Overview

The Water Research Foundation
Presentation Outline

WRF Overview

• What We Do
• Accessing Information
• Research Programs
• Recent Activities

Research and Innovation

• New Resources
• Upcoming RFPs
• LIFT and Innovation
• Involvement Opportunities
What does WRF do?

Identify, prioritize and fund research for the water sector.

Accelerate the adoption of new technologies in the water sector.

Convene experts and sector representatives to identify and collaborate on priority water research.

Educate decision-makers on the science of water.
ALL WATER IS ONE WATER

Rain/Stormwater
Groundwater
Wastewater
Recycled Water
Drinking Water
2020 AT A GLANCE

Funded Research

$73M

Contractually Funded Research
Managed by 53 Staff

$31M Cost Share
$42M Cash

Research Portfolio

210 Active Projects

1 Federal Contracts
2 Private Grants
3 Federal/State Grants
200 Co-funders
77 Co-funded Projects

Subscribers

1040 UTILITIES
88 CONSULTANTS
40 MANUFACTURERS

Research & Innovation Programs

- Research Priority
- Tailored Collaboration
- Emerging Opportunities
- Grants/Awards
  - Paul L. Busch Award
- Facilitated Research
- Unsolicited Research

$.84 OF EVERY DOLLAR supports program services.

1 Federal award received
43 new projects
61 publications
27 Webinars
12 Technology Webinars
2 Expert Symposiums
Estimate 900 volunteers

$35M
$31M
$73M

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Florida Utility Subscribers

- American Water – Florida – Pensacola
- Bal Harbour – Bal Harbour
- Bay Harbor Islands – Bay Harbor Islands
- City of Cocoa – Cocoa
- City of Coral Gables – Miami
- City of Florida City – Florida City
- City of Hialeah – Hialeah
- City of Hialeah Gardens – Hialeah Gardens
- City of Hollywood – Hollywood
- City of Homestead – Homestead
- City of Miami Beach – Miami
- City of North Bay Village – North Bay Village
- City of North Miami – North Miami
- City of North Miami Beach – North Miami Beach
- City of Orlando, FL – Orlando
- City of Tallahassee Water & Sewer Dept – Tallahassee

- City of Tampa Water Department – Tampa
- City of West Miami – West Miami
- City Opa Locka – Opa Locka
- Florida Keys Aqueduct Authority – Key West
- Fort Lauderdale Utilities Administration – Fort Lauderdale
- Hillsborough County – Tampa
- Indian Creek Village – Indian Creek Village
- JEA Water & Wastewater Treatment RRWTP – Jacksonville
- Miami-Dade County, Department of Environmental Resource Mgmt – Miami
- Miami-Dade Water & Sewer Department – Miami
- North Bay Village – North Bay Village
- Orange County Utilities – Orlando
- Pasco County Utilities – New Port Richey
- Pinellas County Utilities – Clearwater
- Sarasota County Utilities Department – Sarasota

- Seacoast utility Authority – Palm Beach Gardens
- Seminole County Environmental Services – Sanford
- Severn Trent Services, Inc. – Tampa
- St. Petersburg Water Department – St. Petersburg
- Tampa Bay Water – Clearwater
- Toho Water Authority – Kissimmee
- Town of Medley – Medley
- Town of Surfside – Surfside
- Virginia Gardens – Virginia Gardens

WRF Board of Directors – Florida Members
- Hardeep Anand, Miami Water & Sewer
- Bart Weis, Hillsborough County
- Gary ReVoir, Tetra Tech
Accessing Information
(Other than contacting me)
www.waterrf.org

• Your primary source for One Water research and resources
• Mobile/tablet optimized
• Improved search
• Personalized content
Account Access

Create An Account

First Name *

Last Name *

Organization *

Title

Email address *

A valid email address. All emails from the system will be sent to this address. The email address is not made public and will only be used if you wish to receive a new password or wish to receive certain news or notifications by email.

Why create an account?

Full access to our Website is a benefit of being a Foundation Subscriber (e.g., utilities, consulting firms, and manufacturers) and we encourage each person affiliated with a subscribing organization to request their own login and password.

If you are not a subscriber, you can still access some content. Create an account to access publicly available materials on the website.

Is my organization a subscriber?

Go to the specific Subscriber List page to verify whether your organization is a subscriber and if so, return to this page to...
WRF Topic Overviews

THE CHALLENGE
Cyanobacteria and cyanotoxins are a natural water formation, with cyanotoxins not only causing serious problems in public health and the environment but also posing a significant threat to the economy. In recent years, cyanotoxins have been found in various water bodies, including lakes, rivers, and reservoirs, posing a serious threat to public health and the environment.

TREATMENT
There are several conventional and advanced treatment options available to address cyanotoxins. The key is in understanding the specific type of cyanotoxin, because different treatments are needed to remove cyanotoxins at varying degrees by different treatment technologies.

THE RESEARCH
WRF, in partnership with the U.S. Environmental Protection Agency (EPA), funded one of the first projects to investigate cyanotoxins as a public health threat to water systems. This study examined the use of cyanotoxin treatment technologies and concluded that cyanotoxin treatment technologies are effective in reducing cyanotoxin concentrations in water systems. The study also found that cyanotoxin treatment technologies are cost-effective and provide a sustainable solution for long-term management of cyanotoxins in water systems.

Per- and Polyfluoroalkyl Substances

THE CHALLENGE
Per- and polyfluoroalkyl substances (PFAS) are a class of chemicals that are used in a variety of products, including firefighting foam, clothing, and food packaging. PFAS can be found in drinking water and pose a significant threat to public health and the environment. In recent years, PFAS have been found in various water bodies, including lakes, rivers, and reservoirs, posing a serious threat to public health and the environment.

TREATMENT
There are several conventional and advanced treatment options available to address PFAS. The key is in understanding the specific type of PFAS, because different treatments are needed to remove PFAS at varying degrees by different treatment technologies.

THE RESEARCH
WRF, in partnership with the U.S. Environmental Protection Agency (EPA), funded one of the first projects to investigate PFAS as a public health threat to water systems. This study examined the use of PFAS treatment technologies and concluded that PFAS treatment technologies are effective in reducing PFAS concentrations in water systems. The study also found that PFAS treatment technologies are cost-effective and provide a sustainable solution for long-term management of PFAS in water systems.
2021 Research Programs and Timeline

Research Priority

Tailored Collaboration

Facilitated Research

Emerging Opportunities

Unsolicited

Volunteers due 6/8
RFPs posted August

Pre-proposals due 6/7
Full proposals due Q3

Ongoing

Opened 2/4
Revolving monthly

2022
Tailored Collaboration Program

2020 TC Awards

- **Post-Wildfire** Distribution System Water Quality Impacts and Potential Responses
- Understanding Pyrolysis for **PFAS** Removal
- Acid+ Digestion
- Application of Finite Element Analysis in the Design of Large-Diameter Buried Pressure Pipes-Special Cases
- Filtration Process Control for Pathogen Removal and Climate Change Adaptation
- Studying the Fate of **PFAS** through Sewage Sludge Incinerators

Utility Sponsor, eligible every other year

WRF matches 1:1 funding up to $100K

Pre-proposals

Full Proposals

06/7/21

08/21

9/21

11/21

Ask for full proposal

Awards
<table>
<thead>
<tr>
<th>Research Priority Program: 2020 Approved Projects</th>
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</thead>
<tbody>
<tr>
<td><strong>Research Area</strong></td>
</tr>
<tr>
<td>Linking Nutrient Reductions to Receiving Water Responses</td>
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<tr>
<td>Assessing Water Quality Monitoring Needs, Tools, Gaps &amp; Opportunities for Potable Water Reuse</td>
</tr>
<tr>
<td>Assessment of Vulnerability of Source Waters to Toxic Cyanobacterial Outbreaks</td>
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<tr>
<td>Guidance for using Pipe Loops to Inform Lead and Copper Corrosion Control Treatment Decisions</td>
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<tr>
<td>Investigation of Alternative Management Strategies to Prevent PFAS Entry into Treatment Plants</td>
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<tr>
<td>Advancing Low Energy Biological Nitrogen &amp; Phosphorus Removal</td>
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<tr>
<td>Holistic and Innovative Flood Management under Extreme Wet Weather &amp; Climate Impacts</td>
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<tr>
<td>Impact of Haloacetic Acid MCL Revision on DBP Exposure &amp; Health Risk Reduction</td>
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<tr>
<td>Case Studies on Management of Cross-Sector Dependencies</td>
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<tr>
<td>Biological Nutrient Removal Process Implementation Through Improved Control Systems &amp; Analytics</td>
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<tr>
<td>Defining Exposures of Microplastics/Fibers in Treated Waters &amp; Wastewaters</td>
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<tr>
<td>Developing a Framework for Quantifying Energy Optimization Reporting</td>
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<tr>
<td>Unsolicited Program</td>
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<tr>
<td>Rapid Detection and Quantitation of Active Microorganisms (5100)</td>
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<tr>
<td>Real Time Carbon Management of Water Resource Recovery Facilities using In-Situ Bio-electrochemical Sensors (5101)</td>
</tr>
<tr>
<td>Application of Novel Method to Estimate Total PFAS Content in Water (5102)</td>
</tr>
<tr>
<td>Microwave Regeneration of PFAS-Exhausted Granular Activated Carbons (5103)</td>
</tr>
<tr>
<td>Use of DNA Nanostructures as Viral Surrogates in Potable Reuse Applications (5104)</td>
</tr>
<tr>
<td>Facilitated Program</td>
</tr>
<tr>
<td>Evaluating Utility Staff Training to Improve Knowledge Retention (5074)</td>
</tr>
<tr>
<td>Videos on Development of Recycled Water Use in S. California (5090)</td>
</tr>
</tbody>
</table>
Convening Outline

01 CURRENT DISRUPTORS
Identify Current State

02 FUTURE DISRUPTORS
Future State: Next 10 to 20 years

03 ADDITIONAL DISRUPTORS
What else is the water sector facing in the future?

04 RECOMMENDATIONS
Considerations for utility long-range planning

05 RESEARCH & INNOVATION
Where are the opportunities to address challenges?
High-Level Research Opportunities

- Data
- Water-Energy Nexus
- Workforce
- Community Engagement
- Resiliency and Sustainability
- Social Science
- Communication and Messaging
- Technology
- Values and measures
- Policies
- Social Media Channels
Common Themes Throughout

**Opportunities:**
- Technology
- System Flexibility
- Advanced Monitoring
- Community Outreach
- Workforce Outreach
- Resilience
- Social Science

**Disruptors:**
- Climate Change
- Technology
- Costs
- Unknown unknowns

**Regulatory**

**Affordability**
Reimagining the Research Priority Program

- **Outline Major inputs**: Jan-March
- **Review & Evaluate Inputs Draft Themes**: May
- **Finalize Themes**: June-September
- **Evaluate Draft Themes**: October
- **Expert Summit**: January 2022
New WRF Resources
## Results of Interlaboratory and Methods Assessment of the SARS-CoV-2 Genetic Signal (5089)

| Study included 33 US Labs and evaluated over 35 independent methods |
| Experimental Plan and QAPP – liaised with Canadian Water Network to compare approaches |
| Wastewater Sampling and Interlaboratory Analysis (Aug 17-28, 2020) |

- **Webcast**

- **Publication in** *Environmental Science: Water Research & Technology*

- Method SOPs and QAP available on the [WRF website](#)
Biosolids Research Summit

• Feb 19-20, 2020 (original summit in 2003)
• 46 attendees
• 11 project concepts will be developed and prioritized into a 5-year research plan by advisory committee for consideration in fall
• Research synthesis
• Key takeaways:
  • Share the knowledge
  • Keep it local
  • Flattening the CEC curve

Co-funded by WRF, WEF and NYCDEP
Nutrients Treatment: Intensification, Reliability, and Efficiency

- **Guidelines for Optimizing Nutrient Removal Plant Performance (#4973)**
  - Ongoing Webcast Series, including upcoming webcasts:
    - 6/23 Nutrient Reduction from Secondary BOD Removal WRRFs
    - 7/7 Optimize Nutrient Removal WRRF Operations
    - 7/21 Nutrient Reduction Approaches for Small Systems
- **New Regulatory Approaches for Improved Nutrient Removal (#4974)**
  - Ongoing
- **Practices to Enhance Internal Fermentation of Side-Stream Secondary Sludge and Mixed Liquor Suspended Solids for Biological Phosphorus Removal (#4975)**
  - Ongoing
- **Nutrient Removal Processes for Resource Efficiency (#4976)**
  - Published 2/24/21
Biofiltration Guidance

Combines 15 years of research and engineering to provide:

- Biofiltration Terminology
- Frequently Asked Questions
- Biofiltration Calculations
- Operations Checklist
- Troubleshooting Guide
- Monitoring Tool Standard Operating Procedures
- Biofiltration Tools Compendium
- List of Biofilter Optimization Case Studies

- Biofilter Optimization Decision Trees
- List of Biofilter Conversion Case Studies
- List of Select Full-Scale Biofiltration Plants with Drivers and Key Parameters
- Sample Biofilter Testing Plans

Published December 10, 2020
Lead and Copper Management

Lead Service Line Identification Techniques (WRF #4693)
• Published 6/8/20, Webcast 6/23/20

Full Lead Service Line Replacement Guidance (WRF #4713)
• Published 2/18/21
• Provides guidance and reference materials for use when planning and implementing FLSLRs, including a toolbox of materials to share with customers (example doorhangers, brochures, etc)
• Field studies conducted at over 100 locations at participating utilities
• 16 Case studies focus on lessons learned in conducting and financing FLSLR, educational materials used, special sample protocols used, and experiences in providing home water filters
Water Resource Planning

• Four case studies demonstrate how multi-objective evolutionary algorithms (MOEAs) can be used to help decision-making processes by revealing planning, operational, or policy tradeoffs that otherwise might be difficult or nearly impossible to assess.

• Tampa Bay Water’s case study involves improving upon budget year source water allocation and financial planning.

• Tailored Collaboration, Published 5/18/21.
Community-enabled Lifecycle Analysis of Stormwater Infrastructure Costs (CLASIC) Tool

**Goal**

- Helps decision makers understand and weigh the estimated costs, reductions in runoff and pollutant loads, and co-benefits of various planning scenarios as they consider stormwater management projects. (green, hybrid green-gray, and gray infrastructure)

**Tool Info**

- online screening tool w/ life cycle cost framework
- interfaced with GIS and links with national databases
- integrates Multiple-Criteria Decision Analysis (MCDA), to consider co-benefits for green infrastructure.
- components: life cycle cost; performance; and co-benefits.

Final tool released April 2021

Webcast 5/26/21

EPA National Priorities grants by grantees from the Water Research Foundation, Colorado State University, Wichita State University, the University of Maryland, and the University of Utah.

Info on [EPA](#) or [WRF](#) website

[Link to Tool](#)
Direct Potable Reuse – CA SWB Grant 1

State Water Board Direct Potable Reuse Research
Webcast Part 1: Pathogens (4951 and 4989)
Wednesday, June 2 | 1pm - 3:30pm ET

Webcast Part 2: Chemicals (4991)
Wednesday, June 9 | 1pm - 2:30pm ET

Register for Webcasts Here
Ongoing PFAS Research

Occurrence of PFAS Compounds in US Wastewater Treatment Plants (WRF #5031)
- Will quantify occurrence of a wide range of PFAS in solid and liquid streams and assess behavior and transformation through treatment
- Datasets from 40 water resource recovery facilities at 34 utilities

Assessing PFAS Release from Finished Biosolids (WRF #5042)
- Will examine release as a function of PFAS loading in finished biosolids, post-digestion processing of biosolids, and age of biosolids (fresh vs field-aged)

Investigation of Treatment Alternatives for Short-Chain PFASs (WRF #4913)

Comparison of established & emerging PFAS treatment approaches on a life-cycle assessment (LCA) and costing (LCC) basis

2020 RFP: Investigation of Alternative Management Strategies to Prevent PFAS from Entering Drinking Water Supplies and Wastewater
## 2021 RFPs Coming in August, Volunteer Now!

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Budget</th>
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<tbody>
<tr>
<td>Understanding the Mechanisms of Chlorine and Chloramine Impact on Opportunistic Pathogens in Distribution Systems</td>
<td>$250,000</td>
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<tr>
<td>Using Phosphate-Based Corrosion Inhibitors and Sequestrants to Meet Multiple Water Treatment Objectives</td>
<td>$250,000</td>
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<tr>
<td>Assessment of Molecular Techniques to Detect and Predict Cyanotoxin-Producing Blooms</td>
<td>$100,000</td>
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<tr>
<td>Development of Innovative Predictive Control Strategies for Nutrient Removal</td>
<td>$200,000</td>
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<tr>
<td>Technologies and Approaches to Minimize Brominated and Iodinated DBPs in Distribution Systems</td>
<td>$250,000</td>
</tr>
<tr>
<td>Establishing Seasonal Targets for Receiving Waters: Rethinking Wet Weather versus Dry Weather Expectations</td>
<td>$200,000</td>
</tr>
<tr>
<td>PFAS One Water Risk Communication Messaging for Water Sector Professionals</td>
<td>$100,000</td>
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</tbody>
</table>
Establishing Seasonal Targets for Receiving Waters: Rethinking Wet Weather versus Dry Weather Expectations!

Project Rationale:

- Clean Water Act administered for both dry and wet weather to support designated uses
- Communities involved in long term control plans (LTCPs) need clear guidance
- Need more accurate data defining the exposure and risk
- Magnitude and Intensity of wet weather event in recent years
- New approaches for seasonal variability and impact to water quality criteria
- Infiltration & Inflow concern, and the unpredictability of wet weather events

Objectives:

- Produce summary of currently available tools and study results
- Outline possible implications on the target setting and regulation
- Generate a guidance recommendation for wet weather target setting
Assessment of Molecular Techniques to Detect and Predict Cyanotoxin-Producing Blooms

Objective

• Develop a guide to support drinking water system cyanotoxin risk management strategies
  • Decision criteria for molecular tools (both DNA-and RNA-based) in toxin-producer activity
  • Explanation of the tools
  • Interpretation of the utility of genomic tools to evaluate toxin formation potential
  • Instruction to guide the application and integration into existing source water monitoring
  • Available statistical tools to assess correlations
Technologies and Approaches to Minimize Brominated and Iodinated DBPs in Distribution Systems

Project Objective

- The objective of this project is to **develop creative and novel techniques and approaches to minimize** the formation of currently unregulated brominated and iodinated DBPs in the distribution system while keeping in mind **practical applicability and economic feasibility** in the operation of existing treatment systems.
Development of Innovative Predictive Control Strategies for Nutrient Removal

• Rationale:
  • Online monitoring and automated control strategies integral to WRRF operation
  • Control strategies are reactive with high design safety factors
  • Ability to improve reliability and process performance with short ROI

• Objectives:
  • Develop one or more machine learning predictive tools
  • Testing of new predictive control strategies at TDL 2 or 3 (TRL 6-8)
Understanding the Mechanisms of Chlorine and Chloramines Impact on Opportunistic Pathogens in Distribution Systems

Motivation

• On October 14-15, 2020, EPA held a Public Stakeholder Meeting to inform potential revision to M/DBPs rule.
• Building water systems and OPs are one of the preliminary implementation improvement topics.

Objective: To elucidate the mechanism of chlorine and chloramines on opportunistic pathogens
Using Phosphate-Based Corrosion Inhibitors and Sequestrants to Meet Multiple Water Treatment Objectives

• **Background**
  – >50% of utilities use P-Based inhibitors or sequestrants for corrosion control
  – Orthophosphate, ortho-polyphosphate blends, zinc orthophosphate, and polyphosphate
  – Revised LCR to require orthophosphate doses for corrosion control studies
  – Phosphorus from DW can have downstream impacts
  – Guidance needed for reducing, stopping, and changing P-based inhibitors and sequestrants

• **Objective:** To provide guidance for dosing and/or adjusting phosphate-based corrosion inhibitors and sequestrants while minimizing lead and copper release and avoiding unintended consequences.
  • Reducing P to WW, discolored water, deposition and release of other metals, simultaneous compliance (DBPs, Disinfection, etc.)
PFAS isn’t going away

UCMR5 includes 29 PFAS

EPA intends to regulate two specific chemicals, perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS)

State-level regulatory actions are underway to control consumer exposure to PFAS via water and treatment residuals

Water professionals need to be the trusted source of information

Biased information from organizations and politicians with broader agendas dominates headlines and media.

Clear and open communications with the public are vitally important to building and maintaining trust with consumers.

Water professionals must present a consistent and unified communications strategy to provide reliable and trustworthy information based on the best available data and science.

PFAS One Water Risk Communication
Messaging for Water Sector Professionals
### Additional Prioritized Projects

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Budget</th>
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<tbody>
<tr>
<td>Demonstration of innovation to improve pathogen removal, validation, and/or monitoring in carbon based advanced treatment (CBAT) for potable reuse</td>
<td>$200,000</td>
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<tr>
<td>Advancement of Densification to Implement and Achieve More Efficient BNR Processes: Granule Generation, Retention and Management</td>
<td>$200,000</td>
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<tr>
<td>Holistic Wet Weather Management through Adaptive Volume and Pollutant Source Control at a Community Scale: Finding the Sweet Spot</td>
<td>$150,000</td>
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<tr>
<td>Enhancing Life Cycle Resilience for Water Infrastructure Systems</td>
<td>$200,000</td>
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</table>
WRF’s Innovation Cycle

FIND IT
Discover the most timely and relevant innovations

SEE IT
Explore new technologies firsthand and understand the relevance for your organization

SHARE IT
Spread knowledge gained across the water sector

TRY IT
Evaluate the applicability of the innovation for your context

DO IT
Implement the innovation within the water sector
## Innovation Products to support subscribers

<table>
<thead>
<tr>
<th>LIFT Strategic Plan Innovation Cycle</th>
<th>LIFT Brand WRF &amp; WEF</th>
<th>Water Research Foundation Brand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Find It</td>
<td></td>
<td>• TechLink featuring Technology Scans</td>
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<td></td>
<td>• Tech Trends Tool</td>
</tr>
<tr>
<td>See It</td>
<td>• LIFT SEE IT</td>
<td></td>
</tr>
<tr>
<td>Try It</td>
<td>• LIFT IWS Challenge</td>
<td>• FAST Water Network</td>
</tr>
<tr>
<td>Do It</td>
<td></td>
<td>• Pilot Projects</td>
</tr>
<tr>
<td>Share It</td>
<td></td>
<td>• Tech Trends Tool</td>
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<td></td>
<td></td>
<td>• Research &amp; Innovation Strategy Committee</td>
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<td></td>
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<td>• Technology Scan Webcasts</td>
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</tbody>
</table>
RESEARCH is the Foundation for Water INNOVATION

- WRF Research
- Technology Scans
- Subscriber Needs
- High Innovation Needs Identified
- Topic Portfolios
  Collaborative Technology Evaluations (CTEs)
Collaborative Technology Evaluation (CTE) Portfolios

ENERGY EFFICIENCY – 2 grants funded by Department of Energy

NITROGEN REDUCTION – Demonstration projects funded through philanthropic partnership

PFAS DESTRUCTION – 2 grant applications submitted to Department of Defense

WATER REUSE – Identifying topics, partners and funding opportunities
LIFT SEE IT

- Scholarship Exchange Experience for Innovation and Technology
- WE&RF, NACWA, WEF Partnership
- $30,000 in Travel Scholarship Funds
Involvement Opportunities

• Volunteer to be a Project Advisory Committee member, deadline June 8 for 2021 RFPs
• Volunteer to be a Participating Utility
• WRF TechLink Reviewers
  • Particularly need drinking water reviewers
• Future research planning summit
• Nominate a research for the Paul L. Busch Award
  Deadline June 15th!
• Upcoming Webcasts Register Here
Thank You!

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AFulmer@WaterRF.org
Alice Fulmer, Regional Liaison

advancing the science of water©

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