



Environmental Protection Agency (EPA) Creating Resilient Water Utilities (CRWU) Initiative

Audrey Ramming | Natural Resources Specialist

SCAN ME



CRWU



Environmental Finance Centers



Creating Resilient Water Utilities

Cybersecurity Technical Assistance

Lead Service Line Replacement Accelerators Pilot

Clean Water Rural, Small, & Tribal TA

Get the Lead Out (GLO) Initiative

Training & Technical Assistance for Small Systems

Preliminary Engineering Support

Closing America's Wastewater Access Gap

and more!!!

Creating Resilient Water Utilities (CRWU): Our Mission

- Provide utilities with the **tools, training, and technical assistance** to increase resilience to climate change
- Promote a clear understanding of **climate science data** and potential **long-term adaptation options**
- Collaborate with utilities and partners to increase our reach and **improve our tools**
- **Improve resilience** in communities that bear disproportionate climate impact
- Non-regulatory



From Left to Right: Griggs Reservoir on Scioto River in OH; Water Replenishment District in Southern CA; Water Sanitation Area in Cincinnati, OH; Water Treatment Plant in San Diego, CA

CRWU Tools and Resources

ACCESS DATA

1. [Climate Data Maps](#)
2. [Data Access Page](#)
3. [Environmental Justice Map](#)

RISK ASSESSMENT APPLICATIONS

4. [Resilient Strategies Guide](#)
5. [CREAT *](#)

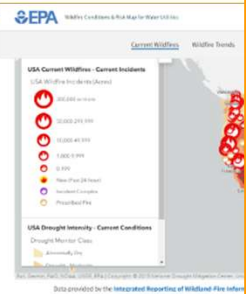
WEB RESOURCES

6. [Adaptation Case Study Map](#)
7. [Training and Engagement Center](#)
8. [Climate Adaptation Funding](#)



1

Inter



CREAT Climate Change Scenarios Projection Map

Creating Resilient Water Utilities

Streamflow Projections Map

Creating Resilient Water Utilities

Historical



Snowpack Change in the Western United States

This map displays the States Geology derived from and annual h availability d

Flow condit main rivers. T statistics pro each statistic estimated. Ne line up pects models.

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Storm Surge Inundation Map

Creating Resilient Water Utilities

Introduction Hurricane Frequency Storm Surge Flooding FEMA Flood Zones Real-Time Advisories Details



Wildfire Conditions & Risk Map for Water Utilities

Current Wildfires

Wildfire Trends

Wildfire Risk

Adapting to Impacts

Additional Resources

USA Current Wildfires - Current Incidents

USA Wildfire Incidents (Acres)

- 300,000 or more
- 50,000-299,999
- 10,000-49,999
- 1,000-9,999
- 0-999
- New (Past 24-hour)
- Incident Complex
- Prescribed Fire

USA Drought Intensity - Current Conditions

Drought Monitor Class

- Abnormally Dry
- Drought - Moderate

Esri, Garmin, FAO, NOAA, USGS, EPA | Copyright: © 2015 National Drought Mitigation Center, University of Nebraska-Lincoln | Source: US Department of the Interior, Office of Wildland Fire

Data provided by the [Integrated Reporting of Wildland-Fire Information \(IRWIN\)](#), the [National Interagency Fire Center \(NIFC\)](#), and the [US Drought Monitor](#).

<https://www.epa.gov/crate-and-weather-data>

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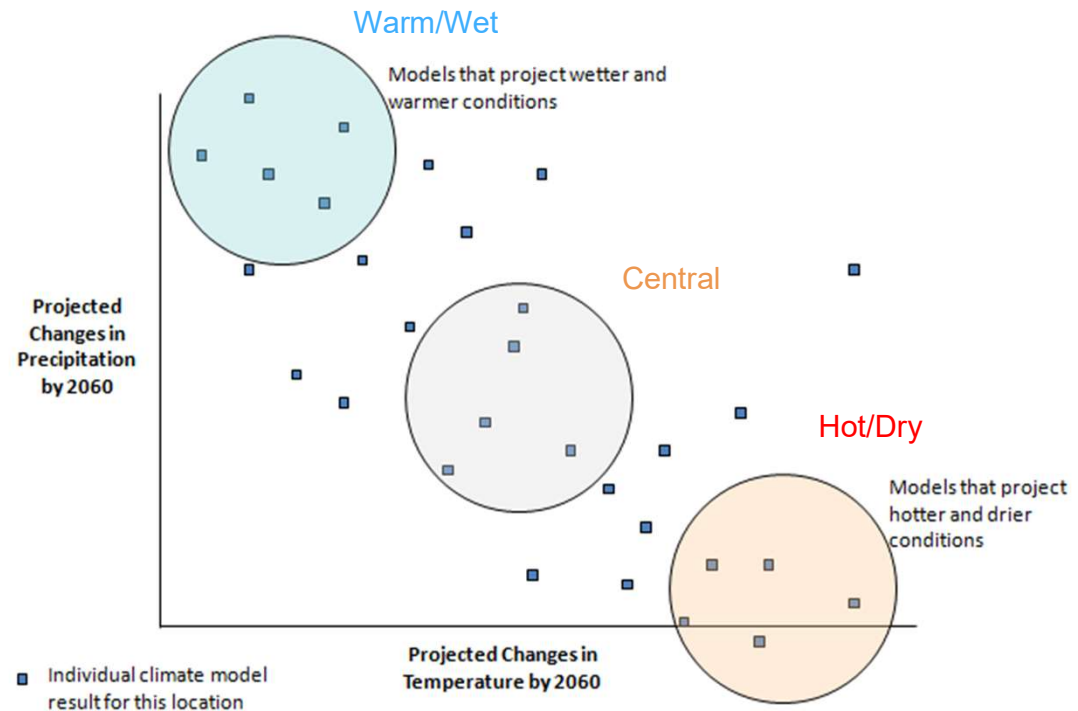


DATA MAPS

5. Wildfire Conditions and Risk Map

Climate Modeling – Future Climate Scenarios

- Climate model data can be difficult to interpret and work with
- CRWU's Climate Projection Maps, Data Access Page, and CREAT combines similarly behaving models to produce possible future climate scenarios
- **Three possible scenarios** help utilities frame potential climate vulnerabilities
- Increases confidence in likely outcomes



CLIMATE TRENDS FOR WYOMING

- **Temperature increases in all months**

- More summer heatwaves
- Warming winter minimums

- **Precipitation increases in most places**

- Relatively minor increases
- Some months become drier
- More heavy precipitation
- Less light precipitation

- **Droughts become longer and more variable**

- **Snowpack declining**

- Warmer winters
- More rain and rain-on-snow events
- Peak occurring earlier

- **Storms become more frequent and intense**

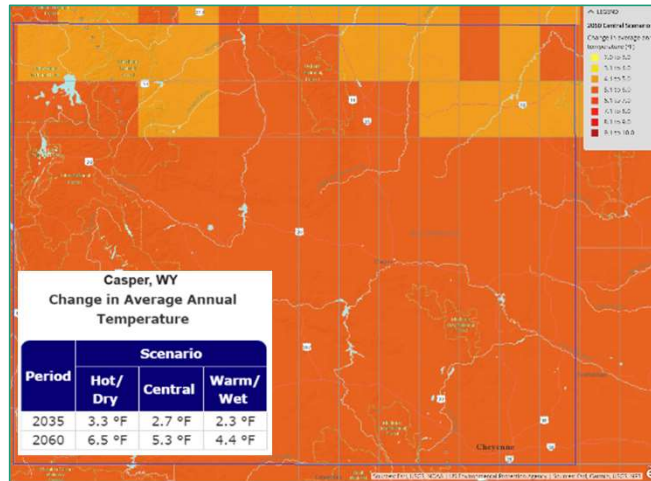
- Increase in heavy precipitation
- Increased tornado risk

- **Wildfire frequency increases**

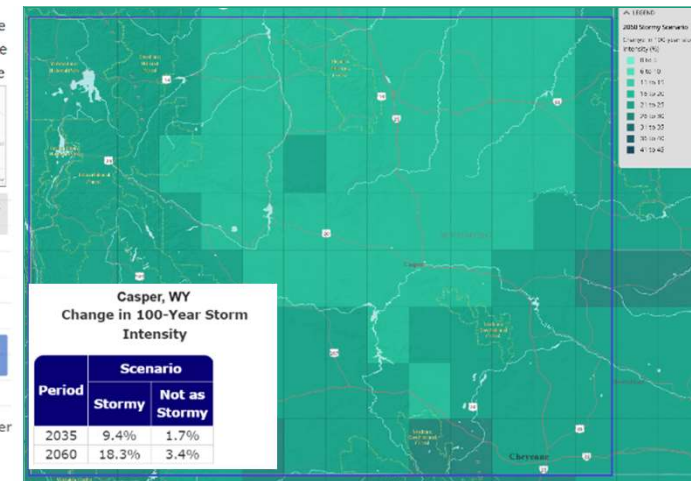
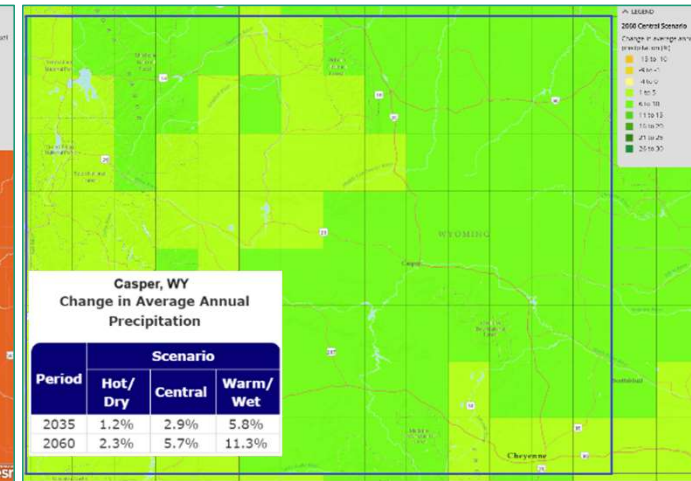
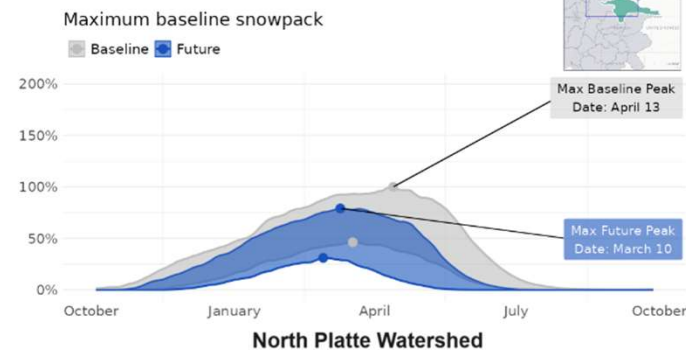
- Acres burned also increasing

- **Increasing flood risk**

- Shift to more winter rain
- Earlier spring rain-on-snow
- Storms with more precipitation
- Rain-driven streamflow peaks are 2.5 times higher than snowmelt-driven peaks on average



Snowpack is displayed as a seasonal time series of the ratio of snow-water equivalent (SWE) to the baseline peak SWE. The shaded ranges depict the range from 10th to 90th percentile for each time period in the North Platte watershed. Models project that the future peak SWE may be 79% of the baseline peak and could occur 34 days earlier.



United States Environmental Protection Agency

Environmental Topics
Laws & Regulations
Report a Violation
About EPA

Creating Resilient Water Utilities (CRWU)

CONTACT US

CRWU Home
Risk Assessment Tools
Resilient Strategies Guide
Climate Resilience Evaluation and Awareness Tool
Climate and Weather Data Maps
Adaptation Case Studies
Adaptation Planning in Action Videos
Climate Adaptation Funding
Training and Engagement Center

Access Data from Creating Resilient Water Utilities

Use the Data Access Page Explorer to search for [Climate Resilience Evaluation and Awareness Tool \(CREAT\)](#) data at your location. Enter an address and click the Search button.

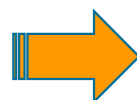
Data from CRWU maps and the [Climate Resilience Evaluation and Awareness Tool \(CREAT\)](#) can also be accessed by downloading any of the zipped geospatial files below. Each file contains geospatial data with locations and information for use with geographic information system software.

Downloadable Data

- [CRWU/CREAT Historical Grid Geospatial Data](#) (1 MB): Grid-based historical climate data
- [CRWU/CREAT Projection Grid Geospatial Data](#) (3 MB): Grid-based projected climate data
- [CRWU/CREAT Projection Streamflow Point Geospatial Data](#) (12 MB): Point-based projected streamflow data
- [CRWU/CREAT Projection Streamflow Grid Geospatial Data](#) (1 MB): Grid-based projected streamflow gage data
- [CRWU/CREAT Historical Streamflow Gage Geospatial](#)

CRWU Maps to Visualize Data

- [Coastal Storm Surge Map](#)
- [Climate Change Scenarios Projection Map](#)
- [Streamflow Projection Map](#)



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Access Data from Creating Resilient Water Utilities

Selected Address

Wall Twp, New Jersey (40.1531, -74.0617)

Data for your location from our maps and CREAT are listed in the tables below. Expand the sections using the + to view the data and a brief description of the dataset. To collapse the sections click the -.

- Historical Climate Grid**

Grid-based historical climate data. The dataset contains historical hurricane strike frequency, precipitation, and temperature data in a gridded geospatial format. The hurricane strike frequency data source is the International Best Track Archive for Climate Stewardship (IBTrACS). The precipitation and temperature data source is the Parameter-elevation Regressions on Independent Slopes Model (PRISM) dataset. Geographic extent of data: CONUS, Alaska, Hawaii, Puerto Rico, and US Virgin Islands. Related CRWU products: [Storm Surge inundation Map](#); [CREAT](#)

Attribute	Value
Count of all hurricane strikes	7
Start year of record	1990
End year of record	2020
Count of Category 1 hurricane strikes	4
Count of Category 2 hurricane strikes	3
Count of Category 3 hurricane strikes	0
Count of Category 4 hurricane strikes	0
Count of Category 5 hurricane strikes	0
Average total annual precipitation (in) (1981-2010)	47.7
Average total January precipitation (in) (1981-2010)	4.0
Average total February precipitation (in) (1981-2010)	3.0

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- Historical Climate Grid**
- Weather Station Points**
- Coastal Gages**
- Historic Climate Station Points**
- Climate Projection Grid**

Grid-based projected climate data. The dataset contains projected future precipitation and temperature trends in a gridded geospatial format. The data source data is an ensemble model output from the Coupled Model Intercomparison Project Phase 5 (CMIP5) dataset, provided as the "Downscaled CMIP5 and CMIP5 Climate and Hydrology Projections" archive by the U.S. Bureau of Reclamation and its collaborators. Geographic extent of data: CONUS, Alaska, Hawaii, Puerto Rico. Related CRWU products: [CREAT](#); [Climate Scenarios Projection Map](#); [CREAT](#)

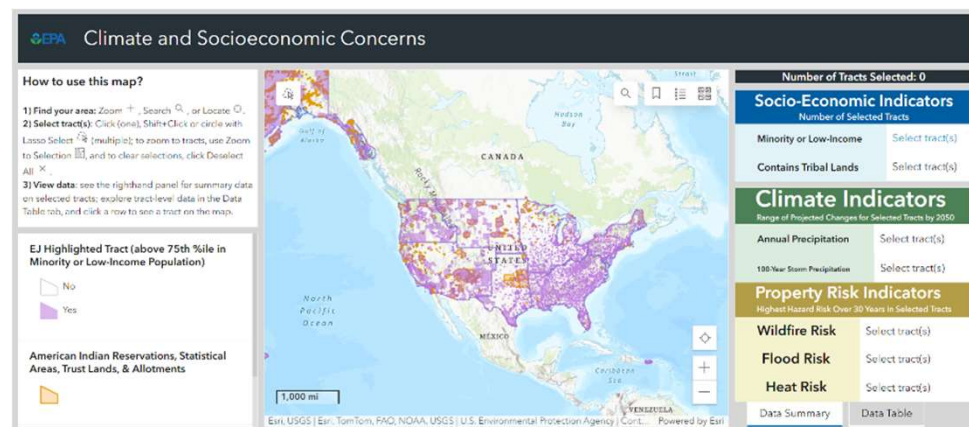
Attribute	Hot/Dry	Central	Wet/Warm
Annual precipitation change (%) (2035 scenarios)	1.9	8.4	5.9
January precipitation change (%) (2035 scenarios)	0.4	6.1	9.7
February precipitation change (%) (2035 scenarios)	3.6	7.0	12.9
March precipitation change (%) (2035 scenarios)	6.3	7.6	6.2

2 Data Access Page

Your location data from our Climate Data Maps and CREAT are listed in tables and available for download.

3 Environmental Justice StoryMap

- Online resource about environmental justice (EJ) and equity approaches in water sector climate adaptation
- Includes background information, data dashboard, case studies, and resources
- Used in CRWU technical assistance to bring EJ into the conversation



CRWU Tools and Resources

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RISK ASSESSMENT APPLICATIONS

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5. [CREAT *](#)

WEB RESOURCES

6. [Adaptation Case Study Map](#)
7. [Training and Engagement Center](#)
8. [Climate Adaptation Funding](#)



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Resilient Strategies Guide (RSG)

- **Free**, online application for reviewing resilience strategies used by water utilities
- Introduction to **adaptation planning** for those with limited experience
- Provides **strategies** based on location, priorities, and assets
- Provides **funding options** based on selected strategies
- **Final report** summarizes selected strategies to explore during adaptation planning
- Outputs can be imported into the Climate Resilience Evaluation and Awareness Tool (CREAT) to **start your assessment** of selected strategies

Resilient Strategies Guide for Water Utilities

Resilient Strategies Guide for Water Utilities

Report: Resilient Strategies Guide for Water Utilities

This report is provided to help identify and organize adaptation options of interest. 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 Type: Drinking Water
State/Territory | Tribal Entity (Midwest)

Quick climate facts:
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.

- Heat waves are anticipated to be more frequent, more severe and longer in duration, and the average number of days each year without precipitation is expected to increase.
- As air temperatures increase, so will surface water temperatures and frequency of algal blooms. In lakes with contaminated sediment, warmer water and low-oxygen conditions can more readily release mercury and other persistent pollutants into surface water.
- Reduced summer water levels are also likely to reduce the recharge of groundwater, dry up small streams and reduce the area of wetlands in the Midwest.
- The observed increases in the intensity of the heaviest rainfalls are projected to continue (Pryor et al. 2009; Schoof et al. 2010) and may increase the frequency of Combined Sewer Overflows (CSOs) into receiving waters.

Priorities

- Lake and reservoir levels**
Category: Preparing for drought
Description: Lake and reservoir levels may fall during periods of low precipitation, reduced runoff and loss of water from vegetation and evaporation. These surface water resources are critical for water utilities and lower levels may limit the ability of utilities to meet water demands, especially during summer months. In some cases, levels may drop below intake infrastructure.

Runoff timing and snowpack
Category: Preparing for drought
Description: Any shifts in seasonal runoff and storage of water in snowpack would disrupt water supply and strain the capacity of reservoirs to hold peak runoff flows. Without changes in management and storage practices, seasonal (summer) shortages could jeopardize supply and compromise biodiversity and fishery goals in watersheds.

Source water quality
Category: Protecting water quality
Description: Periods of extreme heat and low precipitation can degrade surface water quality, necessitating seasonal or episodic requirements for alternate sources or more advanced treatment. Turbidity and pollutant loads following storms and high flow events may also drive utilities to alter their source or treatment following events.

Assets

Drinking Water Treatment Plant

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RSG



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Climate Resilience Evaluation and Awareness Tool (CREAT)

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- Module-based process with clearly defined goals and reports
- Presents available climate data at the regional and local levels
- Multiple scenarios provided to help capture uncertainty
- Assessment of current resilience will help inform adaptation planning
- Results help utilities compare risk reduction value and implementation costs



CLIMATE AWARENESS

Provide basic utility information
Increase awareness of climate impacts



SCENARIO DEVELOPMENT

Understand utility risk
Design scenarios of the future based on climate data

Climate Awareness Report

Potential future climate conditions for Metro Utility (Newark, NJ)

Climate change presents challenges to water, wastewater and stormwater utilities and the communities they serve. Those utilities that adapt to these changes may need to raise rates to develop new water supplies and adjust their treatment and operations. Without adaptation, infrastructure and operations designed for historical climate conditions could be overwhelmed or damaged. Main breaks, overflows, and service outages would lead to lost local business revenue and public health concerns. Several changes are possible for your utility's location in Newark, New Jersey and each future has unique challenges to consider:

<p>What if the climate were significantly hotter?</p> <ul style="list-style-type: none"> Adjust treatment processes to warmer waters and altered water quality Utility crews and equipment stressed during hotter conditions 	<p>5.57°F increase in average annual temperature</p> <ul style="list-style-type: none"> Increased seasonal demand during hotter conditions exceeding supply leads to outages and public health risk Larger wildfires and damage to infrastructure and water resources under hotter conditions
<p>What if the climate were significantly wetter?</p> <ul style="list-style-type: none"> Strained sewers, overwhelmed treatment and flooded facilities during sustained and intense storm events Adjust treatment processes to lower quality inflow due to soil erosion and contaminants from watershed flows 	<p>10.62% change in annual precipitation and 17.56% increase in 100-year storm by 2050</p> <ul style="list-style-type: none"> Flooded streets and basements throughout the community following heavy precipitation events Health risk from Combined Sewer Overflows (CSOs) and Sanitary Sewer Overflows (SSOs)
<p>What if the climate were significantly drier?</p> <ul style="list-style-type: none"> Revenue loss from reduced usage during voluntary or mandatory conservation actions in response to drought Operational changes to increase efficiency, conserve and access alternate supplies during intense drought 	<p>3.22% change in annual precipitation by 2050</p> <ul style="list-style-type: none"> Disrupted historical storage cycles in aquifers, reservoirs and snowpack Larger wildfires and damage to infrastructure and water resources under hotter conditions
<p>How will rising sea level affect our community?</p> <ul style="list-style-type: none"> Frequent flooding during storms due to higher sea level increasing storm surges Coastal facilities more vulnerable to saline intrusion with higher sea level 	<p>8.82 to 31.18 inches higher sea level by 2050</p> <ul style="list-style-type: none"> Property damage and street flooding across coastal communities Relocation of facilities and facilities to accommodate moving equipment

Potential Future Climate Conditions in 2050 for Metro Utility NJ



RISK ASSESSMENT

Assess risk from a changing climate

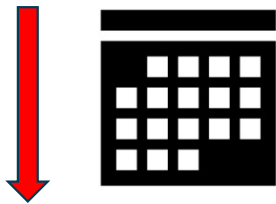
Evaluate adaptation plans



CRWU Tools' Data Updates

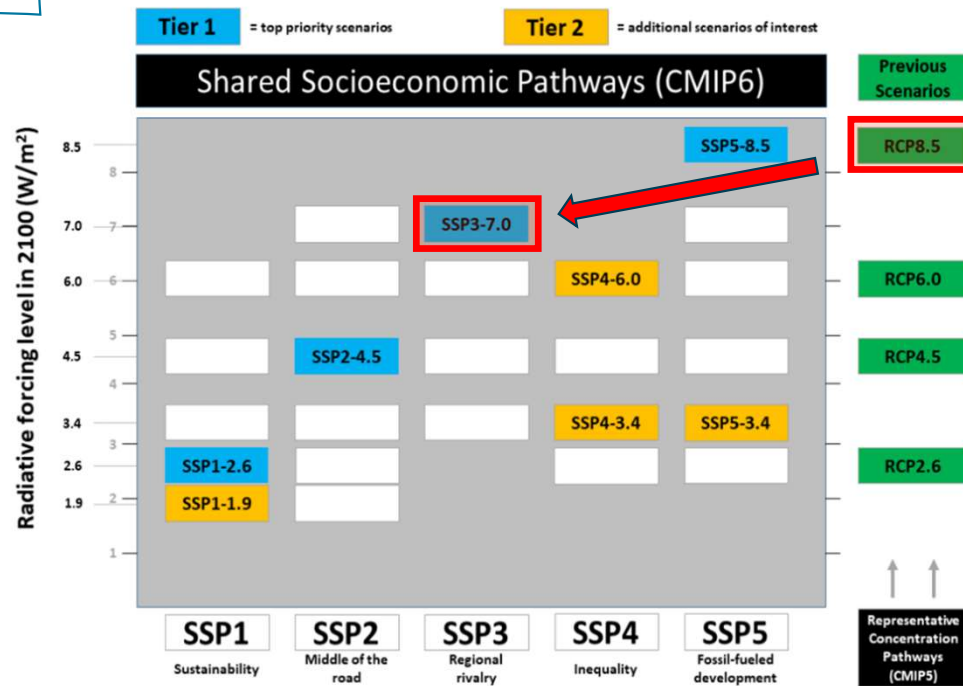
Updated projection
horizon choices

2035 & 2060



2050 & 2090

CMIP6 model & scenarios



LOCA2 downscaling

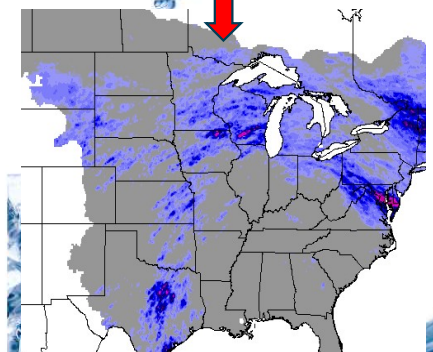
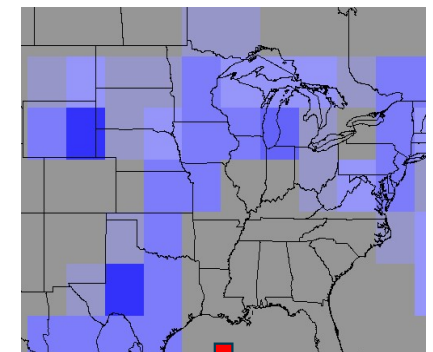


Image Credit: David Lorenz (UW-Madison)



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8. [Climate Adaptation Funding](#)



6

CRWU'S Adaptation Case Studies Map for Water Utilities

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Case Studies



- Connect with peer utilities, share experiences, and learn best practices
- ~ 70 CREAT success stories available
- Regular updates with new utilities
- Highlights case studies surrounding certain themes, such as environmental justice, which change quarterly



7

CRWU Training & Engagement Center

- Watch recorded regional webinars for water sector stakeholders across 9 climate regions within the U.S.
- Get detailed instruction on CREAT and its Modules
- View utility climate resilience and adaptation videos for water systems in some U.S. communities.

CREAT Training Videos

Click on each video below for more information on CREAT and the How-To's for completing its Modules. See the [Methodology Guide](#) for more information on data sources and methods used in the programming of CREAT.

CREAT Welcome Video



CREAT: Scenario Development Module



CREAT: Consequences and Assets Module



CREAT: Risk Assessment Module



Connect With Us:

- Sign up: [CRWU News](#)
- Email us: crwuhelp@epa.gov

The screenshot shows the EPA website's 'Creating Resilient Water Utilities (CRWU)' section. It features a navigation bar with links like 'Environmental Topics', 'Laws & Regulations', 'Report a Violation', and 'About EPA'. The main content area is titled 'Training and Engagement Center' and includes a sidebar with links to 'CRWU Home', 'Resilient Strategies Guide', 'Climate Resilience Evaluation and Awareness Tool', 'Climate and Weather Data Maps', 'Adaptation Case Studies', 'Adaptation Planning in Action Videos', 'Environmental Justice StoryMap', 'Training and Engagement Center', 'Climate Adaptation Funding', and 'Climate Finance Working Group'. The main text area provides information about the training series, including a 'More CRWU Resources and Training' section with links to 'Showcase Leading Practices in Climate Adaptation', 'Climate Resilience Planning', 'Utilizing a New Water Approach', 'Building Resilience to a Changing Climate', and 'CRWU Training Videos'. Below this is a 'Climate Risk and Resilience Trainings' section with a map of the United States showing various climate regions and a list of training topics: 'Northwest Climate Region', 'Southwest Climate Region', 'Midwest Climate Region', 'Southern Great Plains Climate Region', 'Northern Great Plains Climate Region', 'Southeast Climate Region', 'Northwest Climate Region', 'Mid-Atlantic Climate Region', 'Alaska Climate Region', 'National Tribal Utility Sector', and 'National Technical Assistance Providers'. The bottom of the page features a 'Stories from the Sector' section.

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TRAINING

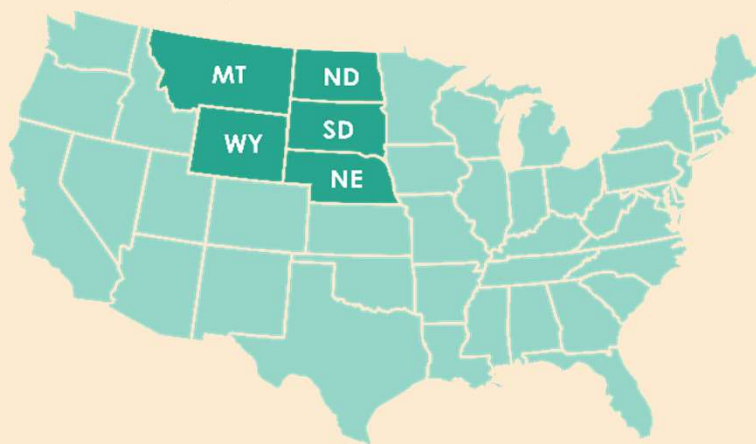


Upcoming CRWU Climate Resilience Training for YOU!

Climate Resilience Training for the Northern Great Plains Water Sector

Webinar Series: November 19 & 21 (9:30am – 12pm MST)

Great Northern Plains climate region,
according to the National Climate Assessment



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Photos from FY23
Tribal Workshops



8 Climate Adaptation Funding

- Points to a variety of sources that fund climate resilience infrastructure projects, pay for operation and maintenance costs, and sustain resiliency programs:
 - Lists Federal Funding Sources
 - Lists Financial Tools
 - Calls out relevant and timely Grant Opportunities

Creating Resilient Water Utilities (CRWU) CONTACT US

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Climate Finance Working Group

Climate Adaptation Funding for Water Sector Utilities

Grant Opportunities


Environmental Protection Agency (EPA)'s Office of Environmental Justice and External Civil Rights (OEJECR)

- **Environmental and Climate Justice Community Change Grants Program (Community Change Grants):** OEJECR's Community Change Grants will offer \$2 billion in Inflation Reduction Act funds to finance community-driven projects that address climate challenges and reduce pollution while strengthening communities through thoughtful implementation. Read the [Notice of Funding Opportunity](#) here. This funding opportunity is currently listed on [Grants.Gov](#) under opportunity number EPA-R-OEJECR-OCS-23-04. **The application period closes on November 21, 2024.**
- **Community Change Equitable Resilience Technical Assistance:** This program will provide free design and project development assistance, community engagement, and partnership development workshops that support climate resilience and environmental justice activities in disaster-prone areas. This program will help eligible entities develop applications to be submitted for grants under the OEJECR Community Change Grant Notice of Funding Opportunity (see bullet above). For more information on the program, eligibility requirements, and possible project types, please [access this link](#). **EPA intends to offer this technical assistance to up to 50 recipients nationwide, and the announcement will remain open until 50 recipients have been identified.** To request assistance, please complete the following form: [Technical Assistance Request Form](#).


Funding Resilience

The implementation of adaptive measures to address climate impact at water sector utilities are necessary to ensure clean and safe water provisions throughout the nation.


Listed below are funding sources from the Environmental Protection Agency (EPA), the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA), the Federal Emergency Management Agency (FEMA), the U.S. Small Business Administration (SBA), and others. These [Federal Funding Sources](#), along with [EPA's Financial Tools](#), will guide you to a variety of sources that fund climate resilience infrastructure projects, pay for operation and maintenance costs, and sustain resiliency programs. Click below to expand each section.



[Federal Funding Sources](#)



[EPA's Financial Tools](#)



CRWU Tools and Resources

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***These Tools and Resources
inform CRWU's Technical
Assistance Process...***

WEB RESOURCES

6. Adaptation Case Study Map
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8. Climate Adaptation Funding



CRWU Technical Assistance Program for Drinking Water, Wastewater, and Stormwater Utilities (*feat. CREAT*)

Assessment #: Last year: 21; This year: 35; Next year: 45+

TA Process:

- 2-4 months (~35-40 hours)
- Series of Virtual Working Sessions to walk through tools
- Potential for On-Site visit
- Utilities are typically asked to designate a lead staff member to serve as a point-of-contact, other members may include hydrology modelers, engineers, treatment plant managers
- **Deliverables:** CREAT Assessment Report, Adaptation Plans, Case Study

Coordination:

- Within EPA's larger WaterTA network
 - National and Regional Environmental Finance Centers
 - Funding Coordination
 - Clean Water & Drinking Water SRFs (States and HQ)
 - EPA's WIFIA
 - FEMA's BRIC Program
 - USDA's Rural Development Program



TOWN OF HARTVILLE WATER SYSTEM; HARTVILLE, WYOMING

Fast Facts:

- Combined System, drinking water services for **64** customers
- Average .0075 MGD
- Vulnerable Financial Condition
- Reliant on **groundwater** sources
- Two aging pump houses in operation, located 4.5 miles from storage tanks in town

Climate Concerns:

- **Drought** (reduced groundwater recharge), wildfires, and reduced snowpack

Potential Adaptive Measures:

- Establish Back-up Power at the pump houses
- Construct second transmission line from pump houses to Hartville for redundancy



LARAMIE PUBLIC WORKS DEPARTMENT; LARAMIE, WYOMING

Fast Facts:

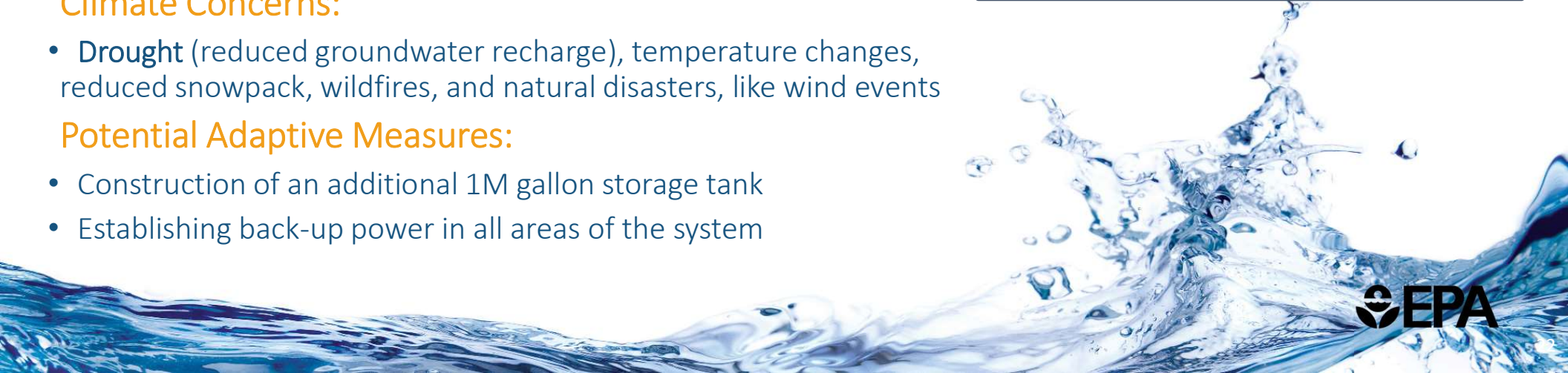
- Combined System; drinking water services for **36,000** customers
- Average **4 MGD**, up to 11 MGD during summertime peaks
- Sources include the **Big Laramie River** and **Casper Aquifer**
- 3 major wellfields
- 3 groundwater treatment facilities, 1 surface treatment plant
- Storage Tanks: Two 3.5M gal, One 8.5M gal, Two 1M gal

Climate Concerns:

- **Drought** (reduced groundwater recharge), temperature changes, reduced snowpack, wildfires, and natural disasters, like wind events

Potential Adaptive Measures:

- Construction of an additional 1M gallon storage tank
- Establishing back-up power in all areas of the system





INTERESTED IN
FREE TECHNICAL
ASSISTANCE
FROM EPA CRWU?



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CONTACT US

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Drew Robison robison.andrew@epa.gov

Sign Up for [CRWU Newsletter](#)

Email: crwuhelp@epa.gov

CRWU website: www.epa.gov/crwu

