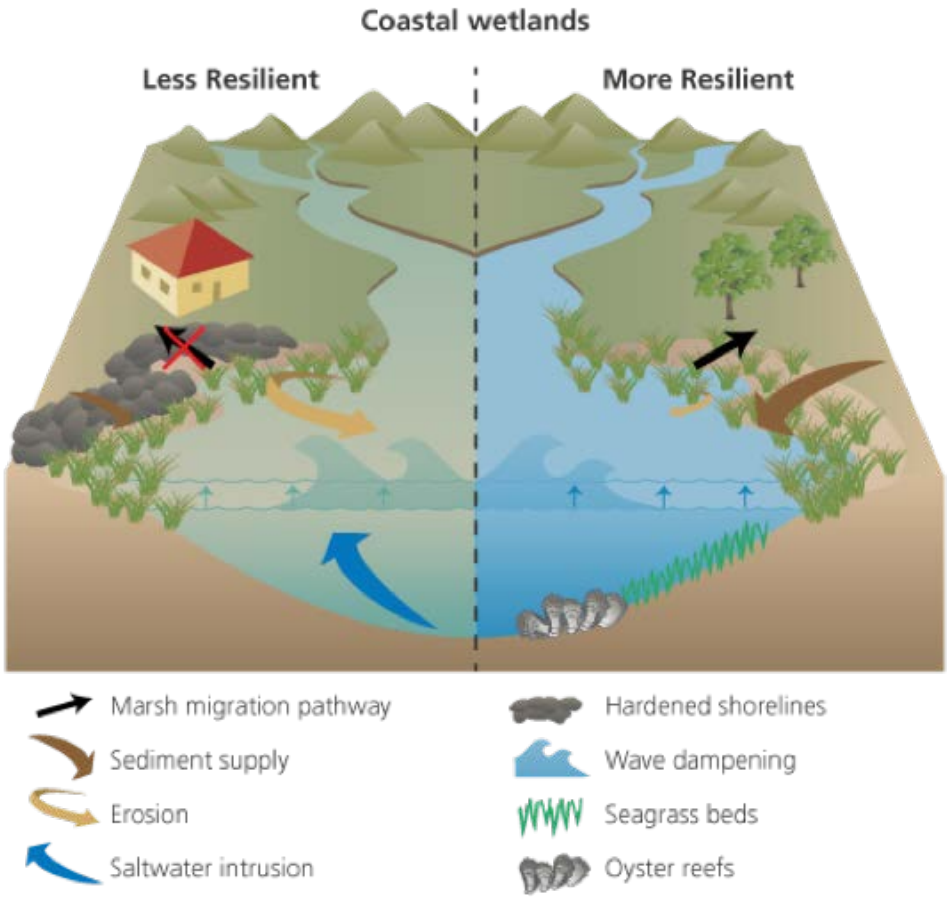
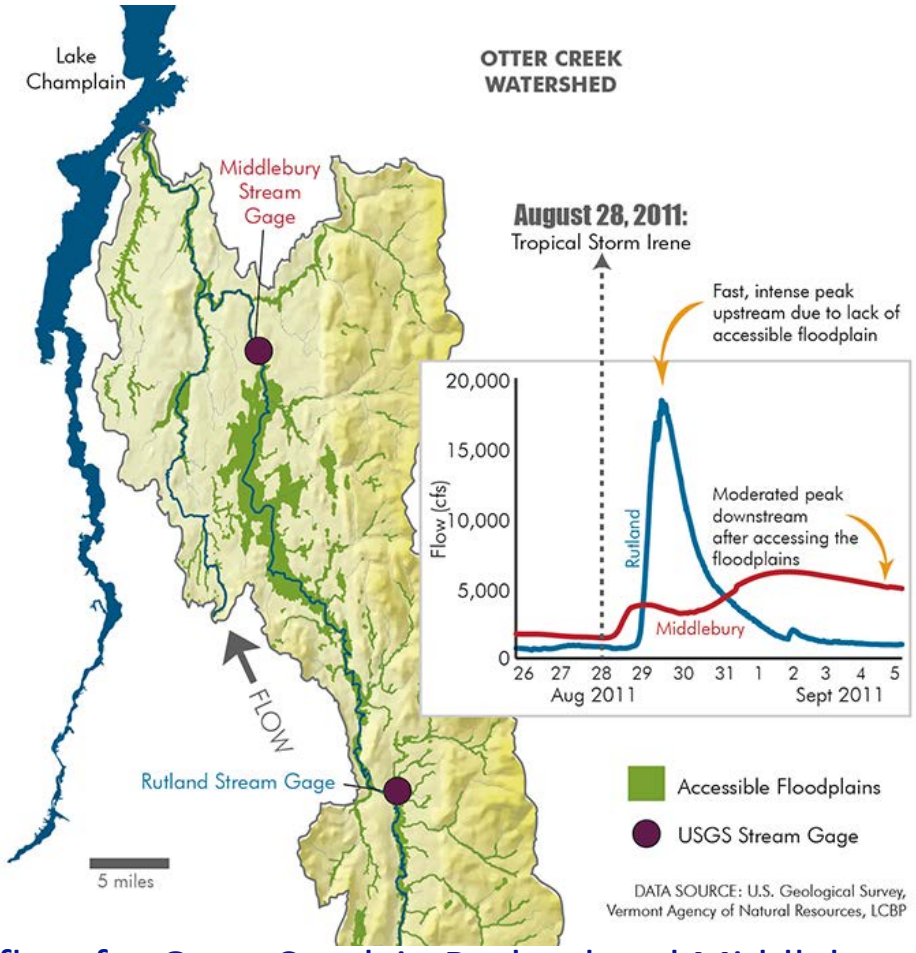
Developing Interventions

A Tale of Two Towns



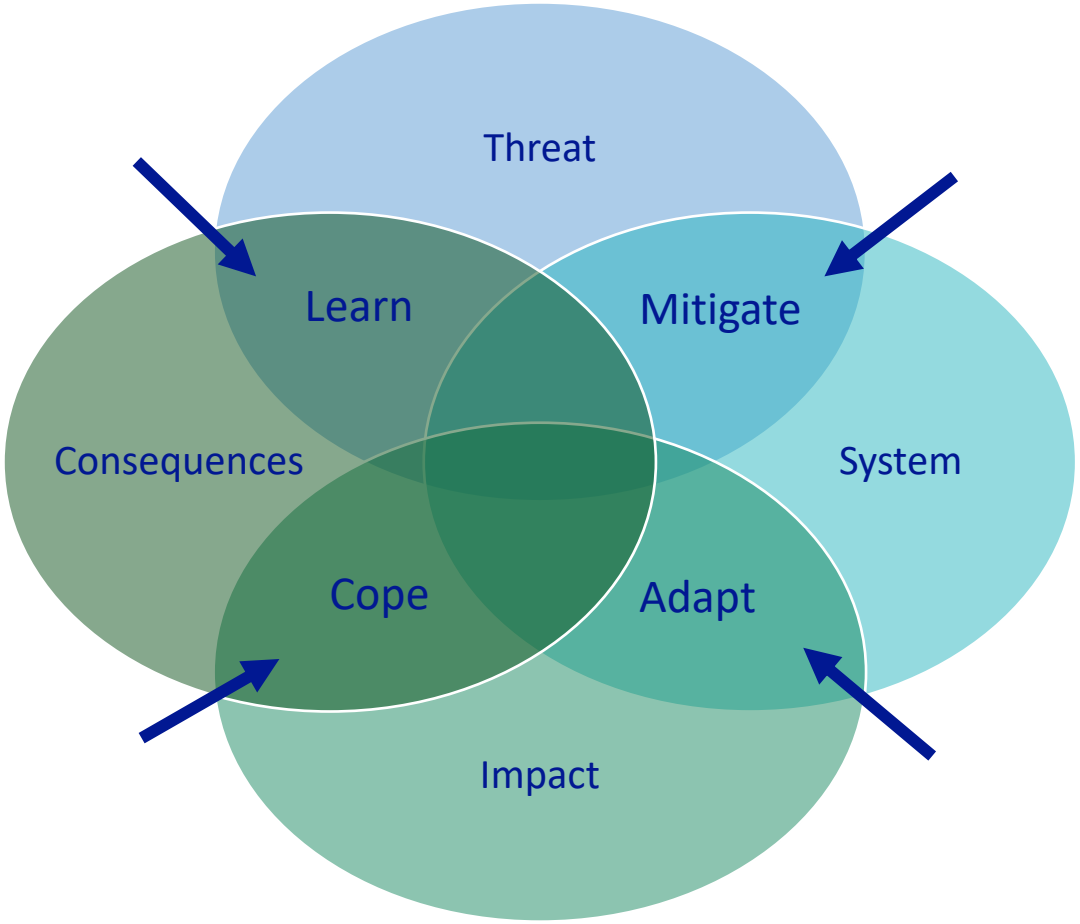
Rutland vs Middlebury Vermont



Mean daily flow for Otter Creek in Rutland and Middlebury (McDavitt, 2012)

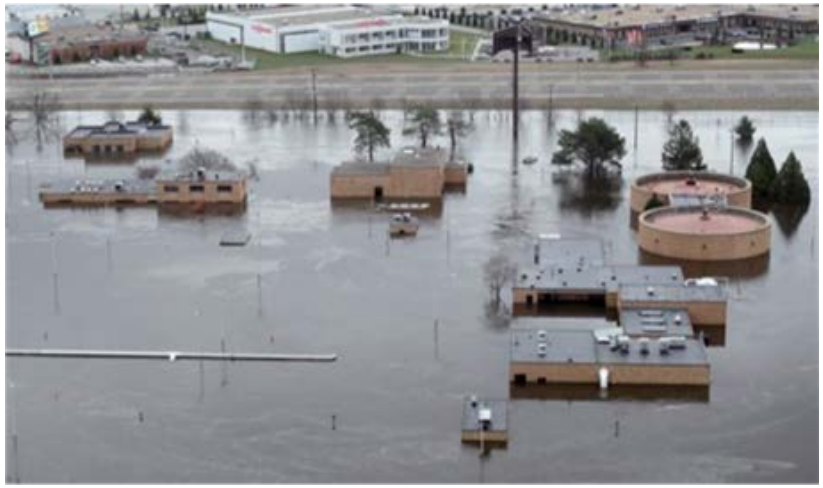
Floodplain access in Otter Creek watershed during Tropical Storm Irene, August 28, 2011

Interventions to Consider



(Butler, D., Ward, S. et. al., March 2016)

Flooding Impacts



- Regional interconnections
- Alternative power supplies
- Monitor and inspect infrastructure
- Elevate or flood-proof assets
- Join a mutual aid network

Changes in Seasonal Runoff

- Monitor
- Incorporate predictions of snowpack and runoff changes into models
- Update drought contingency plans
- Diversify water supplies
- Increase storage capacity
- Establish regional interconnections

Increased Runoff

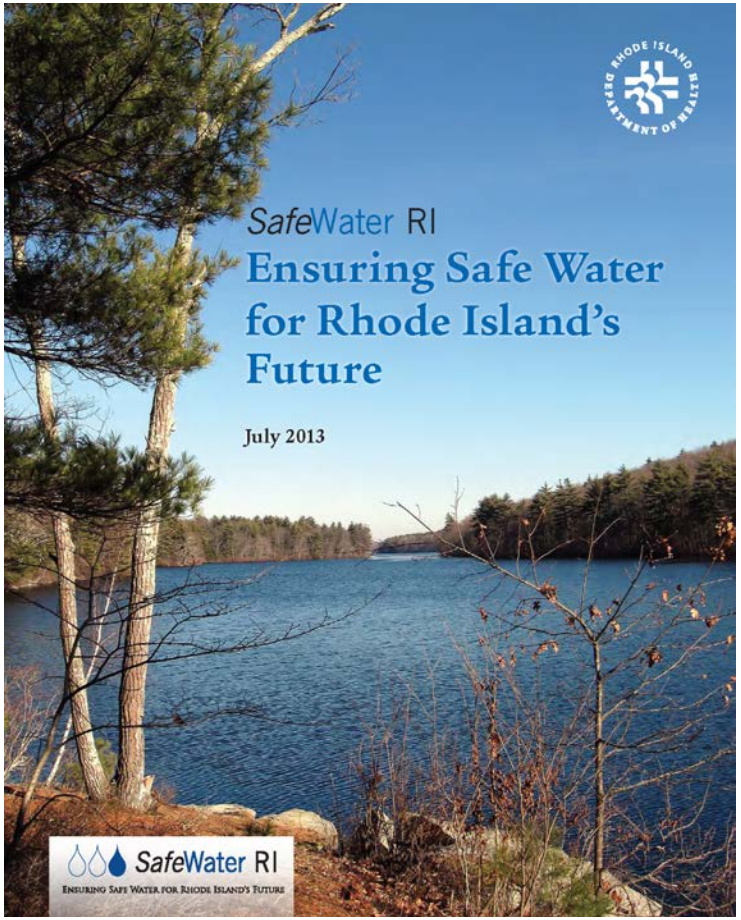
- Green infrastructure
- Distributed systems
- Invest in watershed management
- Model potential stormwater impacts to your service area
- Monitor runoff, vegetation and land use changes

Community and Economic Impacts

- Collaborate Discuss adaptation options with local businesses
- Communicate adaptation activities and plans to customers
- Become marketers
- Raise rates in an affordable and responsible way

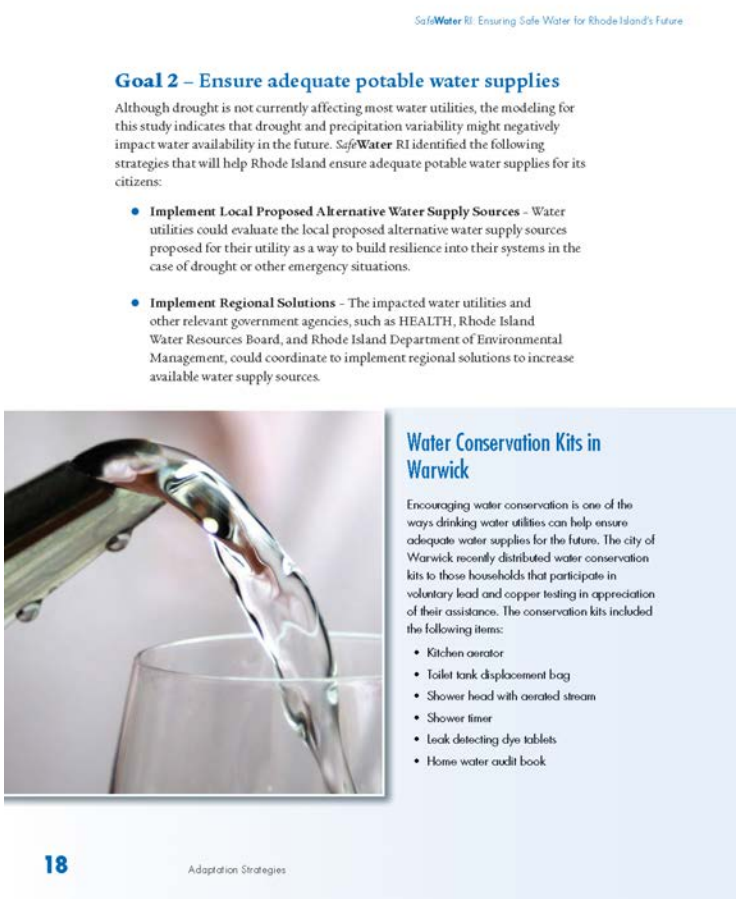
Additional Resources for Planning

State-wide Resilience Strategies



http://www.health.ri.gov/publications/reports/2013EnsuringSafeWaterForRhodeIslandsFuture.pdf

SafeWater RI



Goal 2 – Ensure adequate potable water supplies

Although drought is not currently affecting most water utilities, the modeling for this study indicates that drought and precipitation variability might negatively impact water availability in the future. *Safe*Water RI identified the following strategies that will help Rhode Island ensure adequate potable water supplies for its citizens:

- **Implement Local Proposed Alternative Water Supply Sources** – Water utilities could evaluate the local proposed alternative water supply sources proposed for their utility as a way to build resilience into their systems in the case of drought or other emergency situations.
- **Implement Regional Solutions** – The impacted water utilities and other relevant government agencies, such as HEALTH, Rhode Island Water Resources Board, and Rhode Island Department of Environmental Management, could coordinate to implement regional solutions to increase available water supply sources.

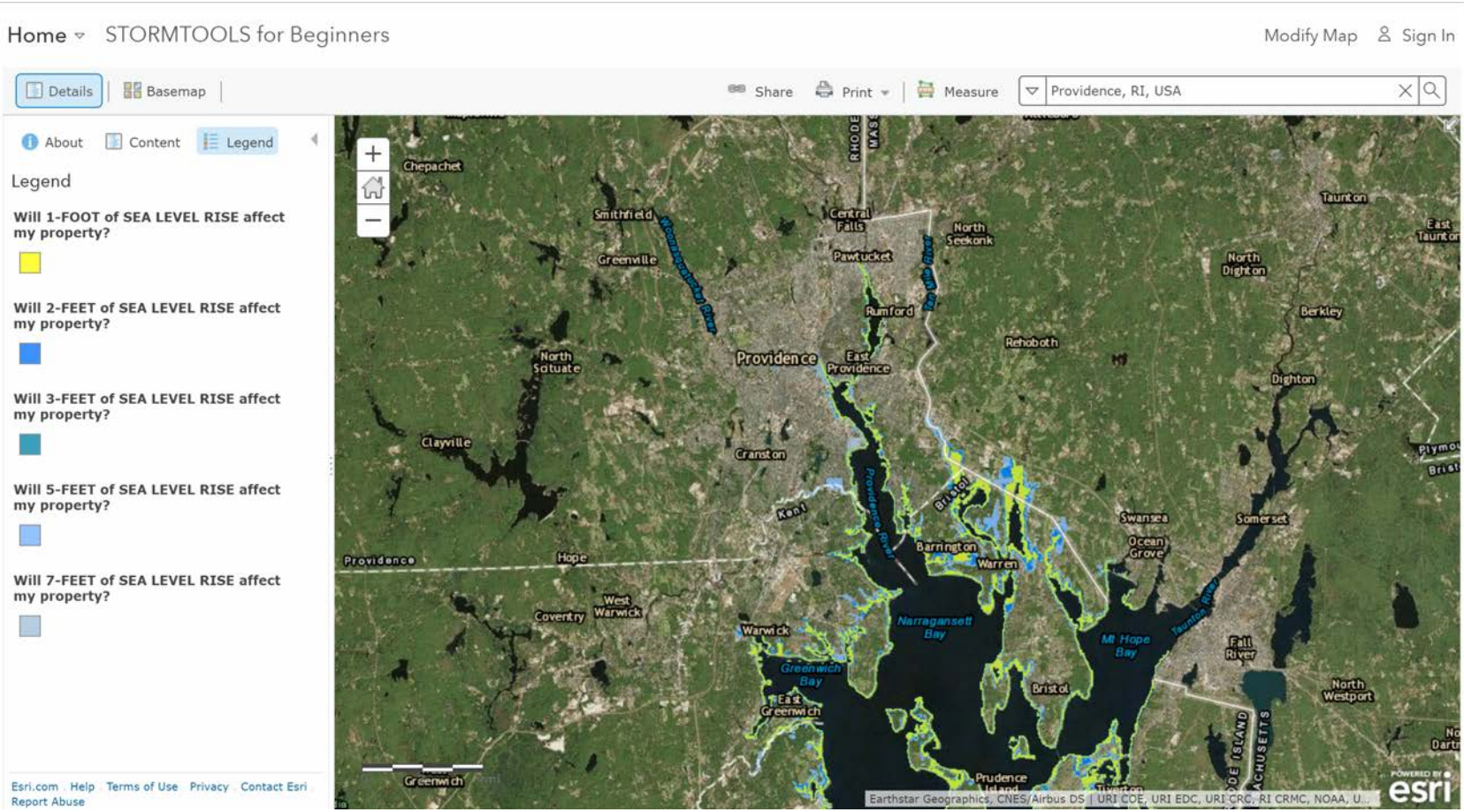
Water Conservation Kits in Warwick

Encouraging water conservation is one of the ways drinking water utilities can help ensure adequate water supplies for the future. The city of Warwick recently distributed water conservation kits to those households that participate in voluntary lead and copper testing in appreciation of their assistance. The conservation kits included the following items:

- Kitchen aerator
- Toilet tank displacement bag
- Shower head with aerated stream
- Shower timer
- Leak detecting dye tablets
- Home water audit book

- Threats
- Vulnerabilities
- Adaptation Strategies
  - Prevent infrastructure losses to water utilities from hazards
  - Ensure adequate potable water supplies
  - Use integrate management and planning to increase adaptive capacity

STORMTOOLS for Beginners



http://www.beachsamp.org/stormtools/

Drought Recovery and Response

- Staffing, Response Plans, Funding Considerations
- Water Supply and Demand Management
- Communication and Partnerships
- Case Studies and Videos

https://www.epa.gov/sites/production/files/2017-10/documents/drought_guide_final_508compliant_october2017.pdf

Staffing, Response Plans and Funding
Water Supply and Demand Management
Communication and Partnerships
Case Studies and Videos

IMPROVE SYSTEM EFFICIENCY

Implement measures to conserve water within your treatment and distribution system without affecting drinking water quality or other operational or regulatory requirements. During a drought, it is important to make improvements to your system first to set the example for your customers. Measures could include:

- Reducing pressure throughout all or part of the distribution system, while maintaining necessary pressure for "high priority" users such as hospitals and firefighters.
- Limiting main flushing as much as possible, while still meeting all regulatory requirements.
- Exploring beneficial uses for flushed water, such as irrigation, construction, fire-fighting storage or other non-drinking water uses.
- Recirculating backwash water to the head of your treatment plant.
- Aggressively finding and repairing leaks; consider including the following considerations and actions in your leak detection and repair program:
  - Authorizing overtime for construction crews.
  - Messaging, such as "Find It and Fix It," to immediately repair a leak on the customer side of the meter.
  - Encouraging self-policing by residents to alert the utility of system leaks.
  - Adopting an ordinance that requires customers to repair leaks within 7 days of being notified.
  - Providing a telephone hotline or website for customers to report leaks, with resources tied to field crew work orders to prioritize leak repairs over other maintenance activities.
  - Installing automated meter reading systems that can provide real-time water leak information.
  - Establishing a leak and minor plumbing repair program for low-income households.

BEST PRACTICE: Look for ways to manage your existing supplies through demand management, or modify system operations to increase supplies.

Involve your operators who understand how the system really works; leverage their ideas to reduce initial project costs and long-term operating costs.

- **Cities of Hays and Russell, Kansas.** Enhanced water treatment allows these utilities to blend lower quality groundwater with higher quality water sources, which enables them to use existing wells that would otherwise be abandoned. Both cities also routinely acidize their wells to maximize production rates.
- **City of Hogansville, Georgia.** The city has maintained many of the demand management practices initiated during its 2007 drought, such as reducing the frequency of main flushing and increasing information provided to customers to raise awareness of leaks and water use. Hogansville also installed all new meters citywide with software that provides "real time" water use data that helps them locate system leaks quickly.

After the Drought:

- Continue to implement your leak detection and repair program that ensures a prompt response mechanism for utility staff to make repairs. Prioritize and repair or replace components in the water distribution network that could lead to leaks.
- Look for other ways to use water efficiently throughout your utility or other departments, such as installing low-flow fixtures, retrofitting landscapes and replacing inefficient irrigation systems.
- Initiate a program to conduct annual water loss audits.

CASE STUDY: City of Hays and City of Russell, Kansas

Click on the video icon to go to the Drought Response and Recovery Project for Water Utilities: Case Studies Map to watch a video about the utilities' drought response.

SYSTEM DETAILS

- Located about 30 miles apart in central Kansas, the city of Hays and city of Russell share a groundwater source — the Smoky Hill River alluvium — and have worked together to respond to drought.

City of Hays	City of Russell
Population: 21,000 8,000 connections	Population: 4,500 2,400 connections
Large water users: battery factory, valve manufacturing plant, regional hospital (HaysMed)	Large water users: ethanol and gluten plant
Groundwater source from 31 wells: • Smoky Hill wellfield, upstream of Russell's Pfieffer wellfield in Smoky Hill River alluvium. • Big Creek Aquifer wellfield. • Dakota wellfield (produces brackish water, used as a back-up supply).	Groundwater and surface water sources: • Pfeifer wellfield (25 miles away in Smoky Hill River alluvium). • Surface water from Big Creek (has seasonal low-flows). • Stored water and water release rights from Cedar Bluff Reservoir, a U.S. Bureau of Reclamation reservoir upstream of the Smoky Hill wellfield.

IMPACT

The region has experienced drought periodically since the 1950s and twice during the past decade. The 2005 – 2006 drought was relatively brief but severe, requiring water use reductions in both communities. The 2011 – 2013 drought was longer and had a greater impact on the water supply of the city of Hays and city of Russell.

RESPONSE MEASURES

Staffing, Response Plans and Funding

Both cities have adopted drought response plans, and have internal drought teams that are led by the city manager and utility department staff under the direction of the City Council. The city of Russell's Municipal Water Conservation Plan clearly defines drought triggers and response actions for four drought stages. During 8 of the last 12 years, the city of Russell declared Stage 3 (Critical Water Stage) or Stage 4 (Water Emergency). The city of Hays has a three-stage drought response plan with established triggers, goals and response actions.

The cities have used a variety of funding sources to implement drought response actions and conservation. Both fund some drought response activities with their water rate revenue. Hays also implemented a 0.05 percent Water Conservation Sales Tax in 1995, and has used the State Revolving Fund to replace about 85 percent of its distribution system to reduce water loss. In the past 20 years, the city of Russell has replaced 80 percent of its water distribution lines, paid for with State Revolving Fund loans.

Water Supply and Demand Management

Both communities have in place year-round water conservation measures. During the 2005 – 2006 drought, the large industry users in Russell were asked to reduce water use to stretch limited supplies. They implemented ongoing measures, resulting in a 63 percent reduction over a 10-year period. Russell also has a water conservation education specialist who gives classes to local elementary school students, who then take

EPA 600/R-11/054 | June 2011 | www.epa.gov/research

EPA
United States
Environmental Protection
Agency

Planning for an Emergency Drinking Water Supply

Office of Research and Development
National Homeland Security Research Center

Adaptation Strategies Guide for Water Utilities

GROUP		DW	WW
Drought	Reduced groundwater recharge	1	
	Lower lake & reservoir levels	1	
	Changes in seasonal runoff & loss of snowpack	2	
Water Quality Degradation	Low flow conditions & altered water quality		2
	Saltwater intrusion into aquifers	1	
	Altered surface water quality	1	1
Floods	High flow events & flooding	2	2
	Flooding from coastal storm surges	2	2
Ecosystem Changes	Loss of coastal landforms / wetlands	2	2
	Increased fire risk & altered vegetation	1	1
Service Demand & Use	Volume & temperature challenges	2	2
	Changes in agricultural water demand	1	
	Changes in energy sector needs	1	
	Changes in energy needs of utilities	2	2

EPA United States Environmental Protection Agency

CLIMATE READY WATER UTILITIES

EPA

HIGH FLOW EVENTS AND FLOODING (DW)

Return to Introduction

Intense precipitation events may occur more frequently, concentrating the annual total rainfall into episodes that may challenge current infrastructure for water management and flood control. When these protections fail, inundation may disrupt service and damage infrastructure such as treatment plants, intake facilities and water conveyance and distribution systems. Episodic peak flows into reservoirs will strain the capacity of these systems. Furthermore, inflow will be of lesser quality due to soil erosion and contaminants from overland flows, leading to treatment challenges and degraded conditions in reservoirs.

CLIMATE INFORMATION

- Since 1991, the amount of rain falling in very heavy precipitation events has been above average across most of the United States (USGCRP 2014). This observed trend has been greatest in the Northeast, Midwest and Great Plains – projections for these regions indicate that 30% more precipitation will fall in very heavy rain events relative to the 1901-1960 average (Karl et al. 2009).
- Heavy downpours are increasing nationally, with especially large increases in the Midwest and Northeast (Kunkel et al. 2012, USGCRP 2014). Precipitation intensity (e.g., precipitation per rainy day) is projected to continue to increase by mid-century for most of the U.S. This change is expected even for regions that are projected to experience decreases in mean annual precipitation, such as the Southwest (Kunkel et al. 2012, Wehner 2013, USGCRP 2014).
- The increasing intensity of precipitation events can be expected to lead to more flooding and high flow events in rivers. For example, by the end of the century, New York City is projected to experience almost twice as many days of extreme precipitation that cause flood damage (Ntelekos et al. 2010). For the U.S. overall, a recent assessment of flood risks found that the odds of experiencing a 100-year flood are expected to double by 2030 (USGCRP 2014).
- The intensity, frequency and duration of North Atlantic hurricanes has increased in recent decades, and the intensity of these storms is likely to increase in this century (USGCRP 2014).

ADAPTATION OPTIONS

Click to left of name to check off options for consideration; $'s ($-$$$) indicate relative costs
Click name of any option to review more information in the Glossary
No Regrets options - actions that would provide benefits to the utility under current climate conditions as well as any future changes in climate. For more information on No Regrets options, see Page 11 in the Introduction.
Click on the or icon to review the relevant Sustainability Brief.

✓	PLANNING	COST
	Integrate flood management and modeling into land use planning.	$
	Develop models to understand potential water quality changes (e.g., increased turbidity) and costs of resultant changes in treatment.	$
	Expand current resources by developing regional water connections to allow for water trading in times of service disruption or shortage.	$$-$$$
	Plan for alternative power supplies to support operations in case of loss of power.	$
	Adopt insurance mechanisms and other financial instruments, such as catastrophe bonds, to protect against financial losses associated with infrastructure losses.	$
	Conduct training for personnel in climate change impacts and adaptation.	$
	Ensure that emergency response plans deal with flooding contingencies and include stakeholder engagement and communication.	$
	Establish mutual aid agreements with neighboring utilities.	$

ADAPTATION STRATEGIES GUIDE FOR WATER UTILITIES

Continued on page 2

https://www.epa.gov/sites/production/files/2015-04/documents/updated_adaptation_strategies_guide_for_water_utilities.pdf

Climate Change Workshop Planner

WORKSHOP PLANNER FOR

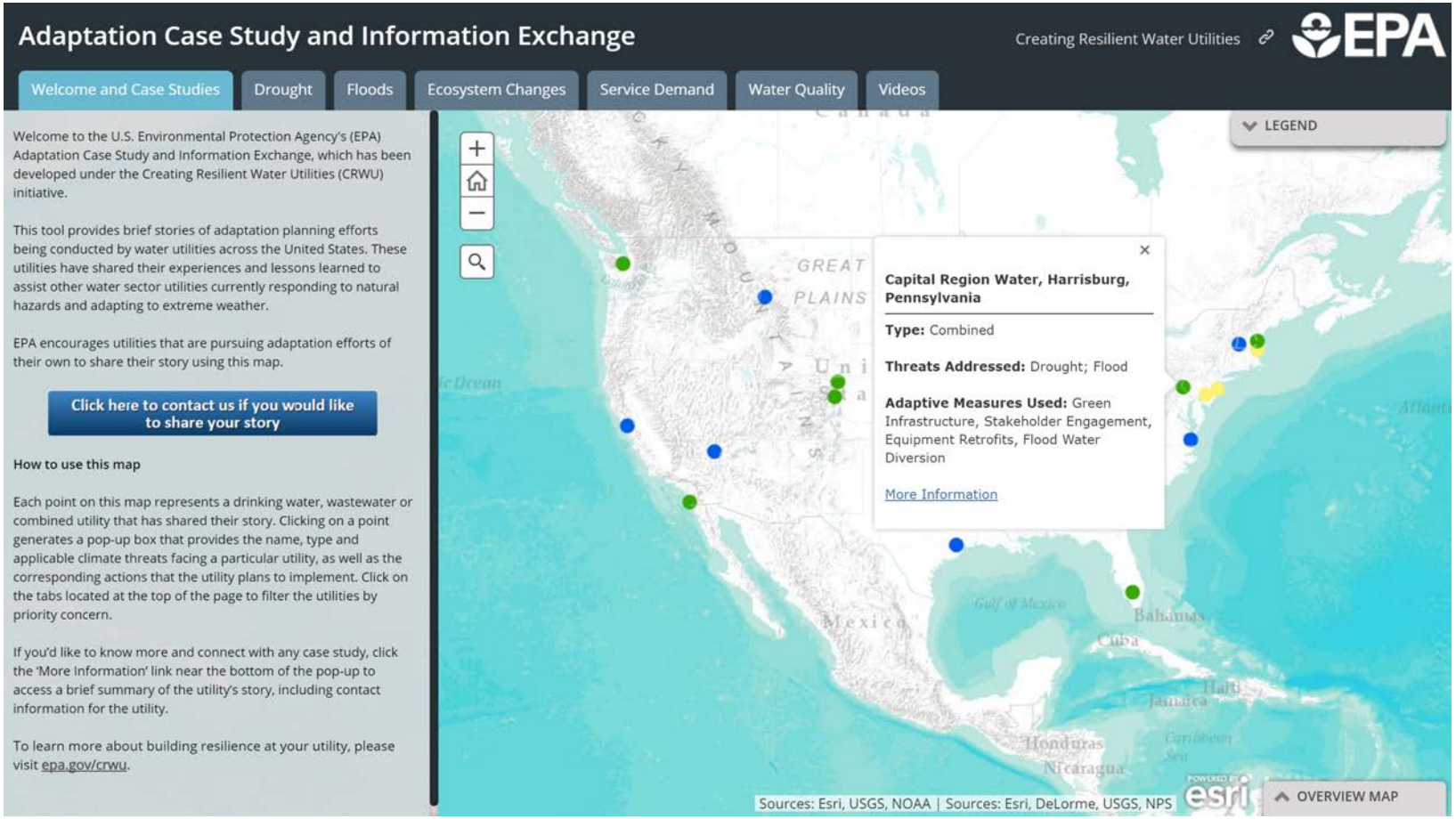
Climate Change and Extreme Events Adaptation

Understanding and adapting to climate change threats is an important part of decision making for water, wastewater and stormwater utilities. Extreme events including floods, drought, sea-level rise, wildfires and reduced snowpack may become more frequent or intense due to climate change. Planning for these extreme events can help protect utility infrastructure and operations, allowing utilities to provide reliable and sustainable service to their customers.

https://workshopplanner.epa.gov/eewp/

https://www.epa.gov/crwu/plan-climate-change-your-utility

Adaptation Case Studies

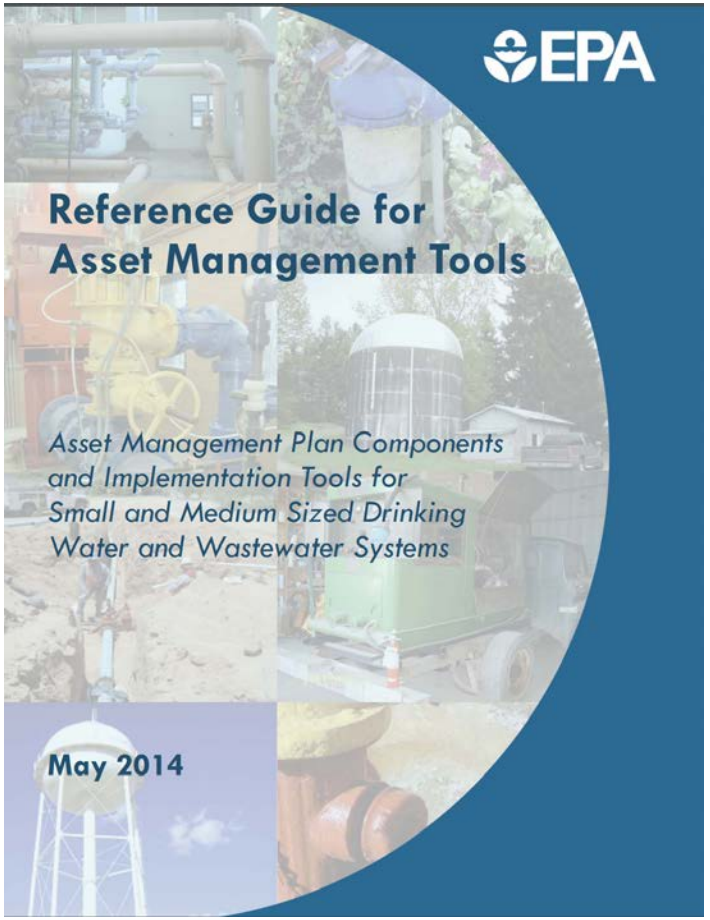


https://epa.maps.arcgis.com/apps/MapSeries/index.html?appid=bfe6b44929a8417b86aa7fd81d6857be

New Hampshire example- https://www.des.nh.gov/organization/divisions/water/dwgb/documents/wd-14-02.pdf

Asset Management Resources

https://www.epa.gov/sites/production/files/2015-04/documents/epa816k03002.pdf



https://www.epa.gov/sites/production/files/2016-04/documents/am_tools_guide_may_2014.pdf

Information Sharing to Support Resilience

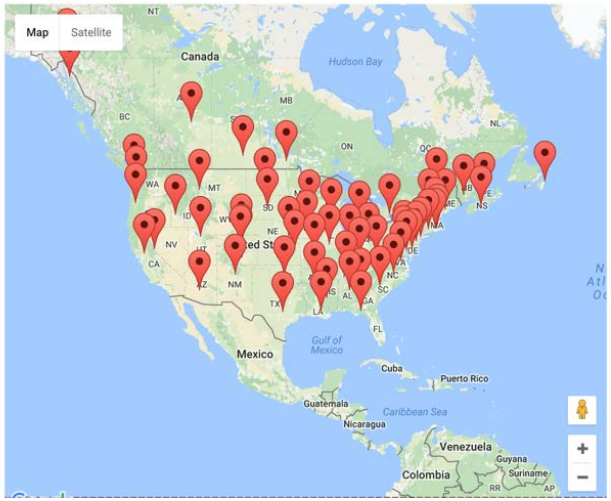
Water/Wastewater Agency Response Network (WARN)

WARN℠

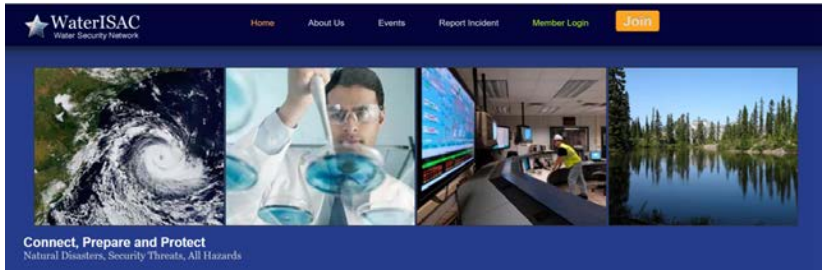
WATER /WASTEWATER AGENCY RESPONSE NETWORK

A Water and Wastewater Agency Response Network is a network of utilities helping other utilities to respond to and recover from emergencies. The purpose of a WARN is to provide a method whereby water/wastewater utilities that have sustained or anticipate damages from natural or human-caused incidents can provide and receive emergency aid and assistance in the form of personnel, equipment, materials and other associated services as necessary from other water/wastewater utilities.

Click a pin to view contact information for the local WARN representative, with a link to more information about that state and region. You can also view current **Situation Reports**.



Water Information Sharing and Analysis Center (WaterISAC)



https://www.awwa.org/resources-tools/water-knowledge/emergency-preparedness/water-wastewater-agency-response-network.aspx

https://www.waterisac.org/

More Resources

Flood Resilience: A Basic Guide for Water and Wastewater Utilities – this guide preceded the drought guide and is structured similarly. I think it uses a very common sense approach and is quite doable without consultants

Response On-The-Go App I like the idea of this because it provides information about response partners and even if the app isn't used it provides some information about what might be needed in an emergency situation

RAINE Resilience and Adaptation in New England – is a database with information about how 230 communities in New England are addressing climate change. It's a good place to look for examples or check out what your neighboring communities are doing. There are more than 90 tags to use to search documents in the database.

Jeri Weiss
EPA Region 1|5 Post Office Square| Boston MA| 02109
617-918-1568

Game of Floods

- **Climate Training Toolkit**: The City of Baltimore led an effort to develop a climate training toolkit for local governments to utilize as they train their own staff on opportunities to support climate adaptation and resilience progress. Products include: 1) the Climate Toolkit How-to Guide; 2) Case Studies; 3) Exercise Track; 4) Game of Floods Track; and 5) a Training Presentation. (*USDN Innovation Fund, 2017*).
- https://www.usdn.org/uploads/cms/documents/usdn_innovation_fund_climate_toolkit_files.zip

Objectives

- Defined Resilience
- Identified Threats
  - Hazard vs Stressor
- Impacts
  - Community vs System
  - Threat → System → Service → Consequence
- Planning
  - Mitigate → Adapt → Cope → Learn

Q&A

- Brandy Espinola
- Program Manager, University of Maryland Environmental Finance Center
- bespinol@umd.edu
- 301.314.9491

Building Resilience and Planning for an Uncertain Future: A Workshop for Local Leaders and Small Water Systems

November 5, 2018

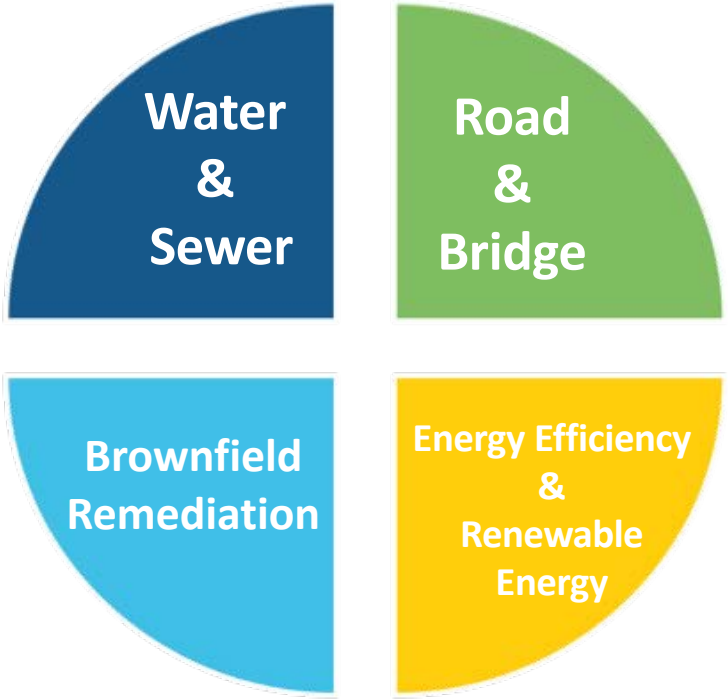
Presented By: Michael Baer – Managing Director,
Rhode Island Infrastructure Bank

Centralized hub of local infrastructure investment in Rhode Island

About RIIB

Mission

Our mission is to actively support and finance investments in Rhode Island's infrastructure. We do so through a variety of means, including the issuance of bonds, the making of loans and grants, and the engagement with and mobilization of sources of public and private capital. Through its activities the Bank fosters infrastructure improvements that enhance the environment, create jobs, and promote economic development



Implementing Resiliency

Our Approach

- We are a Project Partner who
- We are a Project Partner who engages small system users and works to tailor the best solution for the borrower
  - Technical and financial support
  - Collaborative & Innovative
- Community-focused
  - Public health

Examples to Consider

- Implementing automated switches and controls
  - Back-up systems
- Hardening or raising pumps
- Green Infrastructure

RHODE ISLAND
INFRASTRUCTURE BANK

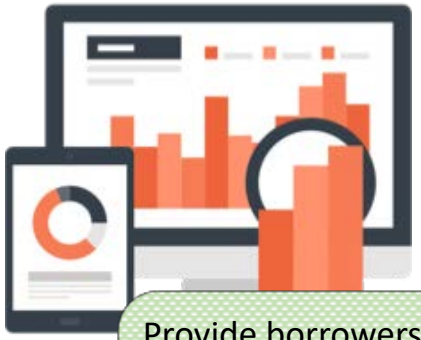
Serving Small Water Systems

Developed a small systems strategy with RI Department of Health

- Targeted outreach → educational assistance → simplified application process → implementation guidance

Committing principal forgiveness funds for small systems ready to make improvements

- Systems serving 10K users or less are eligible for a minimum $100K in principle forgiveness



Provide borrowers with due diligence and technical services

- Consultant conducts income surveys to assess drinking water program eligibility
- Feasibility studies
- Free engineering

RHODE ISLAND
INFRASTRUCTURE BANK

Taking Action to Respond to Water Emergencies

Responding to
PFAS Emergencies

Responsive
Management

Lead Service Line
Replacement

RHODE ISLAND
INFRASTRUCTURE BANK

Contacts

Michael Baer
Managing Director, Program and Business Development
mbaer@riib.org

Anna Coelho Cortes
Director, Customer Engagement
acoelho@riib.org

Carlene Newman
Principal Sanitary Engineer – RI Department of Health
Carlene.newman@healthri.gov

Rhode Island Infrastructure Bank
235 Promenade Street, Suite 119
Providence, RI 02908
401-453-4430
www.riib.org

RHODE ISLAND
INFRASTRUCTURE BANK

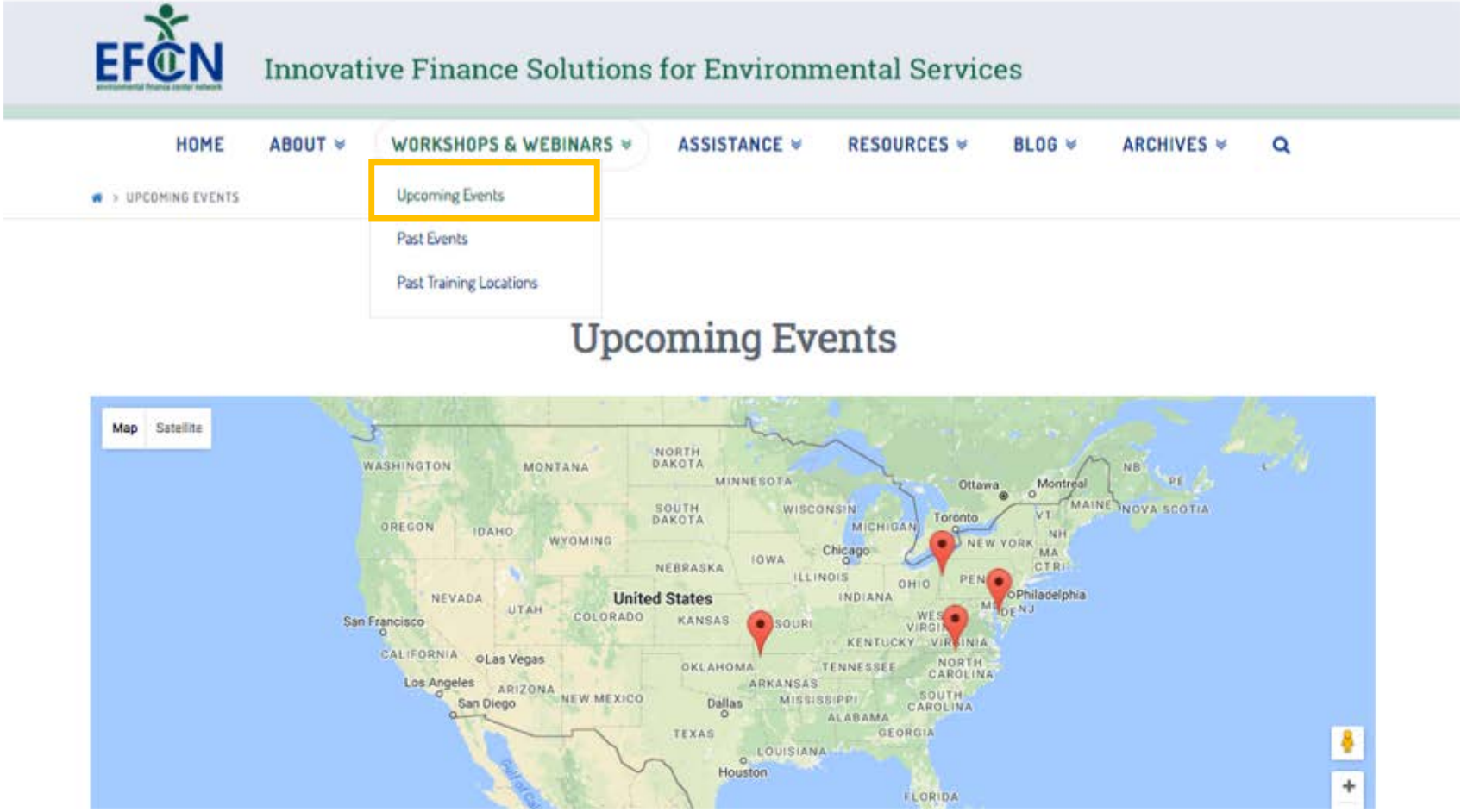
See You Back at 1PM!

Visit the EFCN Website – *www.efcnetwork.org*

for more information on upcoming events, funding, and resources.

Upcoming Events Calendar

Select “Upcoming Events” under the Workshops & Webinars Tab.

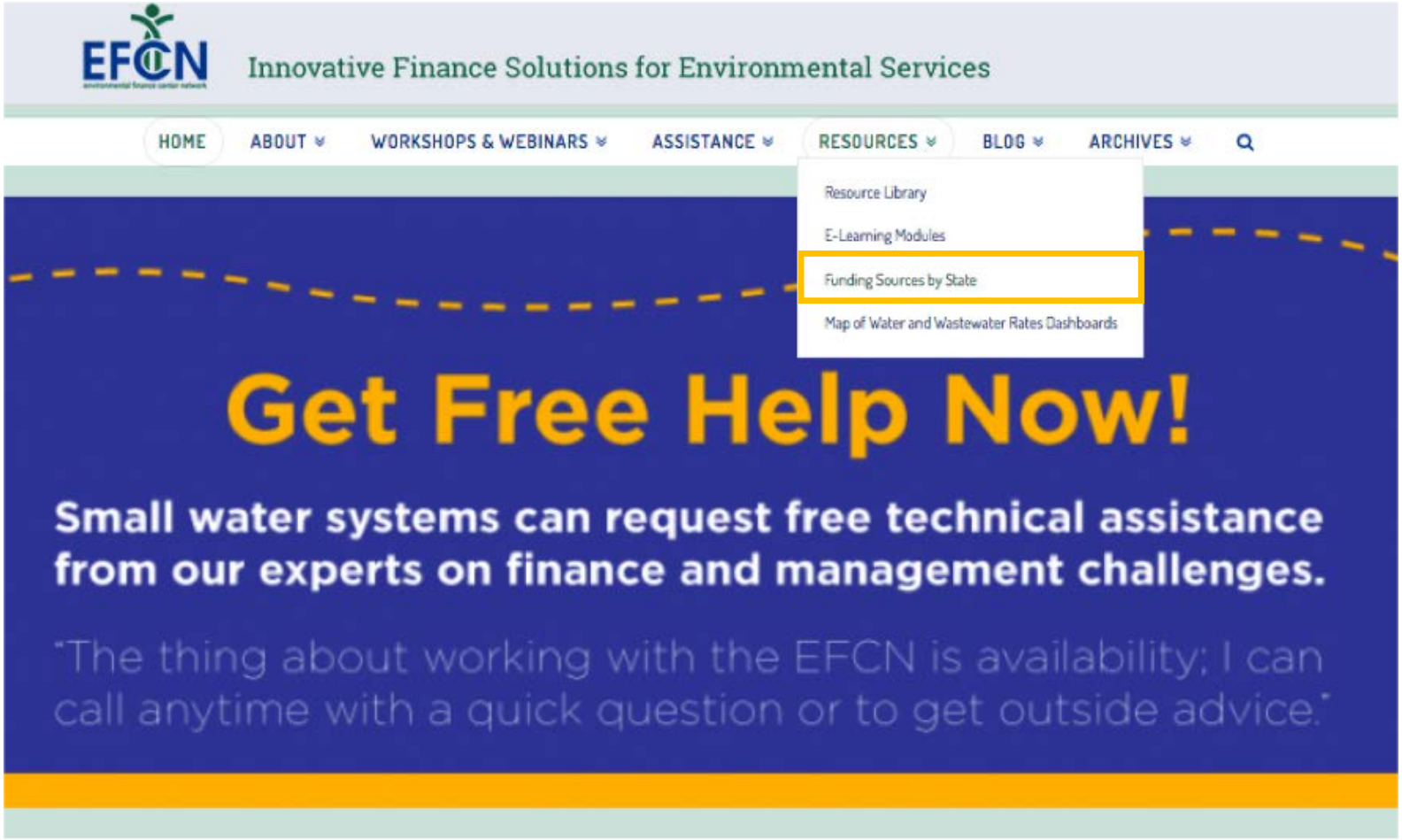


= In Person Event = Webinar

Type	Date/Time	Event
	03/09/2017 2:00 pm - 3:00 pm	WEBINAR I Preparing Winning Financing Applications for Water Infrastructure Projects
	03/22/2017 2:00 pm - 3:00 pm	WEBINAR I Water Audits and Water Loss Control: Entering Your Data into the Spreadsheet
	03/30/2017 9:00 am - 4:30 pm	Maryland I Rates and Finance Workshop for Small Water Systems *Easton Utilities, Easton MD*
	04/04/2017 1:00 pm - 2:00 pm	WEBINAR: Workforce Development: An Overview of Key Components
	05/11/2017 9:00 am - 4:30 pm	Virginia I Rates and Finance Workshop for Small Systems *The Institute for Advanced Learning and Research, Danville Virginia*
	05/25/2017 9:00 am - 4:30 pm	Arkansas I Rates and Finance Workshop for Small Water Systems *Beaver Water District, Lowell AR*
	09/13/2017 9:00 am - 4:30 pm	Pennsylvania I Rates and Finance Workshop for Small Water Systems *Pennsylvania American Water Co, New Castle PA*

Funding Tables By State

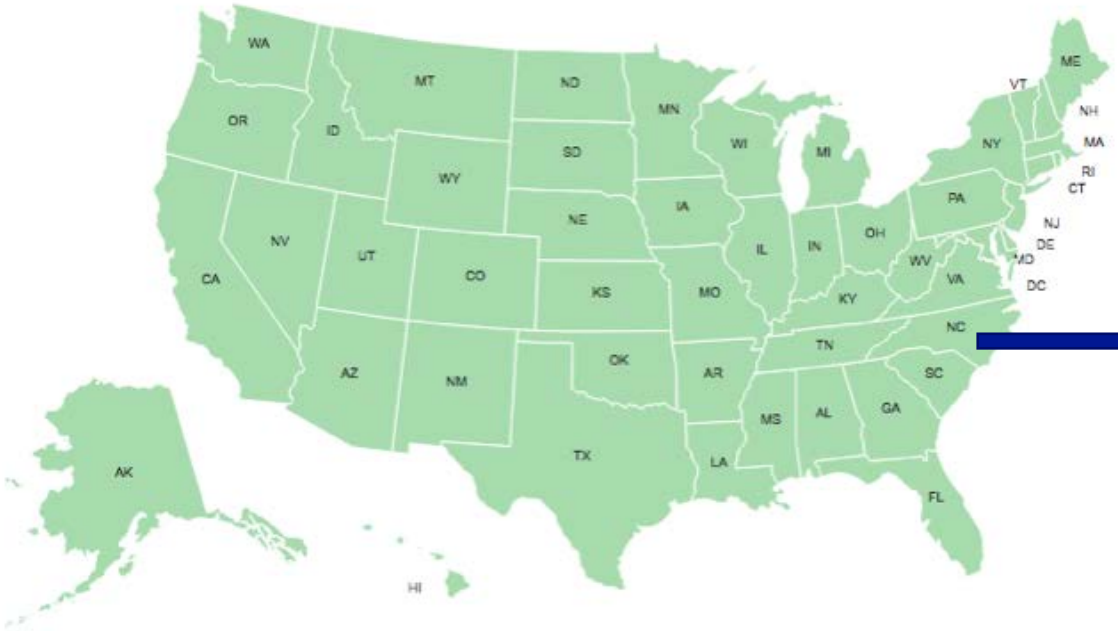
Select “Funding Sources by State” under the Resources Tab.



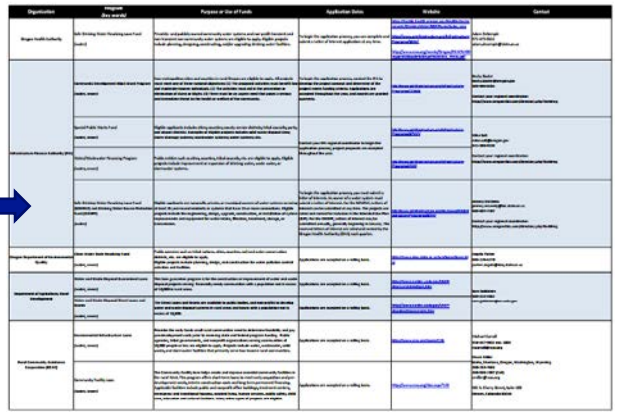
Funding Sources by State

Note: Some states may have additional resources listed below the map.

Click on the map below to view funding sources for each state:

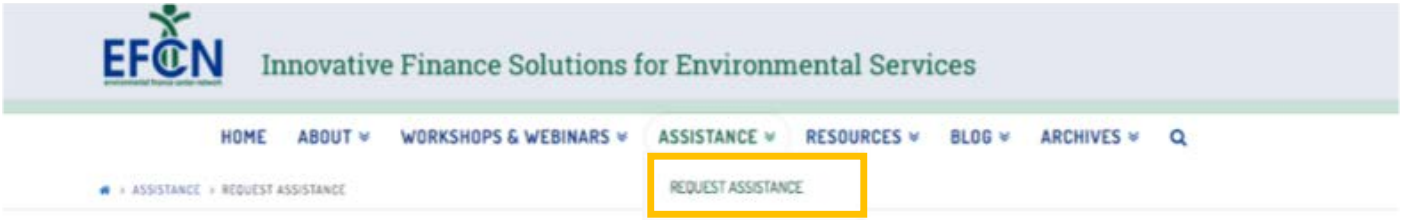


Click on an individual state to view funding table.



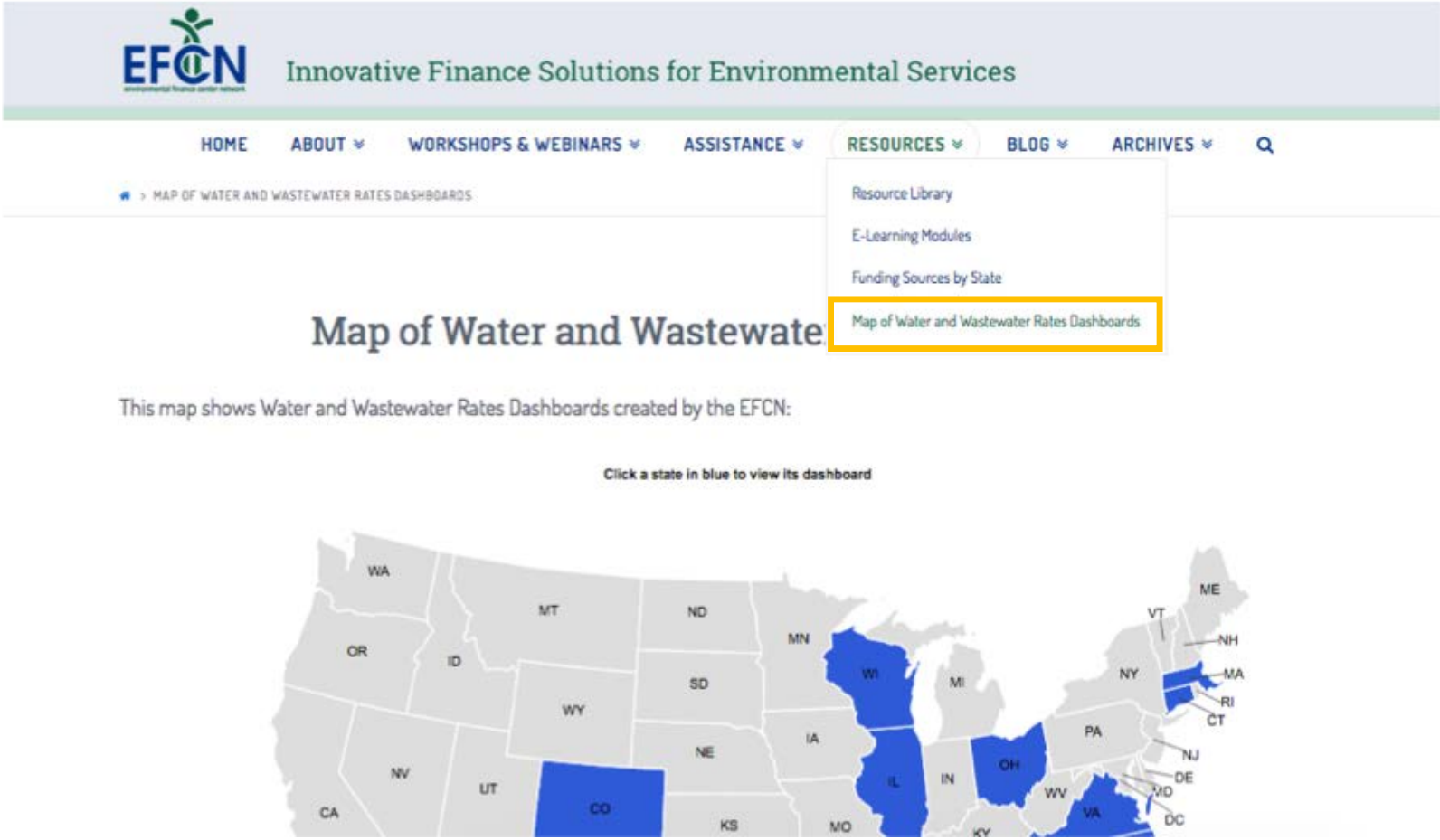
Request Technical Assistance

Select “Request Assistance” under the Assistance Tab off the EFCN homepage to access and submit the TA request form electronically.



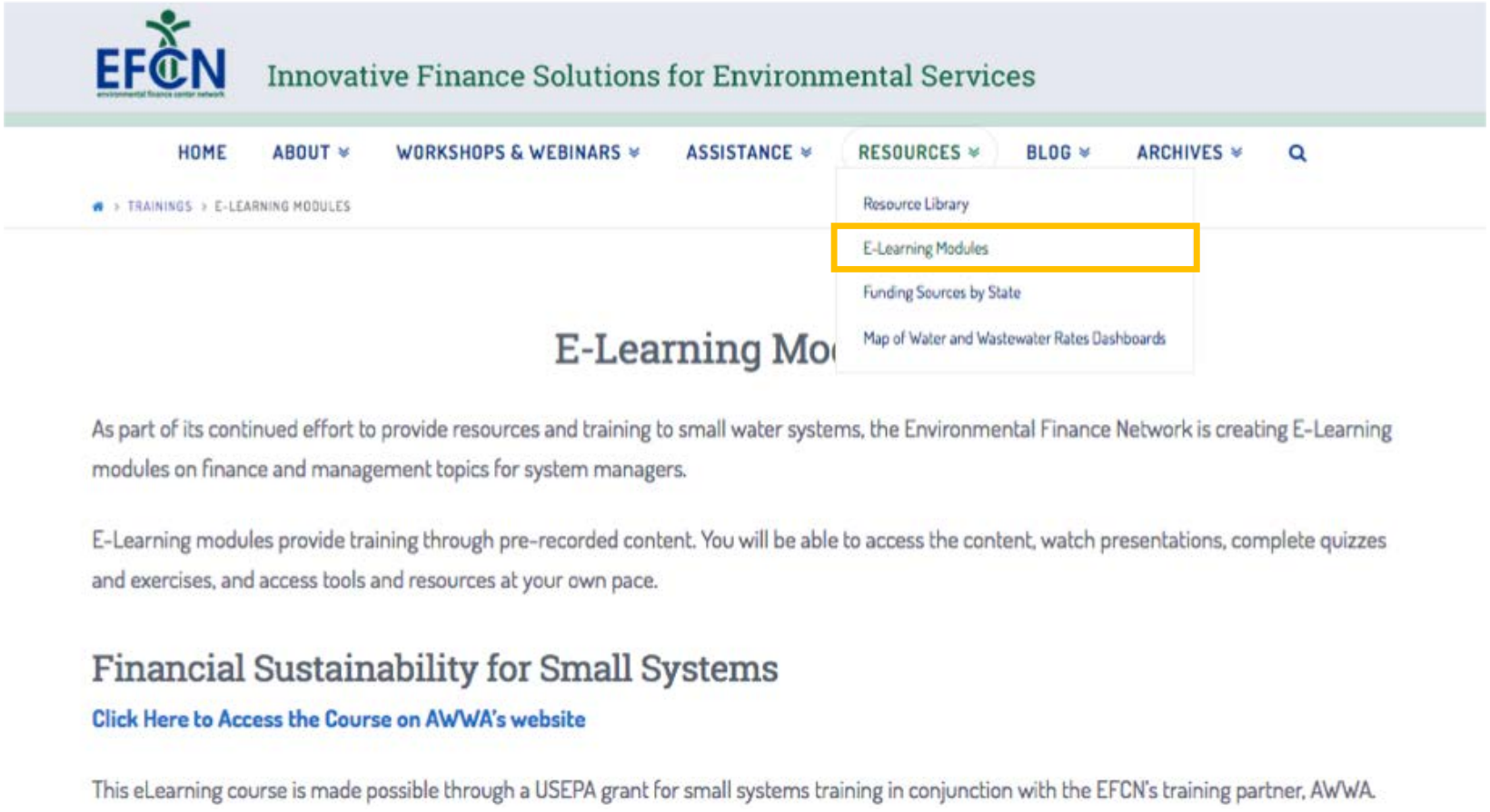
Rates Dashboards

Select “Map of Water and Wastewater Rates Dashboards” under the Resources Tab, and click on any state in blue to view its dashboard.



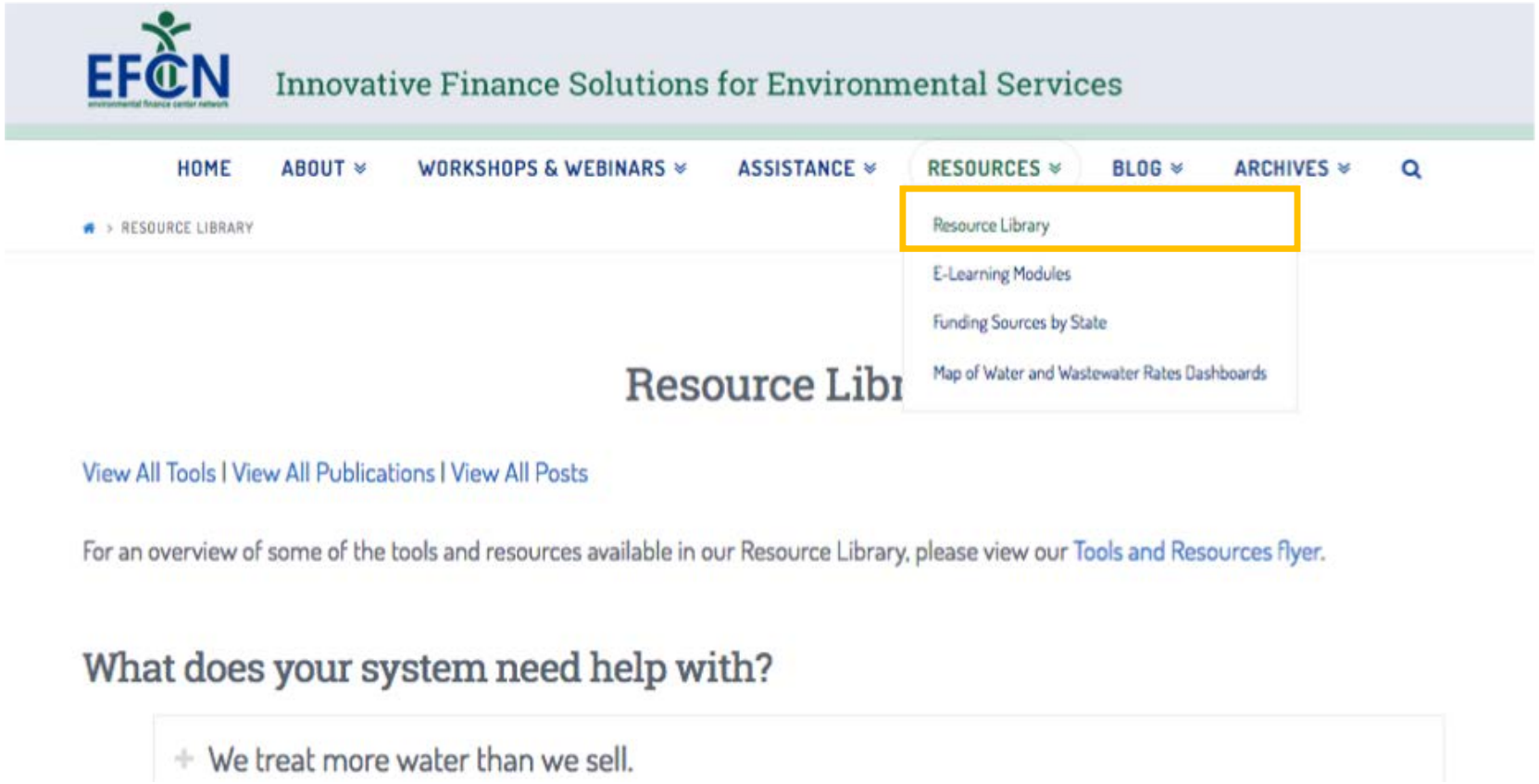
E-Learning Modules

Select “E-Learning Modules” under the Resources Tab off the EFCN homepage.



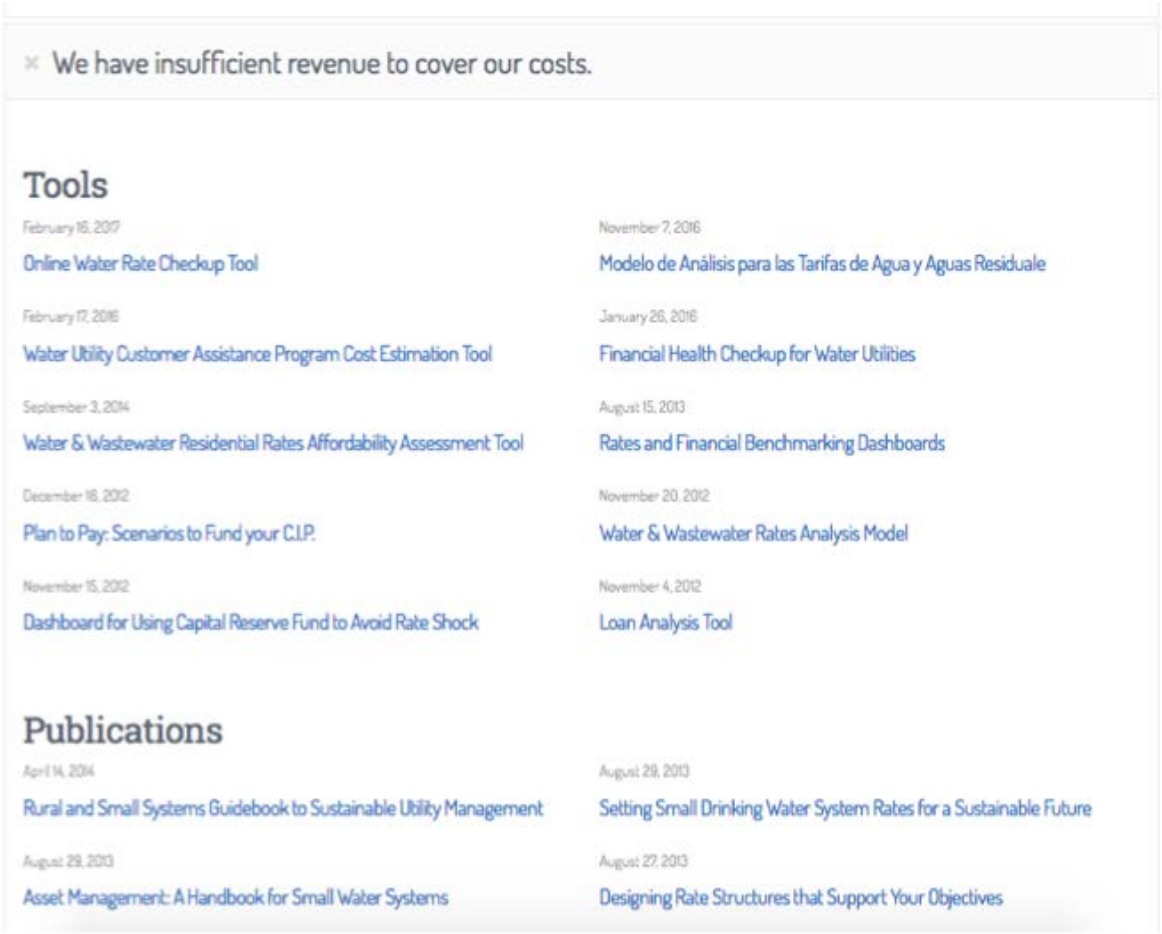
Resource Library

Select “Resource Library” under the Resources Tab off the EFCN homepage.



Resource Library Continued…

Click on a what your system needs help with to reveal tools and publications related to that topic.



This project has been funded wholly or in part by the United States Environmental Protection Agency under assistance agreement A18-0408-001 to the University of North Carolina at Chapel Hill. The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency, nor does the EPA endorse trade names or recommend the use of commercial products mentioned in this document.

Smart Management for Small Water Systems

Thank you for participating today.
We hope to see you at a future workshop!

www.efcnetwork.org

EFCN environmental finance center network

NADO National Association of Development Organizations Research Foundation

GFOA Government Finance Officers Association