



EPA

United States
Environmental Protection
Agency

***An Overview:
Creating Resilient Water Utilities (CRWU)***

March 28, 2019

CRWU Mission Statement

The CRWU initiative provides drinking water, wastewater and stormwater utilities with the practical tools, training, and technical assistance needed to increase resilience to extreme weather events.

Through a comprehensive planning process, CRWU assists water sector utilities by promoting a clear understanding of potential long-term adaptation options.

Resilience Building Process





Resilient Strategies Guide

- **Web-based tool**, based on previous Adaptation Strategies Guide publication, for reviewing resilient strategies being used by water utilities
- **Guided process** to review and select priorities, vulnerable assets, and relevant strategies
- Final report documents selected strategies to explore during **adaptation planning**

The screenshot displays the 'Utility Information' section of a web-based tool. At the top, a progress bar shows six steps: Introduction, Utility Information (checked), Priorities, Assets, Strategies, and Done!. Below the progress bar, the 'Utility Information' section includes a 'Build your report with' button and a 'Filter:' section. The 'Filter:' section contains a 'Category' list with checkboxes and counts: 'Preparing for drought (3)', 'Protecting water quality (2)', 'Building flood protection (2)', 'Preserving ecosystems (2)', 'Maintaining service levels (4)', 'Improving energy efficiency (1)', 'Implementing green infrastructure (1)', and 'Conserving water (1)'. To the right, the 'Priorities' section lists various planning priorities with checkboxes and 'More Info +' links: 'Groundwater recharge', 'Lake and reservoir levels', 'Runoff timing and snowpack', 'Saltwater intrusion', 'Source water quality', 'Riverine flooding - drinking water', 'Coastal flooding - drinking water', and 'Loss of coastal wetlands'. On the far right, a 'Summary' box displays 'Utility Name:', 'State/Territory: National', and 'Utility Type: Drinking Water'. Below the summary, it says 'Selected Priorities:'.

Resilient Strategies Guide





Assets

Select the vulnerable assets in your organization or system.

Filter:

Vulnerability

Potentially Vulnerable (9)

- Telecommunications / Data Network [More Info +](#)
- Buildings and Offices
Potentially Vulnerable Asset [More Info +](#)
- Data Acquisition Systems [More Info +](#)
- Process Control - SCADA
Potentially Vulnerable Asset [More Info +](#)
- Distributed Control Systems [More Info +](#)
- Forested Lands [More Info +](#)
- Managed Species [More Info +](#)
- Flood Protection
Potentially Vulnerable Asset [More Info +](#)

Strategies

Select your strategies in this section. Use the filters on the left to narrow the strategies.

Filter:

Category

- Ecosystem & Land Use (5)
- Modeling (2)
- Monitoring (5)
- New Construction (4)
- Planning (6)
- Repair & Retrofit (2)
- System & Energy Efficiency (1)

Cost

- \$ (17)
- \$\$ (12)
- \$\$\$ (7)

- Participate in community planning and regional collaborations
\$-\$-\$ Planning [More Info +](#)
- Acquire and manage ecosystems
\$\$\$ Ecosystem & Land Use [More Info +](#)
- Implement green infrastructure on site and in municipalities
\$-\$-\$ Ecosystem & Land Use [More Info +](#)
- Implement watershed management
\$\$ Ecosystem & Land Use [More Info +](#)
- Integrate flood management and modeling into land use planning
\$ Ecosystem & Land Use [More Info +](#)
- Update fire models and practice fire management plans
\$-\$-\$ Ecosystem & Land Use [More Info +](#)
- Conduct sea-level rise and storm surge modeling
\$ Modeling [More Info +](#)
- Develop models to understand potential water quality changes

Resilient Strategies Guide: Planning Report



Report: Resilient Strategies Guide for Water Utilities

This report is provided to help identify and organize adaptation options of interest. Your selected Utility Information, Priorities, Assets, and Strategies are described below. Use the information documented in this report as a preliminary step in the process of planning and building resilience strategies. As you continue to monitor conditions and begin implementing resilience options, revisit the Resilient Strategies Guide and revise this report accordingly to inform future planning efforts.

Utility Information

Utility Name:

Utility Type: Drinking Water

State/Territory: National

Quick climate facts about your region:

Recent events and observable trends in climate conditions, including rising temperatures, shifts in precipitation patterns and timing, and altered hydrologic cycles, could be the basis for evaluating and improving utility preparedness and resilience. As part of this planning process, utilities may consider the following statements, drawn from [U.S. Global Change Research Program](#) assessments and references cited therein, on potential future conditions by the end of the century in each selected region.

- U.S. average temperature has increased by about 1.3 to 1.9°F since 1895, with most of this increase occurring since 1970. The 2000-2010 decade was the warmest on record.
- Many types of extreme weather events, such as heat waves and regional droughts, have become more frequent and intense during the past 40 to 50 years.
- Reduced snowpack, reductions in lake ice cover, earlier breakup of ice on lakes and rivers and earlier spring snowmelt have all resulted in earlier peak river flows.
- Cold-season storm tracks are shifting northward due to increasing temperatures, and the strongest storms are likely to become stronger and more frequent.

Priorities

Source water quality

Category: Protecting water quality

Description: Periods of extreme heat and low precipitation can degrade surface water quality, necessitating seasonal or episodic

Congratulations! You are done! Guide!

Generate your report

You can now generate your report, which includes the information and descriptions of your selections.

1. Review the Summary to the right. If you want to change your selections, click the progress bar above to go to that section.
2. Generate your report.

Generate Report

Assess the effectiveness of your strategies

You can also export your data to use in EPA's CREAT, a risk assessment tool that allows you through an assessment of how effective your selected strategies are at addressing your priorities.

1. Export your CREAT data file.
2. Access CREAT at <http://creat.epa.gov/>.
3. Once in CREAT, import your "RSG Export" file to begin your assessment.

Export CREAT File

Want to learn more?

Extreme Events Workshop Planner



WORKSHOP
PLANNER

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WORKSHOP PLANNER FOR

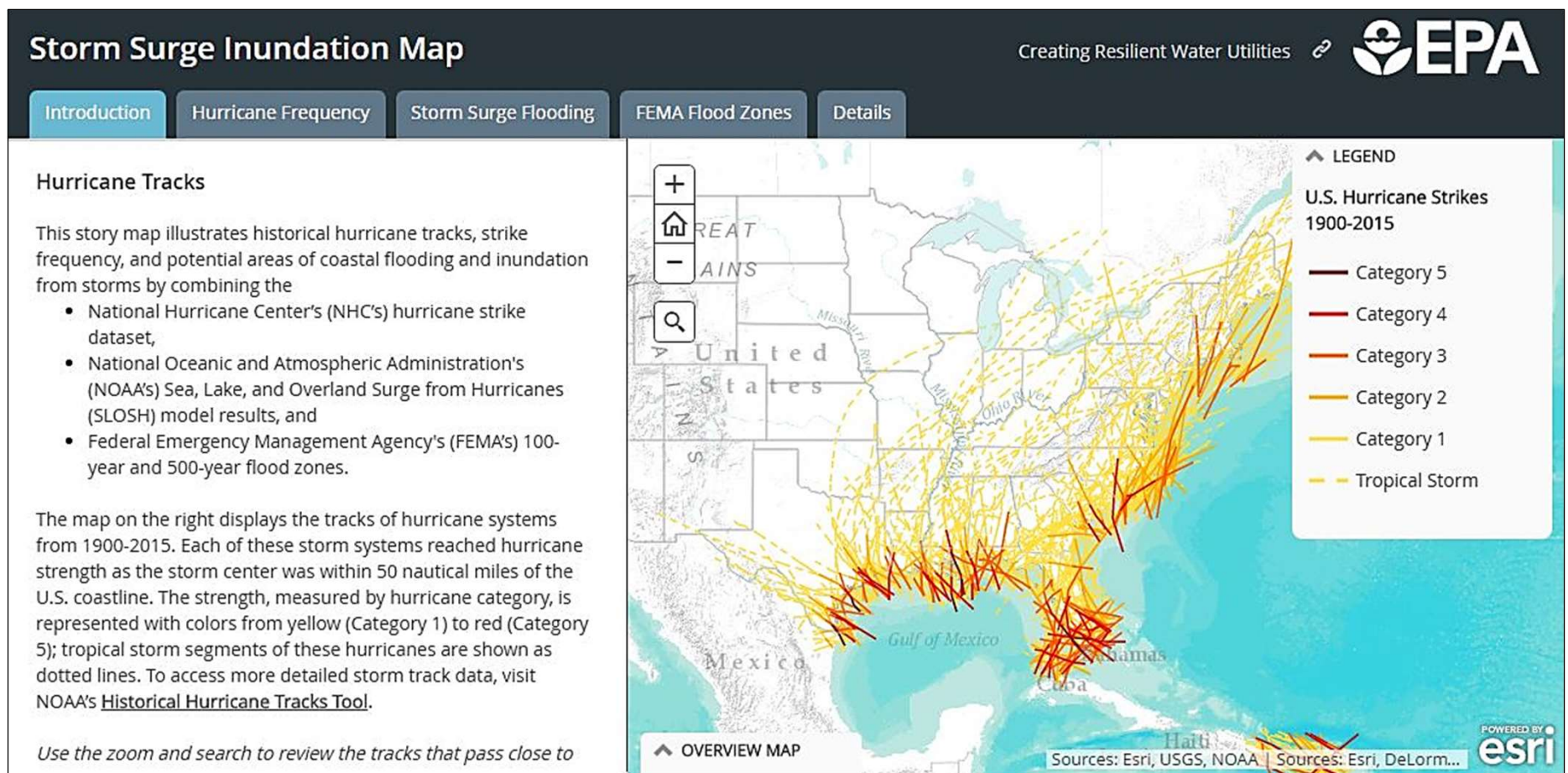
Climate Change and Extreme Events Adaptation

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.

Through a four-step process, the Workshop Planner assists drinking water and wastewater utility personnel, technical assistance providers and other water sector stakeholders with conducting a climate change adaptation workshop. To provide

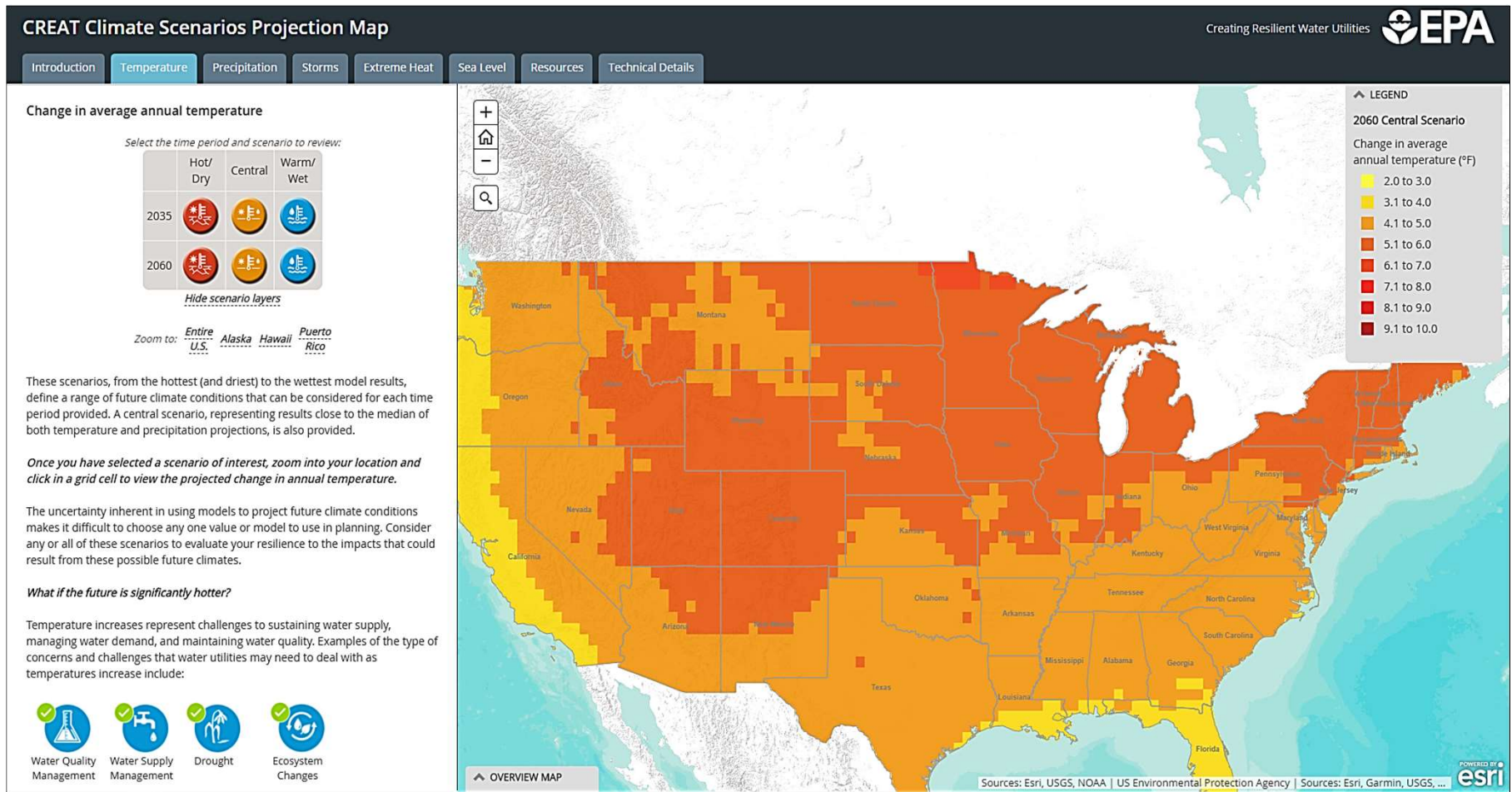
Storm Surge Inundation Map

Illustrates potential for flooding in coastal areas, based on hurricane surge models and FEMA flood zones.



CREAT Climate Scenarios Projection Map

Provides scenarios that capture the range of projected changes



Climate Resilience Evaluation and Awareness Tool (CREAT)



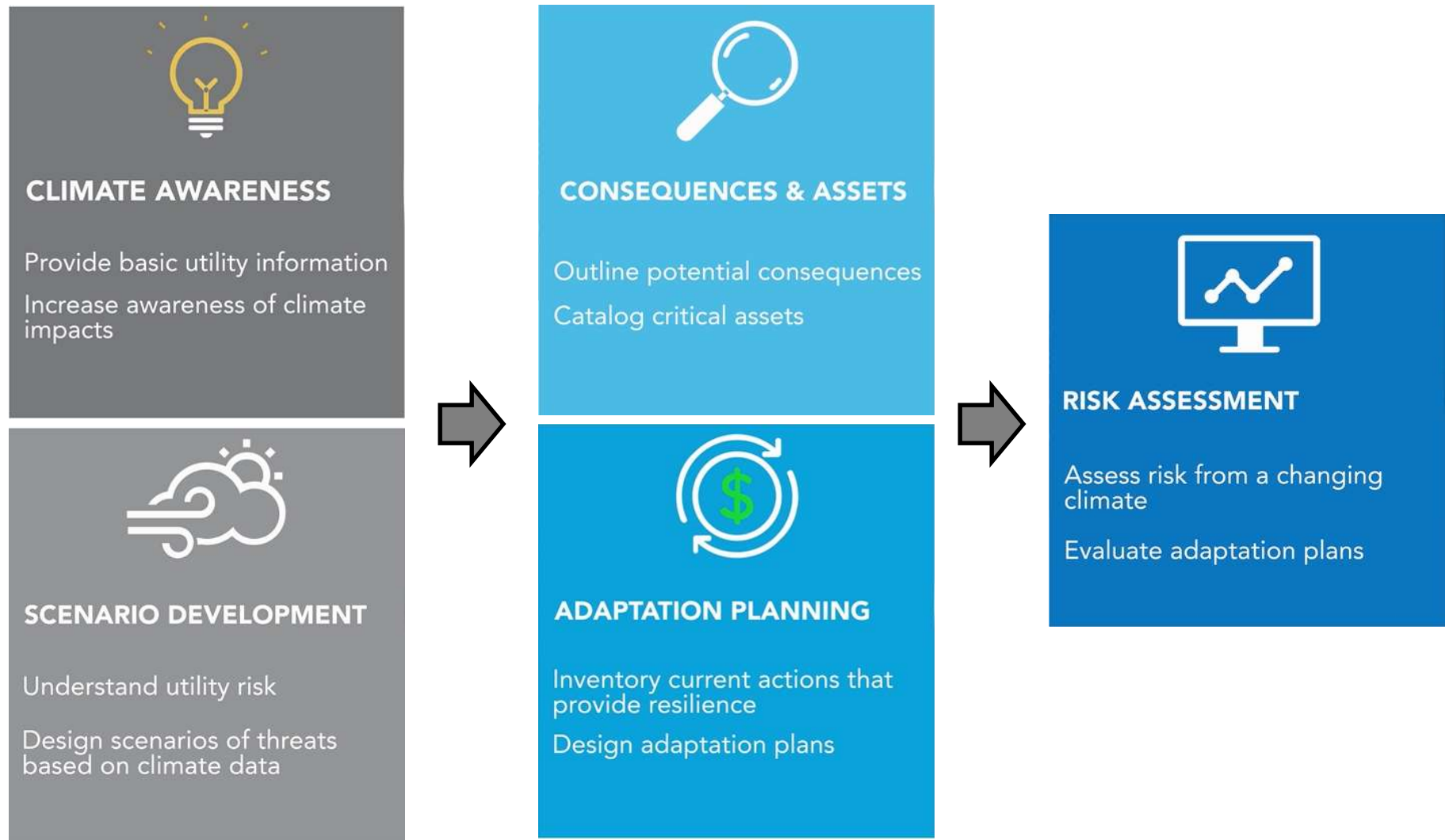
- **Web-based tool** for assessing risk of potential extreme weather impacts
- **Module-based process** with clearly defined goals and reports
- Multiple scenarios provided to help **capture uncertainty**
- **Assessment of current resilience** will help inform adaptation planning
- Results help utilities compare **risk reduction** and **implementation costs**



Results Overview - Plan 1: WWTP Protection Measures			
\$23,767,150 - \$46,869,850 CURRENT MEASURES TOTAL CONSEQUENCES	\$418,000 - \$15,668,300 ADAPTATION PLAN TOTAL CONSEQUENCES	\$8,514,000 - \$46,036,700 TOTAL MONETIZED RISK REDUCTION	\$4,057,500 - \$8,125,000 ADAPTATION PLAN TOTAL COST



CREAT Assessment Process



CREAT Outputs: Final Report

PlanReport - Plan 1- WWTP Protection Measures.docx [Compatibility Mode] Word

Rybarczyk, Zachary

FILE HOME INSERT DESIGN PAGE LAYOUT REFERENCES MAILINGS REVIEW VIEW

Clipboard Font Paragraph Styles Editing

CREAT Plan 1: WWTP Protection Measures Plan Report
TOMS RIVER WATER

CONTENTS

Background	1
Utility Information	1
Adaptation Planning	2
Risk Assessment Results	3
Next Steps	4
Attachment A – Scenario Data	5
Attachment B – Consequence Definitions	6
Attachment C – Plan Comparison	7
Attachment D – Likelihood Sensitivity	8

Background
This report summarizes the potential for reducing

System type Combined

"PlanReport - Plan 1- WWTP Protection Measures.docx": 16,543 characters (an approximate value).

100%

Adaptation Case Study and Information Exchange

Case Study and Information Exchange

Creating Resilient Water Utilities 

Overview

Drought conditions in many regions of the United States impact water utilities by changing water levels in aquifers and reservoirs, reducing snowpack, and altering surface water flows. Water sector utilities facing drought should employ strategies to prepare for, respond to and recover from limited water supply.

Drought



Capital Region Water, Pennsylvania	City of Fredericktown, Missouri	City of Houston, Texas
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City of Blair, Nebraska	City of San Diego, California	East Bay Municipal Utility District, California
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Southern Nevada Water Authority, Nevada	City of Austin, Texas	Seattle Public Utilities, Washington
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SUEZ Water New Jersey, New Jersey	Aquarion Water Company, Massachusetts	Puerto Rico Aqueduct and Sewer Authority, Puerto Rico
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City of Wichita Falls, Texas	City of Cottage Grove, Oregon	The York Water Company, Pennsylvania
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Jordan Valley Water Conservancy District, Utah	Washington County Water Conservancy District, Utah
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Esri, GEBCO, DeLorme, NaturalVue | Esri, GEBCO, IHO-IOC GEBCO, DeLorme, NGS 

Adaptation Case Study and Information Exchange

Case Study: Water and Wastewater Utilities Planning for Resilience



WASHINGTON COUNTY WATER CONSERVANCY DISTRICT (WCWCD) WASHINGTON COUNTY, UTAH

Background

The Washington County Water Conservancy District (WCWCD) provides drinking water services to 175,000 customers in the southwest region of Utah. WCWCD's current water supply comes from a combination of surface and ground water sources in the Virgin River watershed, which relies heavily on snowmelt from nearby mountains. The majority of the district's water is sold wholesale to its local municipal partners. The district also operates small retail culinary water, secondary irrigation water, and wastewater systems.

The not-for-profit agency has been operating for over 50 years and is responsible for conserving, developing, managing, and stabilizing water supplies for the county. Since its start, WCWCD has significantly expanded its infrastructure, services, and capabilities in an ongoing effort to serve the county's growing population. The district predicts water conservation will play an increasingly critical role in water resource planning and management to meet future demand and adapt to climate impacts.

Challenges

WCWCD identified sole water source reliance, water supply/quality management, meeting projected water demands with limited local supplies, and natural disasters as leading concerns for the county. They are particularly concerned that potential flood events could affect their water quality and that drought events may reduce the amount of snow pack in the region. Recently, WCWCD has been seeing decreased river flow due to less precipitation and more frequent warm spells during the winter. If a predicted hotter and drier future were to occur, WCWCD would expect severe business impacts to the utility due to service disruption.

Planning Process

To evaluate the resilience of their water system to extreme drought, WCWCD used the U.S. Environmental Protection Agency's (EPA's) CREAT. CREAT assists water utilities in identifying future extreme weather and other environmental threats, assessing risks from these threats, and evaluating and comparing measures to adapt to these threats. The assessment brought together individuals from WCWCD, state agencies, and EPA to think critically about potential vulnerabilities, priority assets, and strategies for strengthening infrastructure and operational resilience.

Resilience Strategies and Priorities

Based on experiences from prior threats to their water supply, WCWCD has already taken measures to protect their water supply from drought and to improve their overall resilience. For example, they offer landscape water audits to help residents better understand their water use and provide rebates to users who upgrade their irrigation equipment (e.g., use smart timers). Using the results of the CREAT assessment, the county was able to evaluate the performance and costs of different potential adaptation measures that, if implemented, could further strengthen the physical and operational resilience of the

Case Study: Water and Wastewater Utilities Planning for Resilience



CITY OF BLAIR, NEBRASKA

Background

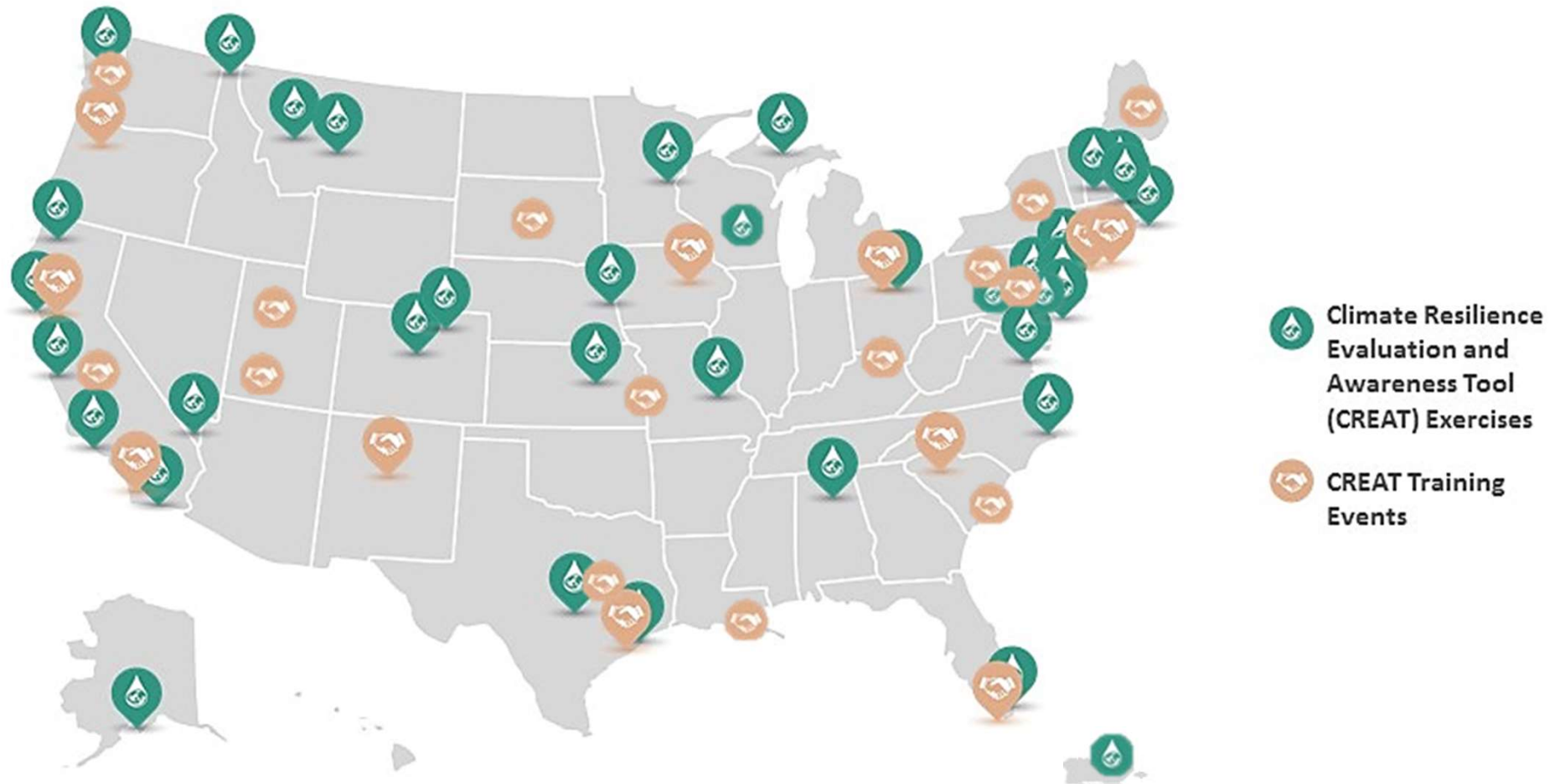
The city of Blair, Nebraska provides drinking water and wastewater services to residential, industrial and commercial customers. The city of Blair owns and operates the entire municipal water system, including a 20 million gallons per day (MGD) water treatment plant that draws from the Missouri River. Drinking water demand for residential, commercial and industrial customers is described in Table 1. The city of Blair has an interconnection with Omaha through a rural system that can provide up to 1 MGD in case of an emergency.

Table 1. City of Blair Drinking Water Demand

CUSTOMER	WATER DEMAND
Residential	Average: 1 MGD; Peak demand: 4 MGD City of Blair: population 8,000 Additional small rural systems outside the city: population of 2,000 – 4,000
Industrial – Cargill biocampus	10-15 MGD; higher demand in summer months
Industrial – Omaha Public Power Plant (OPPD) nuclear power plant	0.4 MGD OPPD switches over to the city of Blair's water source in warmer months when the temperature in their usual source water is too high and could cause the nuclear plant to violate their National Pollution Discharge Elimination System thermal discharge criteria
Additional commercial and industrial customers	2 MGD

Challenges

CRWU Water Utility Resilience Support Projects





Thank you!

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**Visit us on the web and register for the CRWU
newsletter at: www.epa.gov/crwu**