association is accepting papers for the "2002 Midwest FOCUS Groundwater Conference." The conference will be held April 11-12, 2002 at the Congress Plaza hotel in Chicago, Illinois. The deadline for abstracts is November 15, 2001. Contact the ground water association at: 1-800-551-7379 or <http://www.ngwa.org/education/midwest/html>.

## Waterworks

is published  
by the  
Kentucky Water Resources  
Research Institute  
at the  
University of Kentucky

James A. Kipp  
Interim Director

Dr. Lindell E. Ormsbee  
Associate Director

Jack L. Stivers  
Information Specialist

*Waterworks* is published bi-monthly and features water-related topics, including KWRRRI activities. Subscriptions are free. Please address requests to:

*Waterworks* Editor  
233 Mining and Mineral Resources  
Bldg. University of Kentucky  
Lexington, KY 40506-0107  
[stivers@uky.edu](mailto:stivers@uky.edu)  
(859) 257-8637, fax: (859) 323-1049

Previous issues of *Waterworks* can be viewed on the KWRRRI web site at:  
<http://www.uky.edu/WaterResources/>

# New nonpoint source pollution poster

The Kentucky Geological Survey recently completed a poster entitled, "*Protect Kentucky Karst Aquifers from Nonpoint source Pollution.*" The poster is available by contacting KGS at 859-257-5500. The KGS Web site is at: <http://www.uky.edu/KGS/>.

# Public participation in the environment forum

The Tracy Farmer Center for the Environment at the University of Kentucky is sponsoring an open forum on public participation in the environment on October 12, 2001. The forum will have speakers from a variety of organizations and backgrounds (see program below). The forum will be held in the Worsham Theater in the Student Center on the University of Kentucky campus from 8:30 a.m. to 4:30 p.m.

## Program

8:30 – 9:00 *Welcome and Introduction*

9:00 – 9:30 **Kentucky Division of Water**, Jack Wilson, Director

9:30 – 10:00 **Kentucky Watershed Management Initiative**, Greg Epp, Kentucky River Basin Coordinator

10:00 – 10:30 **Eastern Kentucky PRIDE**, Karen Engle, Executive Director

10:30 – 11:00 **Break**

11:00 – 11:30 **Kentucky Resources Council**, Tom Fitzgerald, Director

11:30 – 12:00 **Kentucky River Watershed Watch**, Hank Graddy, Project Director

12:00 – 1:00 **Lunch** (on your own)

1:00 – 1:30 **EPA Region IV**, Bill Cox, Chief of the Watershed and Non-point Source Section

1:30 – 2:00 **Louisville MSD**, Gordon Garner, Executive Director

2:00 – 2:30 **Break**

2:30 – 3:00 **Kentucky Cooperative Extension Service**, Curtis Absher, Asst. Director for Agriculture and Natural Resources

3:00 – 3:30 **Kentucky Farm Bureau**, Rebeckah Freeman, Director of Natural Resources

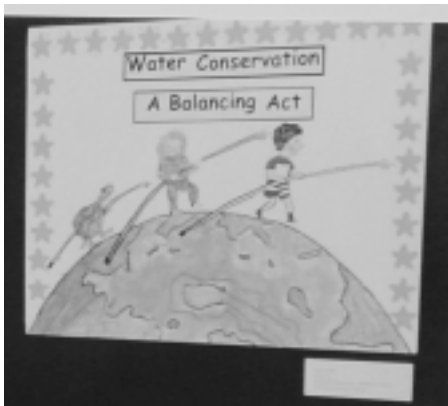
3:30 – 4:00 **East Kentucky Power**, Jeff Hohman, Manager of Natural Resources and Environmental Communication

4:00 – 4:30 **Panel Discussion**, Audrey Lee, Editorial Writer, Lexington Herald Leader

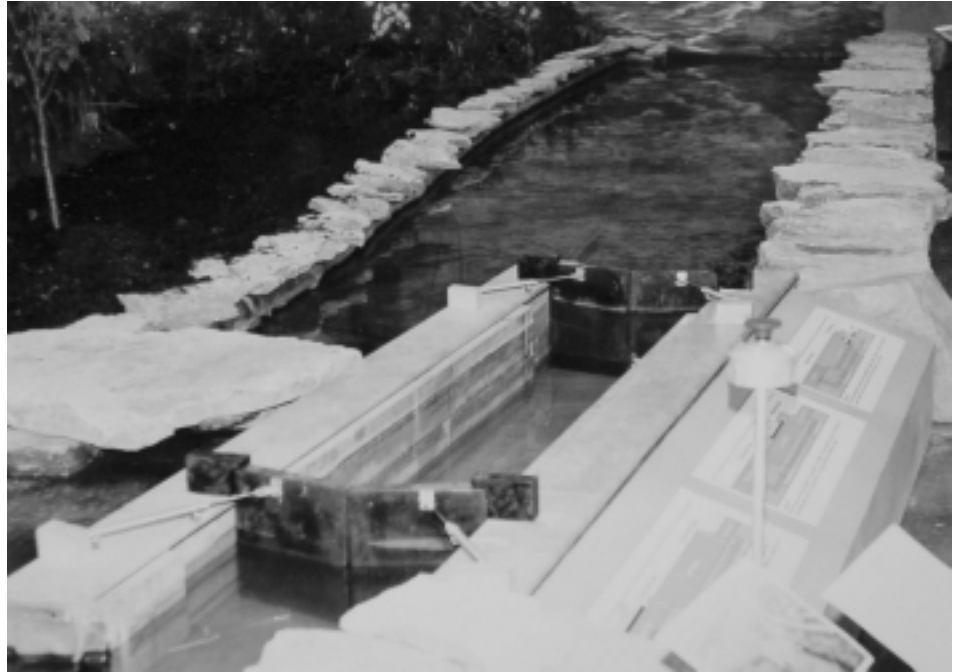
# Water Odyssey was a "fair" success

The special educational exhibition *2001: A Water Odyssey* ended a successful run at the Kentucky State Fair on August 26. Total attendance at the fair this year was estimated at 650,000 and approximately 300,000 individuals visited the exhibit hall during the 10-day run. Around 8,000 primary, middle, and high school students participated in school field trips to learn about watersheds and how they can actively improve water quality in their own local watershed. Teachers who accompanied these groups were provided with a curriculum resource that was directly tied to exhibit elements, but can also be utilized independently in their classrooms for years to come. Many of the display elements and models created as part of the exhibition will be available through the Kentucky Division of Water to assist in continuing watershed education efforts throughout the Commonwealth. Mark your calendars now for next year's major Kentucky State Fair educational exhibit, *2002: A Land Odyssey*.

**Text and photos by Jim Kipp**



*The work of 295 Kentucky school children was on display at the Water Odyssey exhibit.*



*At the 2001: A Water Odyssey education exhibit, there was a working model of a lock, which could be operated by pressing a large, red button. The Kentucky River Authority will use the lock model as a dry but still interactive museum display.*



*Visitors to the Water Odyssey education exhibit had the opportunity to find and stand on their local watersheds displayed on a large watershed map spread out on the floor.*



# The University of Kentucky presents...

A two-semester seminar series by the University of Kentucky

Tracy Farmer Center for the Environment and the

Environmental Systems Certificate Program of the Graduate School



## Fall Semester

### 1. The Kentucky River: Its important role in our lives – yesterday, today, and tomorrow

Aug. 28 The Kentucky River Basin: A river flows through it  
*Eric Christianson, UK History Dept.*

Sept. 4 Physical landscapes of the Kentucky River Basin: Our geologic inheritance  
*James Dinger, Kentucky Geological Survey*

Sept. 11 Aquatic organisms in the Kentucky River Basin: Habitats, ecology, and indicator species  
*Greg Pond, Kentucky Division Water*

Sept. 18 Man-made impacts in the Kentucky River Basin: Our management responsibility  
*Lindell Ormsbee, UK Civil Engineering*

Sept. 25 Public Discussion

### 2. Water quality policy

Oct. 2 The Clean Water Act: How it's supposed to work  
*Hank Graddy, Kentucky Watershed Watch*

Oct. 9 TMDLs: An agricultural perspective  
*Rebeckah Freeman, Director of Natural Resources, Kentucky Farm Bureau*

Oct. 16 TMDLs: A scientific perspective  
*Ken Reckhow, Water Resources Research Institute of the University of North Carolina*

Oct. 23 The Clean Water Act: The role of the state government  
*Bob Ware, Kentucky Div. of Water*

Oct. 30 Public Discussion

### 3. Water quality management

Nov. 6 The impact of water quality on regional water supply: The central Kentucky experience  
*Lindell Ormsbee, Tracy Farmer Center for the Environment*

Nov. 13 Urban water quality: The Lexington experience  
*David Gabbard, Lexington-Fayette Urban County Government*

Nov. 20 Tour of the Kentucky-American water treatment plants  
*Rick Buchanan, Kentucky-American Water Company*

Nov. 27 Rural water quality  
*Dave Harmon, Kentucky Division of Water*

Dec. 4 Public Discussion

## Spring Semester

### 4. Know your water

Jan. 15 Making sense of weather data  
*Tom Priddy, UK Agricultural Weather Center*

Jan. 22 Public health and the environment: Real life examples  
*Rice Leach, Commissioner for Public Health in Kentucky*

Jan. 29 The role of the press in water issues

Feb. 5 New tools for the 21<sup>st</sup> century  
*Sylvia Daunert, UK Dept. Chemistry*

Feb. 12 Public Discussion

### 5. Community actions: Local ways to get involved

Feb. 19 Watershed action!  
*Greg Epp, KWRRRI and Ken Cooke, Kentucky Division of Water*

Feb. 26 Eastern Kentucky PRIDE  
*Karen Engle, Executive Director*

Mar. 5 Town Branch: The forgotten heart of Lexington  
*Zina Merkin, Town Branch Trail*

Mar. 12 Spring Break

Mar. 19 Public Discussion

### 6. Kentucky's water future

Mar. 26 Go Seafood: Aqua-farming in Kentucky  
*J. Tidwell, President of the World Aquaculture Society*

Apr. 2 Open House at the Aquaculture Facilities at Kentucky State University

Apr. 9 Water Works Wonders: Recreational Fisheries in Kentucky  
*Benjy Kinman, Kentucky Dept. of Fish & Wildlife Resources*

Apr. 16 Public discussion

### Summary

Apr. 23 Water in Kentucky: Challenges and solutions for the future  
A round-table discussion

The seminars will be on Tuesdays 4:30 p.m. - 5:30 p.m. in Rm. 102 of the Mining & Mineral Resources Bldg.

## Assessing, from page 1

(2) Using current science, we recommend several changes in how EPA and the States conduct the TMDL program that can be immediately implemented, leading to improvements in the TMDL program. Many of these recommendations simply involve changes in the techniques used in the TMDL process, not development of new techniques.

(3) In the long run, science advances through a process of research and improved understanding. We can improve the science used to support the TMDL program over time, and we recommend research activities to do that

The first and third points are worth restating by analogy with the field of medicine. We would all agree that today's medical knowledge is sufficient for the successful practice medicine. Still, we fund medical research, knowing that this will improve the practice of medicine, leading to improvements in health care over time. As much as we might hope that medical practice will eventually be perfect—all diseases correctly diagnosed and cured—in reality we know that medical uncertainties will always remain. Those uncertainties, however, do not prevent us from benefiting greatly as a result of current medical knowledge.

In a similar manner, our National Research Council Committee strongly believes that water quality knowledge is sufficient for the practice of water quality assessment and management within the context of the TMDL program. As with medical science, water quality science will never be perfectly known; there will always be uncertainties, but those uncertainties do not prevent us from making good decisions based on existing scientific knowledge. To improve practice over time, we continue to engage in medical research; likewise, we should continue



*Dr. Kenneth H. Reckhow*

to fund and conduct water research, with the expectation that such research will improve the TMDL process over time.

Let me now elaborate on my second point, which was that there are several changes that EPA and the States could immediately implement to improve the science underlying the TMDL program. I provide two brief examples:

- 1) As part of the TMDL, EPA requires a “margin of safety” factor that is protective of water quality. This factor is intended to reflect the uncertainty in the TMDL forecast; however, EPA allows the margin of safety to be arbitrarily chosen, resulting in a variable level of protection. We can do better; techniques exist now to base the margin of safety on an explicit calculation of uncertainty.
- 2) A TMDL is required for waterbodies listed by the states as in violation of a water quality standard. Unfortunately, many states have not required well-designed monitoring programs with statistical hypothesis testing to diagnose standard violations. We know how to do this now, but states are just not using the best science in many situations. Using the medical analogy, this issue is equivalent to using outdated techniques for diagnosing a disease.

This second example addresses a vital feature of the TMDL program—the

listing, or diagnosis, of waterbodies in violation of a water quality standard. Clearly, what we want to do is correctly identify all waterbodies in need of a TMDL, and we believe that the statistical hypothesis testing procedure will add the necessary scientific rigor to that identification task. At this point, the States already have identified, and listed (on the 303d list), waterbodies they believe to be in violation of water quality standards and hence in need of a TMDL. However, due to limitations in state water quality monitoring and assessment programs, many of these lists appear to be in error. That is, we believe that some waterbodies have been identified as “in violation” when in fact standards are being met, while other waterbodies that truly are in violation of a standard have not yet been identified. To correct this problem, we propose that EPA approve a two-list process in which States would create a “preliminary list” of waterbodies suspected of being in violation of a water quality standard. They would then have a limited period of time to undertake the necessary monitoring and statistical hypothesis testing to refine the preliminary listing decision. Those waterbodies thus determined to be in violation would then go on an “action list” (the 303d list) and require a TMDL to meet the standard and achieve the designated use.

In conclusion, it is important to recognize the tremendous variability among the estimated 40,000 protected TMDLs. Some are accompanied by a great deal of data and existing knowledge; for others, very little may be presently known. Some have self-evident solutions, while for others the problem is exceedingly complex and solutions are unclear. Again, consider the medical analogy—there are many different diseases and a great variety of treatments; thus doctors must be prudent in diagnosis, make appropriate treatment choices, and then monitor patients until health is achieved. Both the medical doctor and the TMDL scientist face uncertainty in their tasks. We believe that the NRC report outlines a strategy for using the best science to move ahead with the TMDL program.

# Meet the Researcher

## **Christopher J. Matocha, Ph.D.**

Assistant Professor of Environmental Soil Chemistry, Department of Agronomy, College of Agriculture, University of Kentucky.

### **Education:**

Ph.D. University of Delaware, 2000.

M.S. Texas A&M University, 1996.

B.S. Texas A&M University, 1993.

### **Teaching:**

PLS 671 - Graduate soil chemistry course and lab

### **Current Research:**

Dr. Matocha's research focuses on solving frontier mechanistic environmental problems related to the cycling of nonmetals (carbon,

nitrogen, and sulfur) and metals (iron, manganese, zinc, and lead) in natural waters and soils in Kentucky that may be probed through reactivity and kinetic studies. This research requires the combination of spectroscopic and macroscopic measurements with field observations to predict processes of nutrient cycling and contaminant fate.

The research project that Dr. Matocha is doing with KWRRRI's support is trying to answer the question, "Does waste amendment affect abiotic N cycling in soils by naturally occurring reactive Fe (II)? An excerpt from the abstract follows.

"It is usually assumed that denitrification occurs as a biologically mediated process. Surprisingly,

recent studies indicate that denitrification occurs in conditions where it would not be expected and has been linked to the presence of Fe(II). Because nitric oxide and nitrous oxide are two major products of abiotic denitrification (chemodenitrification), the extent of this process could have a significant impact on the production of greenhouse gases that enter the atmosphere through agricultural activities.

The major objective of this study is to investigate the role of naturally occurring soil Fe (II)-bearing minerals in the mediation of N redox cycling as affected by animal waste additions."

*(Editor's note: "Meet the Researcher" features the people who are doing research supported by the Institute.)*



---

Kentucky Water Resources Research Institute  
233 Mining and Mineral Resources Bldg.  
University of Kentucky  
Lexington, KY 40506-0107