

The New England Water Treatment Technology Assistance Center (NE-WTTAC)

at the
University of New Hampshire

Recent Accomplishments,
Current Projects,
and Potential Projects



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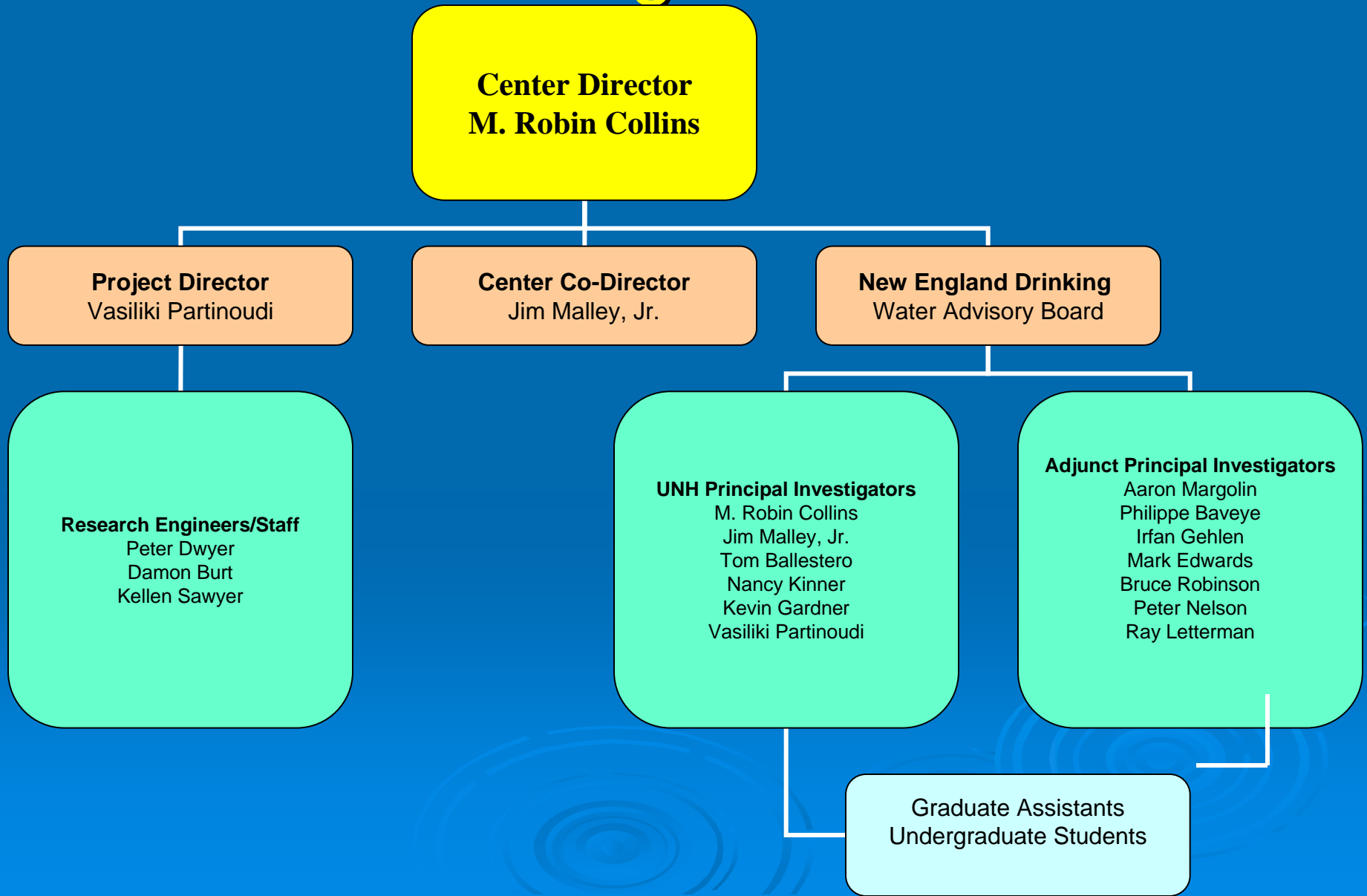
September 2008

http://www.unh.edu/erg/wttac/about_us.html

<http://www.tacnet.info/>



NE-WTTAC Organizational Chart



EPA TECHNICAL ASSISTANCE CENTER NETWORK

Assisting Small Public Water Systems ... Protecting Public Health

Search the TAC centers by clicking a location on the map, and then selecting a category below.

CHOOSE A LOCATION

- Technology
- Training
- Website
- **HELP**



ALL TAC CENTERS

[MISSION](#)[ORGANIZATION](#)[FUNDING & OVERSIGHT](#)[PROJECTS & PRODUCTS](#)

TACnet Mission Statement

Together, the small public water systems technology assistance centers form a network with a common goal: to protect public health, improve water system sustainability, and enhance compliance.

The technology assistance centers address the needs of small public water systems, including systems that serve Indian tribes, by applying university resources in the following areas:

- technology verification
- pilot and field testing of innovative technologies
- training and technical assistance

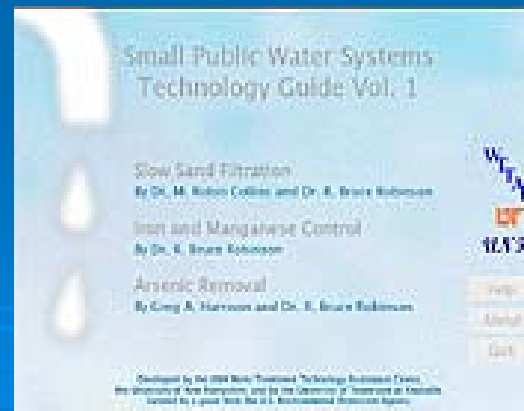
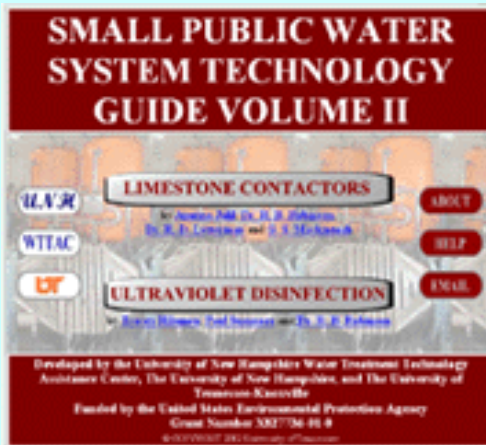
NE-WTTAC Programs

1. Technical Training Resources
2. Non-Aligned Treatment Technology Evaluations
3. Innovative Technology Comparisons
4. Treatment Technology Cost Summaries

Technical Training Resources

- Web Site about Slow Sand Filtration, Iron and Manganese Control, and Arsenic Removal*
- Web Site about Limestone Contactors and UV Disinfection*
- Explore Incorporating CEUs with the Completed CD and Website*
- Co sponsorship of an International Slow Sand and Alternative Biological Filtration Conference*
- Literature Review Assessment of UV Design Modification to Reduce the Risk of Mercury Release*

Small Public Water Systems Technology Guides



SMALL PUBLIC WATER SYSTEM TECHNOLOGY GUIDES: Vol. I

SLOW SAND FILTRATION

By Dr. M. Robin Collins and Dr. R. Bruce Robinson

IRON AND MANGANESE CONTROL

By Dr. R. Bruce Robinson

ARSENIC REMOVAL

By Greg A. Harrison and Dr. R. Bruce Robinson

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ABOUT

QUIT

Developed by the UNH Water Treatment Technology Assistance Center (www.wttac.unh.edu),
the University of New Hampshire and by the University of Tennessee, Knoxville
Funded by a grant from the U.S. Environmental Protection Agency

Introduction/home page

WaterTechCD_SS&Fe&As

File Find

CONTENTS

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- Process description
- > Typical filter
- Design Criteria
- Examples plans & specifications
- Performance
- Operation
- Automation
- Advantages
- Limitations & concerns
- Pilot plants
- Costs
- References
- Contacts & facilities
- Virtual tour of Rutland and Gorham WTP's

CLICK ON AN ASPECT OF THE DIAGRAM FOR DETAILED INFORMATION

ABOUT

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TYPICAL FILTER

Filter diagram

4th International Slow Sand and Alternative Biological Filtration Conference

IWW Water Centre
Mülheim an der Ruhr, Germany
3-5 May 2006



Water Tower at the Aquarius Water
Museum in Mülheim an der Ruhr

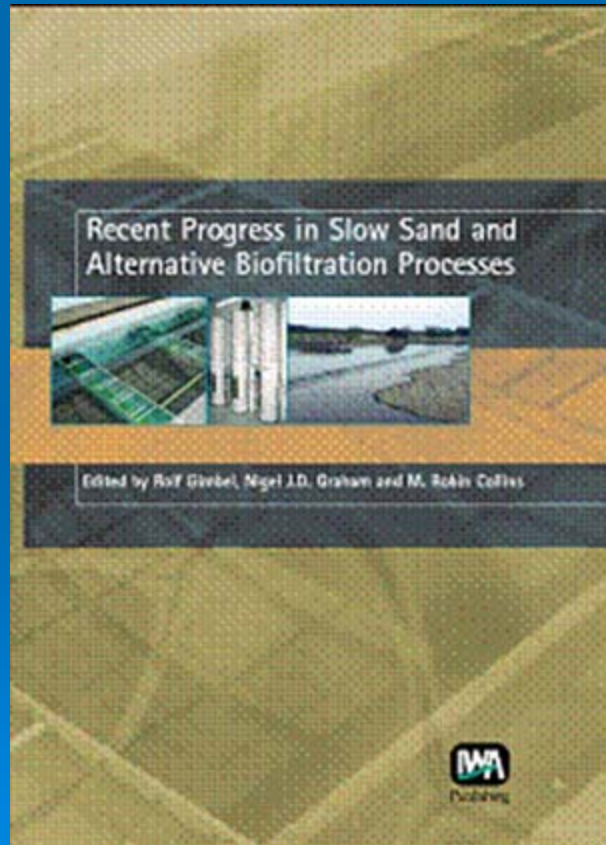
The main objective of the conference was:

To provide an updated prospective on the physical, chemical, biological, and operational factors affecting the performance of biological filtration systems from slow sand filtration and riverbank filtration to more advanced biological treatment techniques such as biological activated carbon.



Recent Progress in Slow Sand and Alternative Biofiltration Processes

Editor(s): R. Gimbel, N.J.D. Graham, M.R. Collins



The authors collectively represent a perspective from 23 countries and include academics, biofiltration system users, designers, and manufacturers.

The main topics were:

- comparable overviews of biofiltration systems,
- slow sand filtration process behavior,
- treatment performance and process developments,
- and alternative biofiltration process behaviors,
- treatment performances,
- and process developments.

Technical Training Resources

Current

- Riverbank Filtration Engineering Training Website
- Riverbank Filtration Workshop & Manual
- Book on Bioclogging of Filters and Natural Porous Material
- Basic Safety Guidelines for Small Water Systems
- Best Management Practices for Well Abandonment/Decommissioning

Non-Aligned

Treatment Technology Evaluations

- Antibiotic Removal in Slow Sand Filtration (Oregon State University)*
- Enhanced Organic Precursor Removals by Gravel Roughing Filters (Kerr Wood Leidal Associates Ltd)*
- Aeromonas Removal in Selected Water Treatment Processes (University of Tennessee)*
- Enhanced Particle Capture in Porous Media Using an Attachment Mediating Polymer (Cornell University)*
- Assessing Temperature Influences on Slow Sand Filtration Treatment Performance*
- Assessing the Role of a Schmutzdecke in Microbial Removals by Riverbank Filtration and Slow Sand Filtration*
- Comparison of Riverbank and Slow Sand Filtration Removal Capabilities*

Non-Aligned

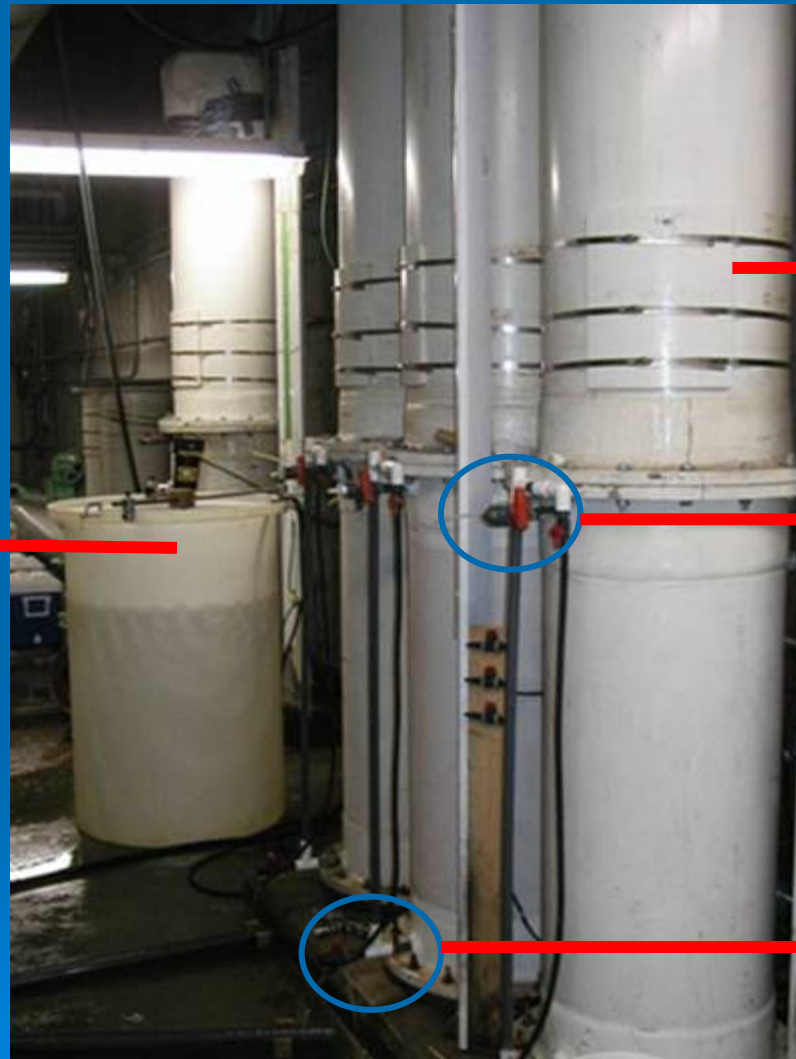
Treatment Technology Evaluations (cont.)

- Fate and Transport of Radionuclides from Small On-Site Wastewater Disposal Systems*
- Assessing Water Quality from the RBF Pumping Study in Manchester, NH*
- Artificial Recharge of Groundwater in Newmarket, NH*
- Radioactive Contamination of Ion Exchange Resins Used for Treatment of Radionuclides in Drinking Water*
- Fate and Transport of Radionuclides from Small On-Site Wastewater Disposal Systems*
- Assessing the Role of Protists in Removing Problematic Microbes by Biofiltration systems
- Assessing Pretreatment Needs of Small Water Systems

Radionuclide Disposal Project



Temperature Influence Study



110 Gal Tank with
Microchallenge
Solution

Removable Door
(Sand Coring)

Surface
Drain
(Influent)

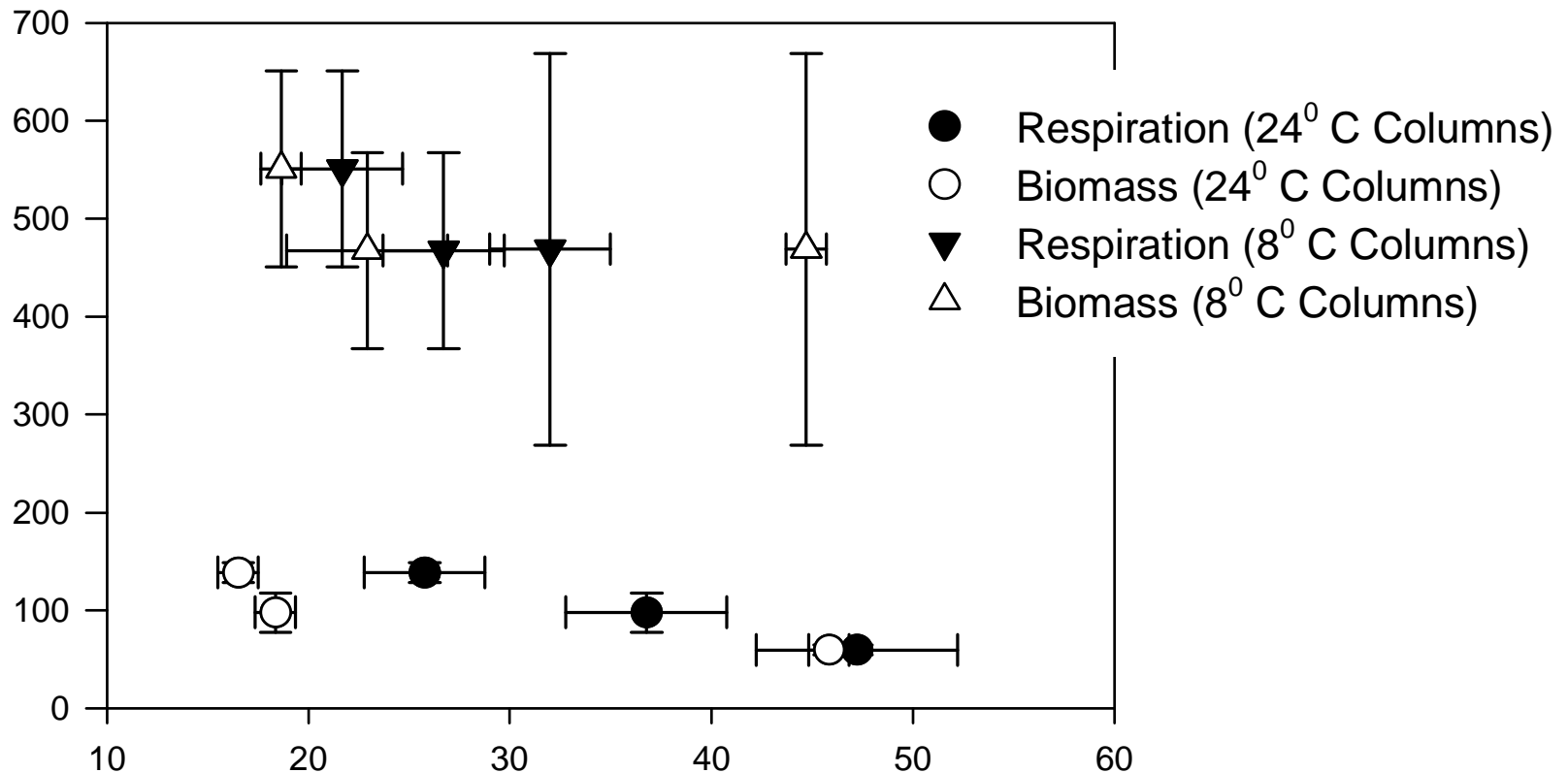
Bottom
Drain/Backf
ill
(Effluent)

SSF in Winthrop, ME

Screening Experiment Design



Effect of Temperature on Schmutzdecke Recovery



Biomass (as Phospholipids), nmol PO₄ / gdw and
CO₂ Respiration, µg as Carbon / gdw sand / h



Flagellate



Amoebae

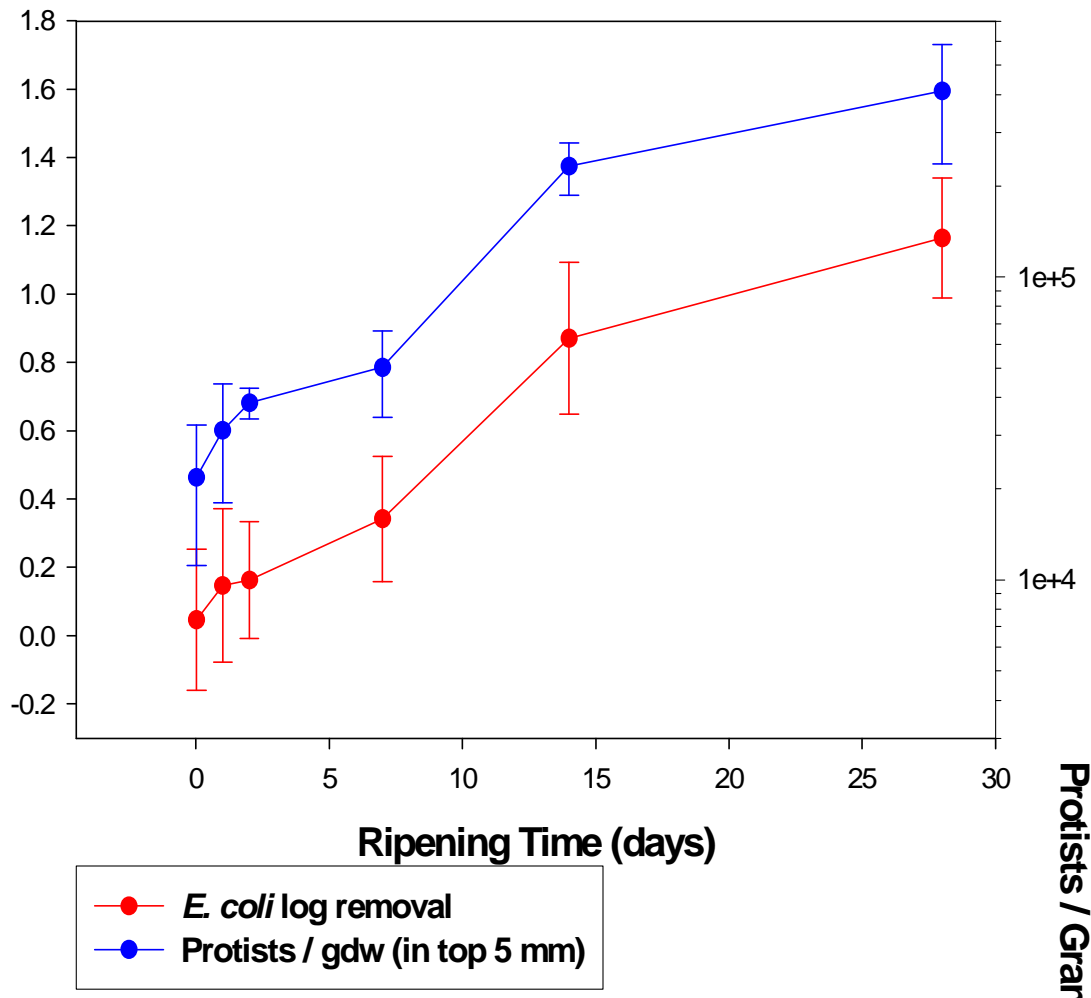


Free Ciliate



Stalked Ciliate

Protistan Abundance



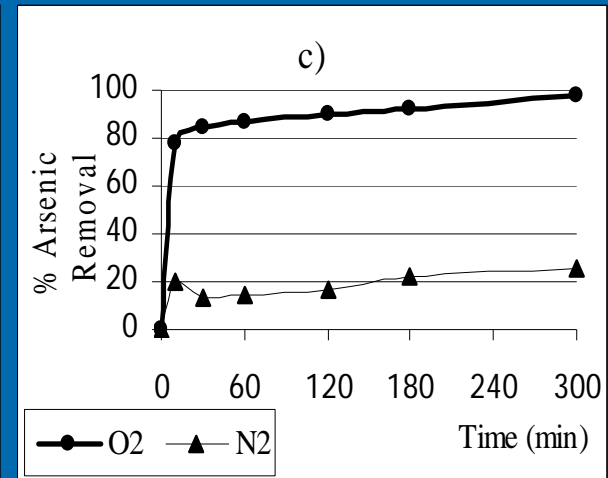
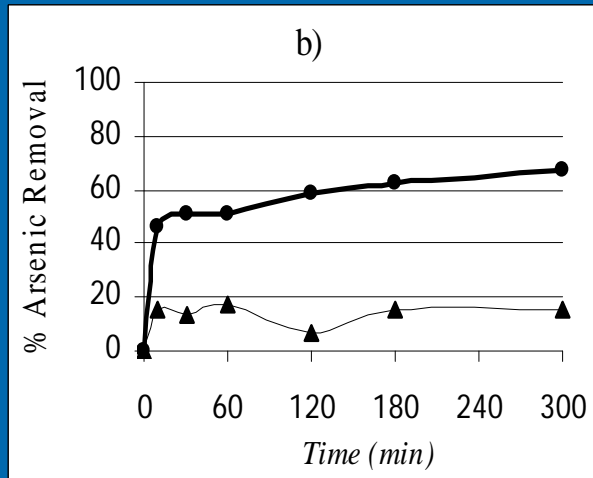
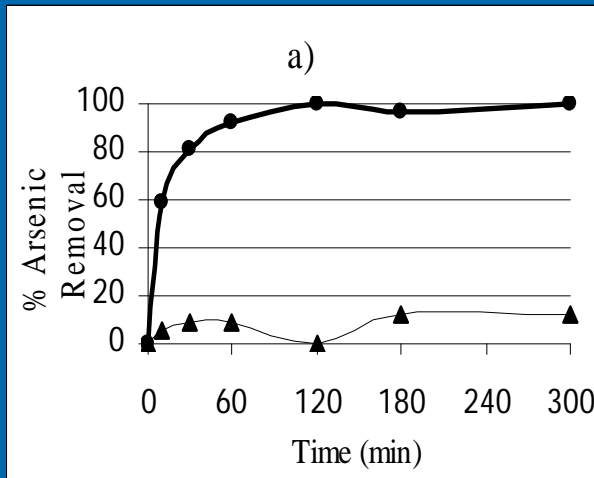
Most Important Results

- Removal continues to increase with increased filter runtime.
- Protistan abundance correlates well to removal

Innovative Technology Comparisons

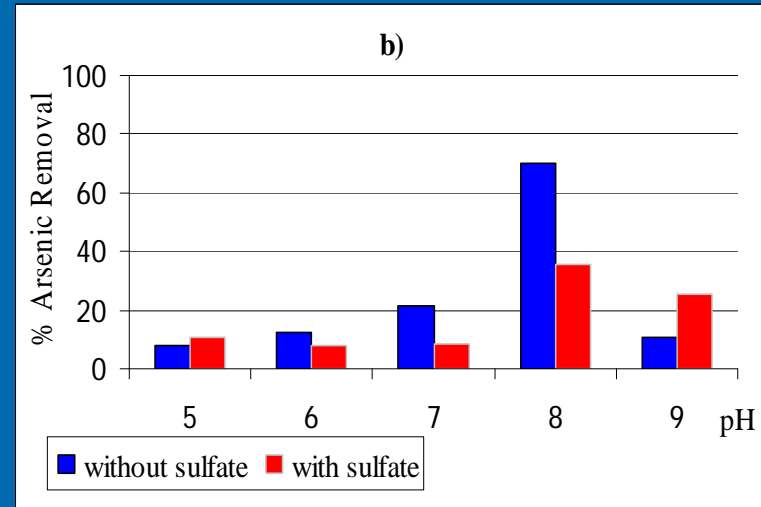
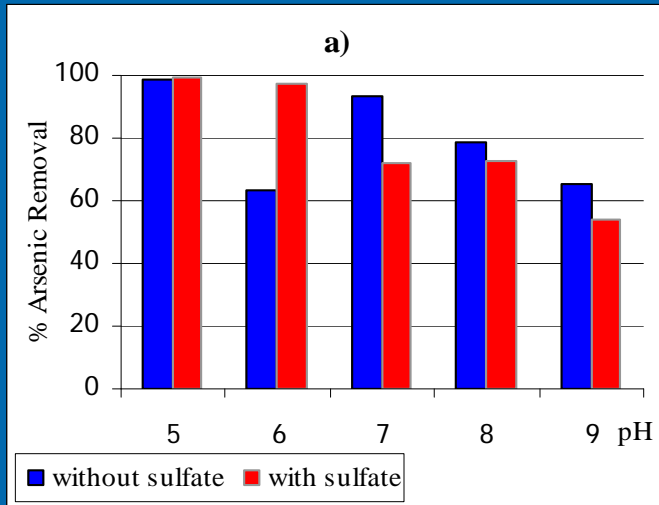
- Alternative Surrogates for Monitoring of Ultraviolet Disinfection Performance*
- Enhancing Arsenic Removal Using Innovative Adsorbents*
- Enhanced Corrosion Control in Small Water Systems Using Calcium Silicate Contactors (Syracuse University)*
- Evaluation of Fused Carbon Nanotube Technology for Drinking Water Treatment Applications*
- Evaluating the Disinfection of Particle Associated Viruses
- Post Treatment Aeration to Reduce DBP for Small Systems
- Assessing Zero Valent Iron for Arsenic Removal
- Enhancing Natural Organic Matter and Arsenic Removal Using Metal Coated Sand

Assessing Zero Valent Iron (ZVI) for Arsenic Removal



Example of results obtained with the kinetic studies
% Arsenic Removal: a) pH 5, b) pH 6, c) pH 7

Assessing Zero Valent Iron (ZVI) for Arsenic Removal



Influence of Sulfate on Arsenic removal:

a) with O_2 ,

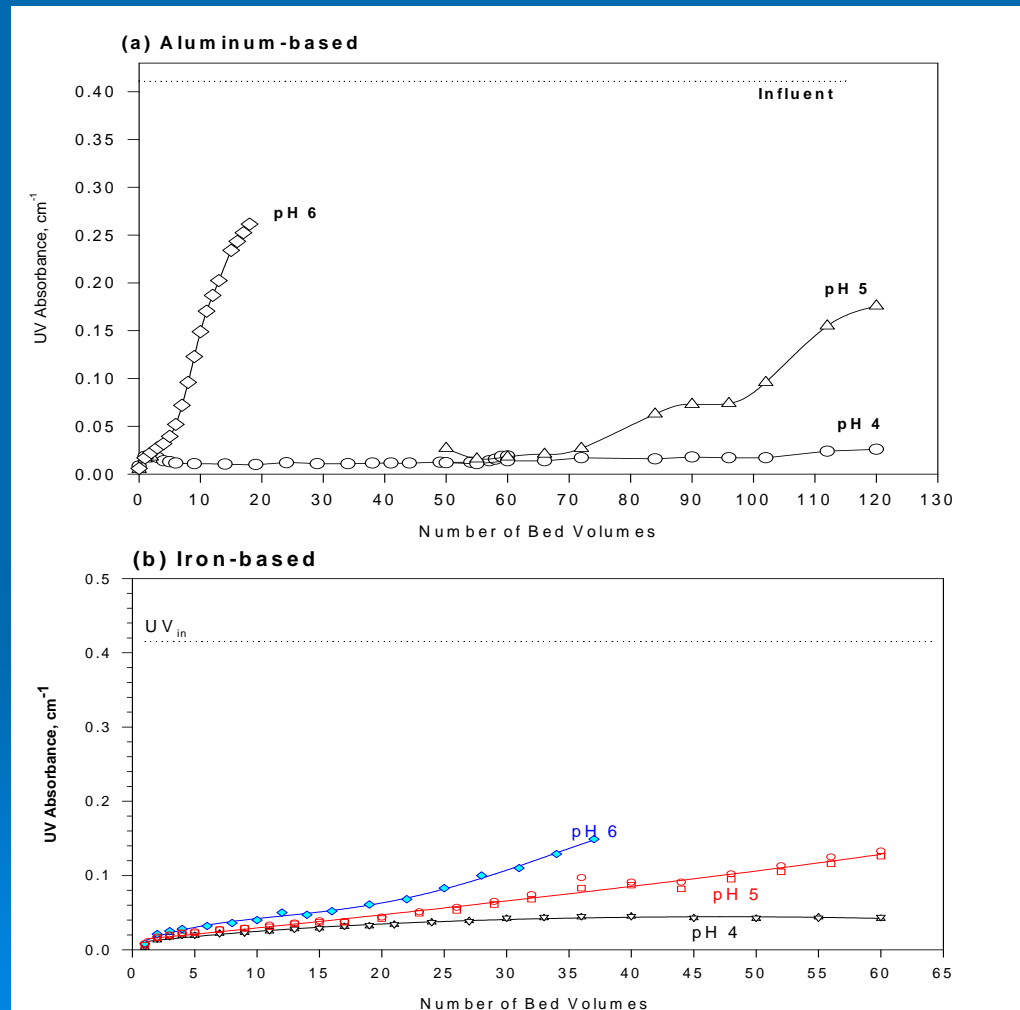
b) with N_2 ;

Ionic Strength = 0.005 M; T = 20°C;

$[As]_{Initial} = 3.22$ mg/L; ZVI = 200 mg/L)

Effect of Challenge Solution pH on NOM Removal after Regeneration at pH 11

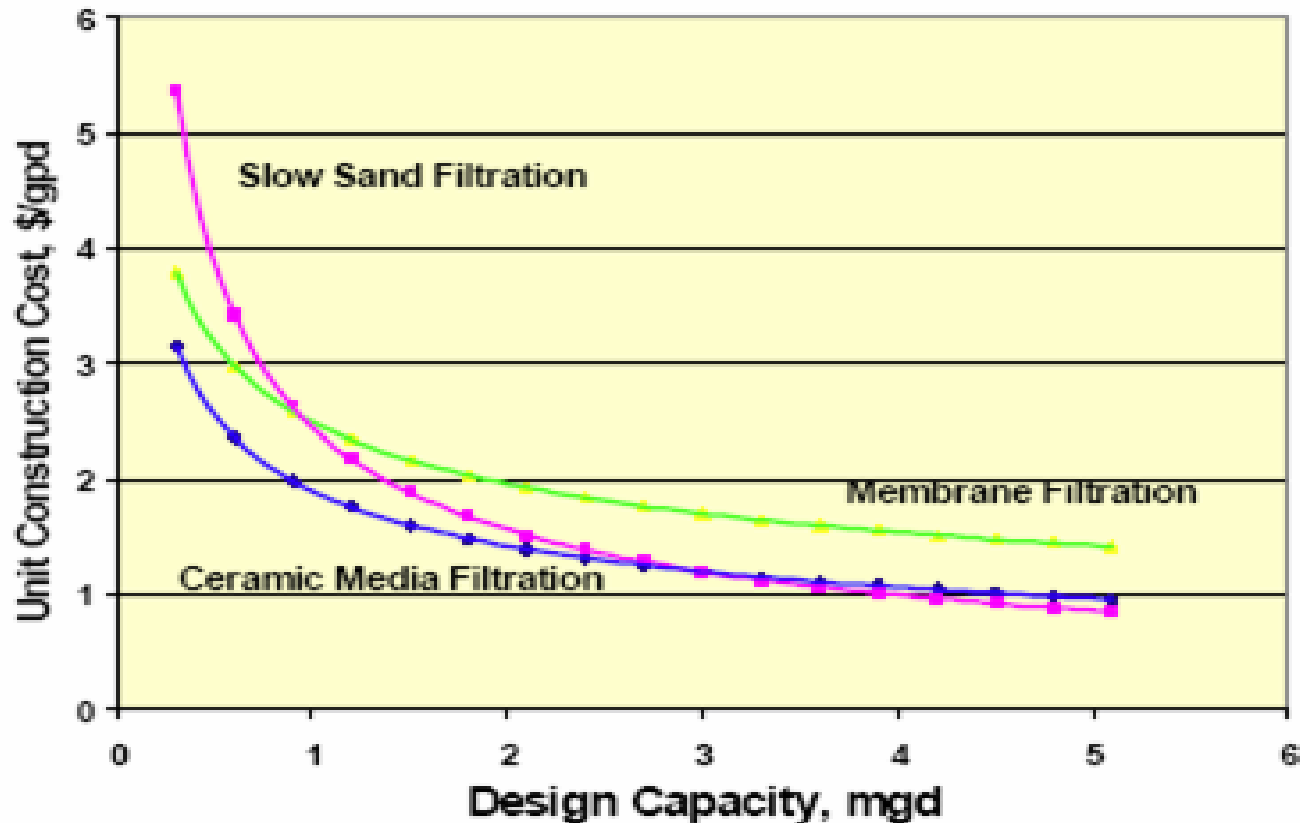
(a) aluminum-based coating and (b) iron-based coating



Treatment Technology Cost Summaries

- Costing Summaries for Slow Sand Filtration and Ceramic Media Pressure Filtration*
- Costing Summaries for Diatomaceous Earth Filtration and Arsenic Treatment by Activated Alumina and Ion Exchange*

Costing Summaries for Slow Sand Filtration and Ceramic Media Pressure Filtration



Comparison of Costing Curves from this Study with Previous Study by Elandee, et al.

FUTURE PROJECTS

- Helping Small Water Systems Develop and Manage a Corrosion Control Strategy
- Evaluation and Optimization of an Intermittent Slow Sand Filter for Small Community and non-Community Systems
- Assessing Emerging Microbes Removals by RBF
- Pharmaceutical and Personal Care Product Distribution in a NH Watershed - Case Study

QUESTIONS ?

