

Virginia Water Resources Research Center

Annual Technical Report

FY 2001

Introduction

The Virginia Water Resources Research Center (VWRRC) is both a federally authorized program within the U.S. Department of the Interior under the U.S. Geological Survey and a state agency under the code of Virginia. The VWRRC is administered by the Research Division at Virginia Tech.

Water quantity and quality problems and issues in Virginia are typical of other urbanizing Eastern states. For the past three years, Virginia has experienced a drought reaching a climax in the summer of 2002. Water use restrictions were implemented in many Virginia localities during the past year, necessitating a closer look into water supply and management issues. Virginia water quality concerns are motivated by the impaired water listing process and the TMDL program mandated under section 303(d) of the Clean Water Act. The VWRRC will continue to support and encourage research on these issues and timely dissemination of science-based information to decision-making bodies and citizens.

Activities and programs of the VWRRC are in accordance to its legislative mandate and mission statement that was developed in 1995: The VWRRC provides research and educational opportunities to future water scientists; promotes research on practical solutions to water source problems; facilitates the timely transfer of water sciences information to policy and decision makers.

The use of 104 funds is critical to the management of the VWRRC. The 104 funds have been instrumental in increasing the university (Virginia Tech) and state commitment to the programs of the VWRRC. The 104 funds are also offered (and serve) as evidence of federal-state partnership. This is important because less restrictive 104 funds can be used as match for fund raising efforts and marginally supplementing other funding sources. Overall, the VWRRC program management is based on realities of state and federal budget prospects. The VWRRC no longer completely relies on the 104 base grant funding to support its programs. The VWRRC seeks project specific external funding in collaboration with the university faculty and plays a leadership role to facilitate funding from external sources.

During the FY 2001 reporting period, the VWRRC used its 104 funds to support publishing of its newsletter (Virginia Water Central), to further develop and update its Website, and to support internal operations. In summary, the 104 funds were dedicated to the outreach function. Supplemental funds added to the base grant by state agencies were used to conduct studies of TMDL program and capacity development for small water systems. During the reporting period, the VWRRC used its state allocation to fund 3 state-wide competitive grants (up to \$25,000/year) and several seed grants (up to \$5,000/year). The VWRRC also provided, on a competitive basis, several undergraduate research fellowships, summer internships, and one graduate fellowship. The VWRRC organized its annual water research symposium and facilitated several workshops and seminars.

During the FY 2001 reporting period, the VWRRC facilitated three supplemental grants. Two of these projects were funded by the USGS and one project was funded by the US Army Corps of Engineers.

Research Program

Major in-house research activities (funded through programs other than 104 funds) undertaken by the VWRRC staff and affiliated faculty during the reporting year are: 1. Developing Benthic TMDL Reports for Six Impaired Stream Segments 2. Capacity Development for Small Water Systems 3. Stream Corridor Assessment

During the reporting period, the VWRRC used its state allocation to fund 3 state-wide competitive grants (up to \$25,000/year) and several seed grants (up to \$5,000/year).

PUBLICATIONS

1. Articles in Refereed Scientific Journals

Bosch, D.J. and J.W. Pease. 2002. Economics Risk and Water Quality Protection in Agriculture. *Review of Agricultural Economics* 22(2): 438-463.

Crowder, D. W. and P. Diplas. 2002. Assessing Changes in Watershed Flow Regimes with Spatially Explicit Hydraulic Models. *Jour. American Water Resources Assoc.* 38 (2): 397-408.

Darken, P., G. Holtzman, E. Smith and C. Zipper. 2000. Detecting changes in water quality using modified Kendall's tau. *Environmetrics* 11:423-434.

Darken, P., C. Zipper, G. Holtzman and E. Smith. 2002. Serial correlation in water quality variables: Estimation and implications for trend analysis. *Water Res. Research* 38 (7):

Speir, C. and K. Stephenson. 2002. Does Sprawl Cost Us All? Isolating the Effects of Housing Patterns on Public Water and Sewer Costs. *APA Journal* 68(1): 56-70.

2. Book Chapter

Younos, T. and J. L. Walker. 2002. Evaluation of Biological Assessment Data and Protocols for TMDL Reports. In: *Universities Contribution to TMDL Program Development. Water Resources Update (Peer Reviewed Issue) No. 122, The Universities Council on Water Resources, Southern Illinois University, Carbondale, IL. pp. 47-54.*

3. Dissertations

Krause, C. W. 2002. Options for Modeling and Managing Stream Temperature in the Face of Increasing Water Demands and Minimum Instream Flows. *Doctoral dissertation in Fish and Wildlife Sciences, Virginia Tech.*

Young, M. M. 2002. Cooperative Infrastructures for Small Water Systems: A Case Study. *M.S. Thesis in Agricultural and Applied Economics, Virginia Tech.*

De Leon, R. 2002. Developing a Service-Learning Program for Watershed Management: Lessons from the Stroubles Creek Watershed Initiative. *Major Paper to fulfill requirements of a graduate degree in Urban Affairs and Planning, Virginia Tech.*

4. Conference Proceedings

De Leon, R. and T. Younos. 2002. Integrating Student Service-Learning and University Knowledge into Watershed Management Programs: The Stroubles Creek Watershed Case Study. In: Proceedings (CD) of the 7th National Watershed Conference, Richmond, Virginia. Pp. 93-102.

Walker, J. L., K. R. Porter, and T. Younos. 2002. Monitoring Needs to Meet Benthic TMDL Requirements. Proceedings of the 2002 National Monitoring Conference. May 19-23, 2002. Madison, WI.

Walker, J. and T. Younos. 2002. Virginia's Water Monitoring and Needs Assessment Survey. Proceedings of the 2002 National Monitoring Conference. May 19-23, 2002. Madison, WI. Abstract.

Walker, J. and T. Younos. 2001. TMDL Plans for Stream Segments Benthically Impaired by Trout Farm Effluents. Proceedings of The Society of Environmental Toxicology and Chemistry 22nd Annual Meeting. November 11-15, 2001. Baltimore, MD. Abstract.

Walker, J., T. Younos, J. Anderson, and K. Porter. 2001. Challenges in Preparing TMDL Reports for Stream Segments Impaired by Trout Farm Effluent. Proceedings Virginia Water Research Symposium 2001--Protecting Our Water Resources for the Next Generation: Where Do We Go From Here? November 14-16, 2001. Charlottesville, VA. Virginia Water Resources Research Center Publication P7-2001. pp 81-83.

Walker, J. L., T. Younos, J. L. Anderson, and K. R. Porter. 2001. TMDL Development for Benthic Impairments from Trout Farm Effluent. Total Maximum Daily Load Environmental Regulations Proceedings of the March 11-13, 2002 Conference. ASAE Publication 701P0102. pp 449-453.

Information Dissemination

Basic Information

Title:	Information Dissemination
Project Number:	2001VA2861B
Start Date:	3/1/2001
End Date:	2/28/2002
Funding Source:	104B
Congressional District:	9th
Research Category:	Not Applicable
Focus Category:	None, None, None
Descriptors:	None
Principal Investigators:	Leonard Shabman

Publication

State: Virginia
Project Number: VA2861
Title: Information Dissemination
Project Type: Information Transfer Project
Focus Category: None
Keywords: None
Start Date: 03/01/2001
End Date: 02/28/2002
Congressional District: 9th
PI: Leonard Shabman
Professor, Virginia Polytechnic Institute and State University
email:shabman@vt.edu
phone:540-231-5624

Abstract

During the application period, the following information dissemination and outreach activities activities will be supported through 104 program include:

1. Editorial (personnel), printing and mailing cost for the Water Center's bimonthly newsletter, the Virginia Water Central. The Virginia Water Central is one of the Center's principal outreach programs and is distributed in hard copies and electronically in Virginia and other states. Current issue of the Virginia Water Central can be located on Water Center's website: (<http://www.vwrrc.vt.edu/pdf/Final.Jan01Distiller.pdf>). Past issues are posted on www.vwrrc.vt.edu.
2. Partial personnel cost for program development of the Service Training for Environmental Progress (STEP). STEP is a community outreach program of the Water Center. The Water Center staff works closely with community leaders to identify water-related problems, serve as a link between community and university faculty and students who will take on the projects, and seek sources of funding to support the ongoing program.
3. Personnel cost to maintain the Water Center's library of videos and slide shows. University faculty, students, local and state agency personnel and citizens are clients of the Water Center's library. The Water Center maintains a library and responds to numerous requests each month.

Title: Information Dissemination

Statement of critical regional or State water problem. N/A

Statement of results or benefits. N/A

Nature, scope, and objectives of the project, including a timeline of activities. N/A

Methods, procedures, and facilities. N/A

Related research. N/A

Training potential. N/A

Investigator's qualifications.

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Administration

Basic Information

Title:	Administration
Project Number:	2001VA3081B
Start Date:	3/1/2001
End Date:	2/28/2002
Funding Source:	
Congressional District:	9th
Research Category:	
Focus Category:	None, None, None
Descriptors:	None
Principal Investigators:	Leonard Shabman

Publication

State: Virginia
Project Number: VA3081
Title: Administration
Project Type: Information Transfer Project
Focus Category: None
Keywords: None
Start Date: 03/01/2001
End Date: 02/28/2002
Congressional District: 9th
PI: Leonard Shabman
Professor, Virginia Polytechnic Institute and State University
email:shabman@vt.edu
phone:540-231-5624

Abstract

During this application period the 104 funds will be used to provide skilled personnel support to Water Center's website (www.vwrrc.vt.edu). The website is one of the Water Center's principal outreach tools. During the application period, 104 funds will support the following activities related to Water Center website:

1. Editing and daily maintenance (personnel cost) of the homepage. Daily Water News is a major feature of the Water Center's website. On a daily basis, important regional water issues are extracted from regional newspapers and posted on Water Center website.
2. Scanning and posting of Water Center publications on the Water Center website. While recent publications of the Water Center are created in a pdf file and posted immediately on the web, past publications (several hundred since 1965) are available only as hard copies. There are numerous requests for these publications. Scanning and posting of all Water Center publications will reduce printing and mailing costs.
3. The Water Center is developing a web-based inventory of all its publications noted above and its past and present research projects and reports. Funds through 104 program are used to provide personnel support for database management, and website maintenance of hardware and software to ensure that the Center's website capabilities are state of the art.

Title: Administration

Statement of critical regional or State water problem. N/A

Statement of results or benefits. N/A

Nature, scope, and objectives of the project, including a timeline of activities. N/A

Methods, procedures, and facilities. N/A

Related research. N/A

Training potential. N/A

Investigator's qualifications. (See Project No. VA2861)

Multi-Institute Bactrial Source Tracking Project

Basic Information

Title:	Multi-Institute Bactrial Source Tracking Project
Project Number:	
Start Date:	1/1/2002
End Date:	12/31/2004
Funding Source:	Supplemental
Congressional District:	Ninth
Research Category:	Water Quality
Focus Category:	Methods, None, None
Descriptors:	bacteria, E.coli, source tracking, fecal contamination
Principal Investigators:	Tamim Younos , Charles Hagedorn

Publication

The purpose of this multi-institute project is to compare four methods of Bacterial Source Tracking (BST) to identify sources of fecal pollution. Methods to be studied include: Carbon source utilization of bacterial source samples; Pulsed-field gel electrophoresis analysis of bacterial source samples; Ribotyping of bacterial source samples; Antibiotic resistance analysis of bacterial source samples.

Information and knowledge gained from this study will advance field and analytical methodologies of bacteria source determination in natural waters. The evaluation and comparison of bacteria source tracking methods will provide information that will help other investigators across the nation choose appropriate techniques for determining sources of bacteria in natural waters.

Phytoremediation of Organic Contaminants in Soils and Ground Water: Mechanistic Evaluation

Basic Information

Title:	Phytoremediation of Organic Contaminants in Soils and Ground Water: Mechanistic Evaluation
Project Number:	2001VA8S
Start Date:	5/1/2001
End Date:	9/30/2004
Funding Source:	Supplemental
Congressional District:	Ninth
Research Category:	Biological Sciences
Focus Category:	Water Quality, Groundwater, None
Descriptors:	phytoremediation, organic contaminants, groundwater
Principal Investigators:	Tamim Younos , James A Smith

Publication

This work represents a joint collaboration between Dr. Cary Chiou of the National Research Program of the USGS and Dr. James Smith of the University of Virginia. Recently, Chiou et al. (2001) have developed a new model to describe the uptake of organic contaminants from soil and ground water by plants. The model is relatively simple to implement, and is based on equilibrium-driven partitioning of the organic contaminant between water and specific organic components (e.g., lipids and carbohydrates) present in any location of the plant. The model is compatible with limited plant-uptake data in the literature. However, it has not been rigorously tested by extensive data to verify many important implications of the model field applications. The primary objective of this work is to perform a series of laboratory experiments to validate (or invalidate) this new model. These data and model results will be of primary benefit to engineers designing phytoremediation systems for shallow soil and ground water contaminated with organic pollutants. The results will improve our understanding of levels of crop contamination by pesticides for different crops in various contaminated soils.

Modernizing US Army Corps of Engineers Policies and Programs

Basic Information

Title:	Modernizing US Army Corps of Engineers Policies and Programs
Project Number:	
Start Date:	3/1/2001
End Date:	2/28/2005
Funding Source:	Supplemental
Congressional District:	Ninth
Research Category:	Social Sciences
Focus Category:	Law, Institutions, and Policy, None, None
Descriptors:	policy, ecosystems, global warming, shoreline erosion
Principal Investigators:	Tamim Younos

Publication

US Army Corps of Engineers (Corps) policies, program and budget have been under increased review by the public, Congress, and the administration. Policy and planning for civil works projects have been described as confusing and needing modernization to reflect current state of the art planning practices. The Virginia Water Resources Research Center conducts policy reviews and applied research on planning for each of the following four efforts:

1. Produce background documents upon which can be developed a uniform rationale and procedure for monetary and non-monetary evaluation of ecosystem benefits and costs.
2. The Corps is developing a Corps Environmental Performance Atlas (CEPA) as an online tool for analyzing, managing, and improving the Corps environmental performance. CEPA will help Corps analysts collect and compare information on environmental issues and the Corps environmental programs. There is a need to analytically review Corps environmental project reports, i.e., to extract specific information on economic valuation of environmental features of Corps projects. This review will be utilized in finalizing the final format for the CEPA. The purpose of this study is to review Corps environmental project reports to identify the types of data might be available, the level of detail, and excerpt information related to economic valuation of environmental features, benefits, and costs of projects.
3. Carbon dioxide is included in the category of greenhouse gases that are believed to contribute to global warming. The possible consequences of climate change caused by greenhouse gas emissions present Corps planners with the question of how to incorporate consideration of project-induced changes in carbon emissions or sequestration rates in the project planning process. This study will consider how the effects of project-induced sequestration or release of carbon might be accounted for in the process of project formulation and evaluation according to the planning framework established by the Economic and Environmental Principles and Guidelines for Water Related Land Resources Implementation Studies.
4. The role and magnitude of Federal agencies in shore protection is a contentious issue and frequently modified by Federal legislation. The most comprehensive survey of shoreline change was the 1971 National Shoreline Study conducted by the Corps. That report identifies categories of shoreline erosion and associated development patterns. This study will review and update the 1971 National Shoreline Study Report. The review will focus on the "critical erosion" category to look at changes in development patterns for those areas.

Information Transfer Program

a. Water Center Newsletter

Virginia Water Central, published five to six times per year, is a newsletter on water-related issues in Virginia. The length varies from 12 to 28 pages but usually is 16 or 20 pages. The main elements of the newsletter (a given issue typically includes all elements) are a feature article on water policy or law; an article on scientific concepts related to current news; short summaries of recent water-related news items; notices of events, publications, etc.; a guide to finding information on water-related topics; a guidance on the Virginia K-12 Standards of Learning supported by parts of the particular issue. In this reporting year, five issues of Virginia Water Central were distributed. As of June 2002 the newsletter mailing list included approximately 2400 recipients of paper copies and 320 recipients of an e-mail notice sent whenever a new issue has been posted to the Centers Website. In addition, we send about 40 copies to 13 campus departments and 20 copies to the Library of Virginia for distribution to the state depository libraries. The newsletter is available on Water Centers Website: www.vwrcc.vt.edu/central/virginia.htm.

b. Web-based Daily News

News about water-related issues from regional newspapers is gathered and posted on the Water Center website on a daily basis and is a very popular feature of the VWRRC website. Frequent web visitors include state and local agency personnel and interested citizens. Daily news can be located on the website: www.vwrcc.vt.edu/news/daily.htm.

C. Short Courses, Workshops or Seminars Offered

Virginia Water Research Symposium 2001, November 14-16, 2001, Charlottesville, VA Attendance: 180

Stroubles Creek Watershed Stakeholder Summit November 2, 2001, at Virginia Tech Attendance: 30

Integrating Service-Learning into Watershed Management - Workshop January 17, 2002, at Virginia Tech Attendance: 20

TMDL Bacteria Source Tracking Workshop February 22, 2002, Charlottesville, VA Attendance: 30

Student Support

Student Support					
Category	Section 104 Base Grant	Section 104 RCGP Award	NIWR-USGS Internship	Supplemental Awards	Total
Undergraduate	0	0	0	15	15
Masters	0	0	0	12	12
Ph.D.	0	0	0	0	0
Post-Doc.	0	0	0	0	0
Total	0	0	0	27	27

Notable Awards and Achievements

Tamim Younos, was awarded the prestigious Japan Society for Promotion of Science short-term fellowship for presenting lectures at the University of Tokyo. He visited the University of Tokyo (September 21 October 14, 2001) where he offered several lectures.

Tamim Younos was reelected to the Board of Directors for the Universities Council on Water Resources (UCOWR) (June 2002).

Publications from Prior Projects

1. Loganathan, G.V., H.D. Sherali, S. Park, and S. Subramanian. 2002. Optimal Design-Rehabilitation Strategies for Reliable Water Distribution Systems. Virginia Water Resources Research Center, Special Report SR18-2002.52 p. Available on the Web:
<http://www.vwrrc.vt.edu/publications/Loganathan%20report%20special.pdf>