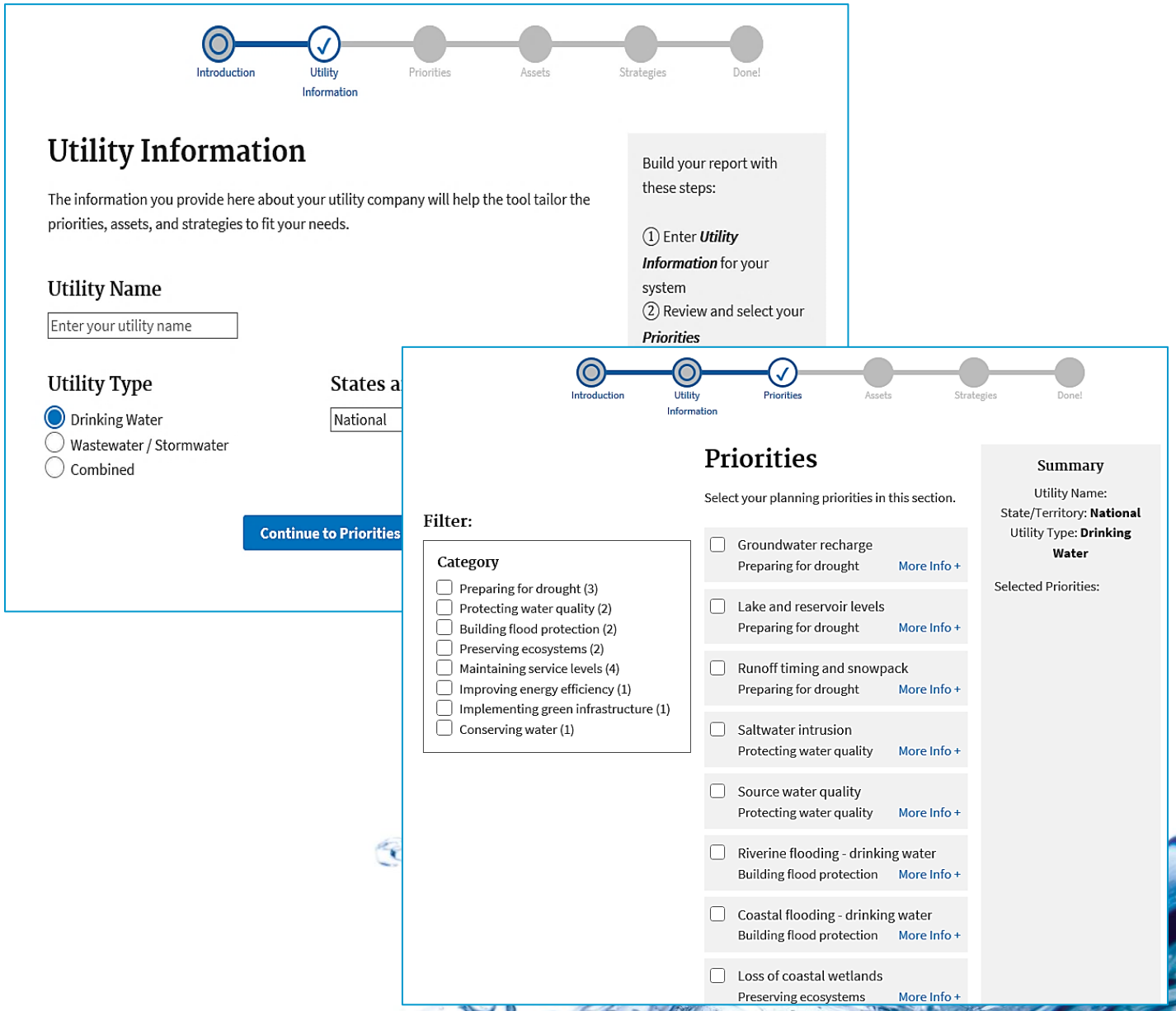
U.S. EPA's Creating Resilient Water Utilities initiative:
Mission Statement

- 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
- Take complex climate science data and put it into usable formats

Resilient Strategies Guide

- Introduction or “On-Ramp” to climate change for those with no or limited knowledge of climate change
- Guided process to review and select priorities, vulnerable assets, and relevant strategies
- Final report documents selected strategies to explore during adaptation planning



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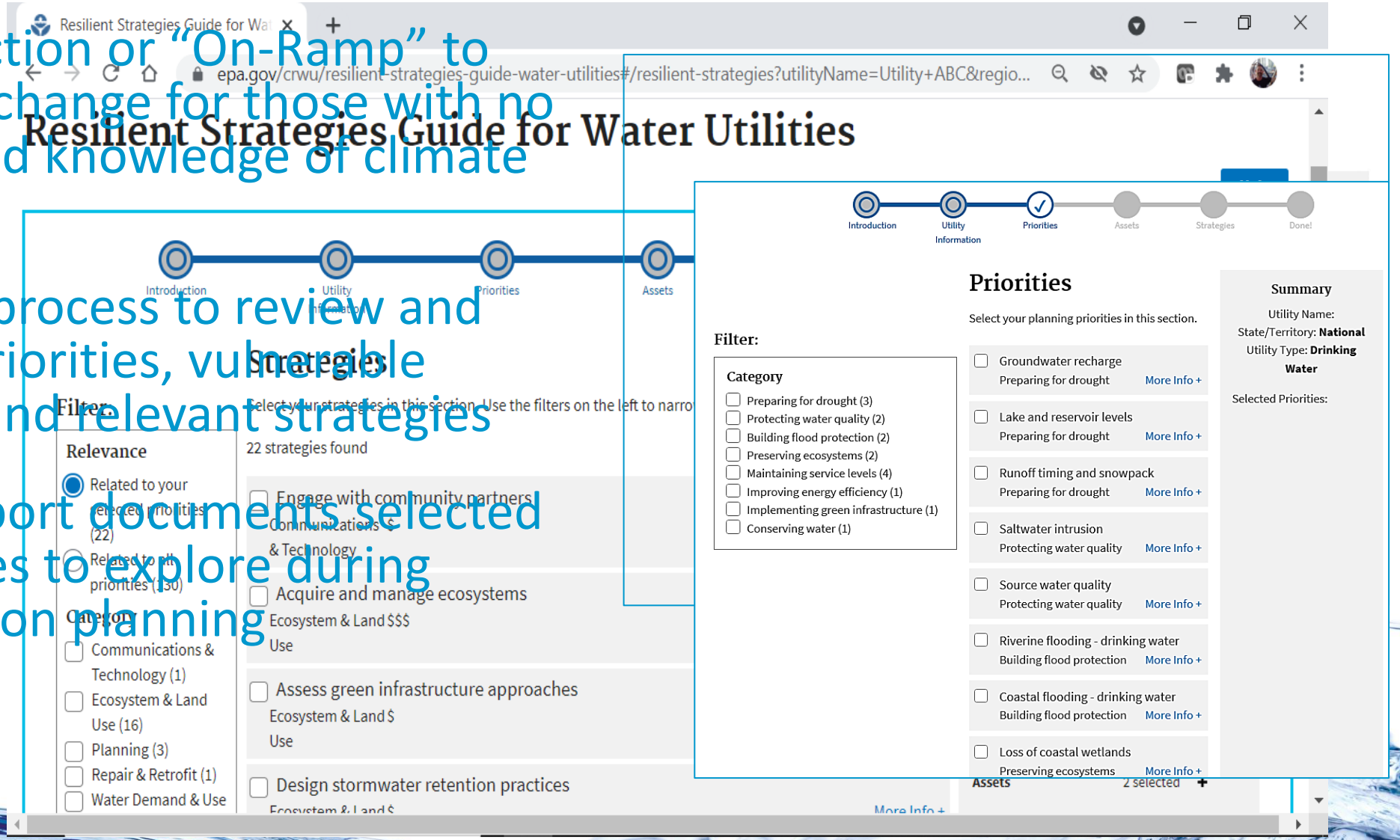

Climate Resilience Evaluation and Awareness Tool

- First of its kind – web-based climate change risk assessment tool or the water sector
- Walks users through a flexible and customizable risk assessment framework that presents available climate data at the regional and local (downscaled) levels
- The tool steers users through a process of identifying impacts, vulnerable assets, and adaptation options to help reduce risks and was built with significant stakeholder input

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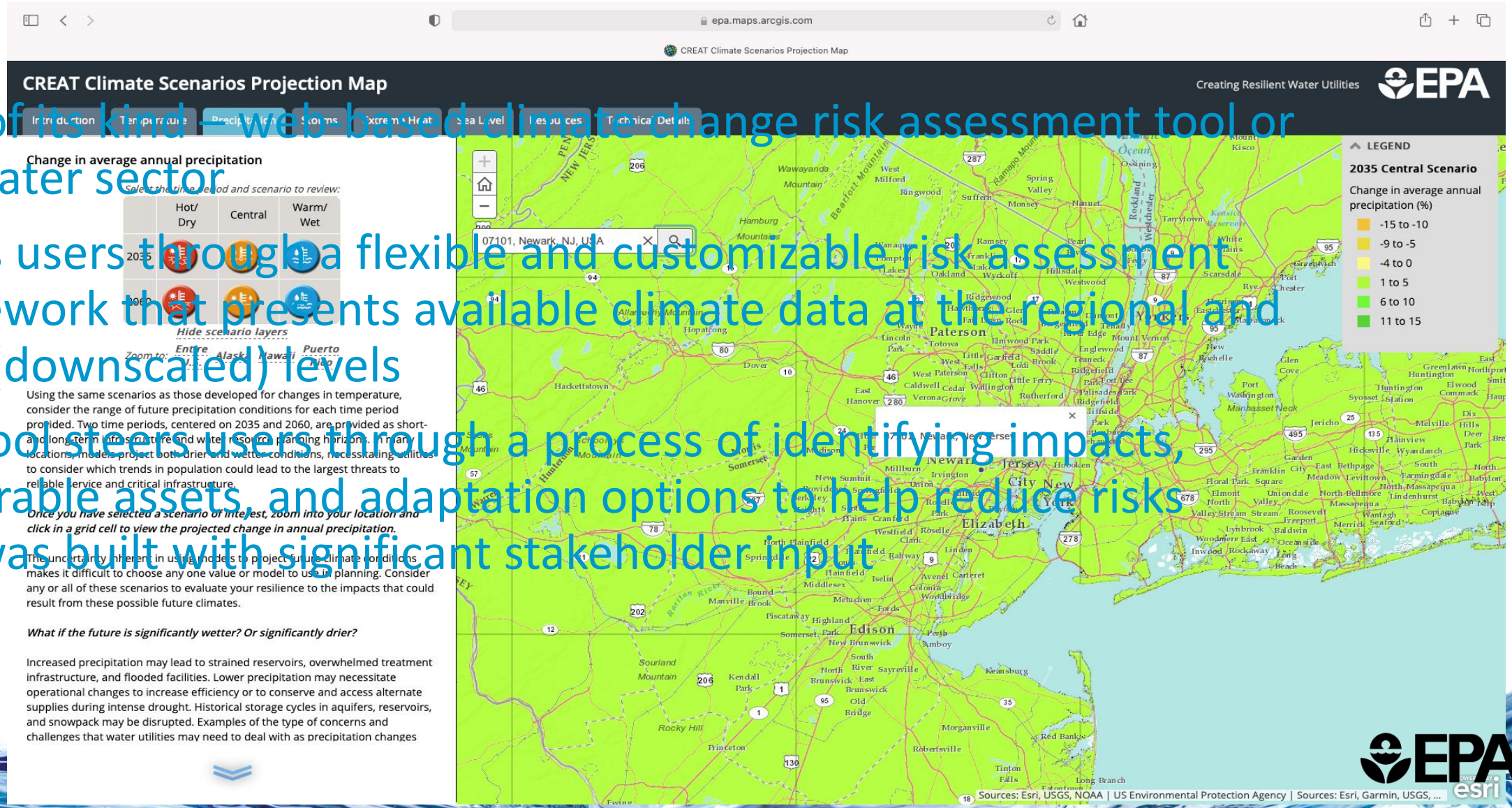

Climate Resilience Evaluation and Awareness Tool

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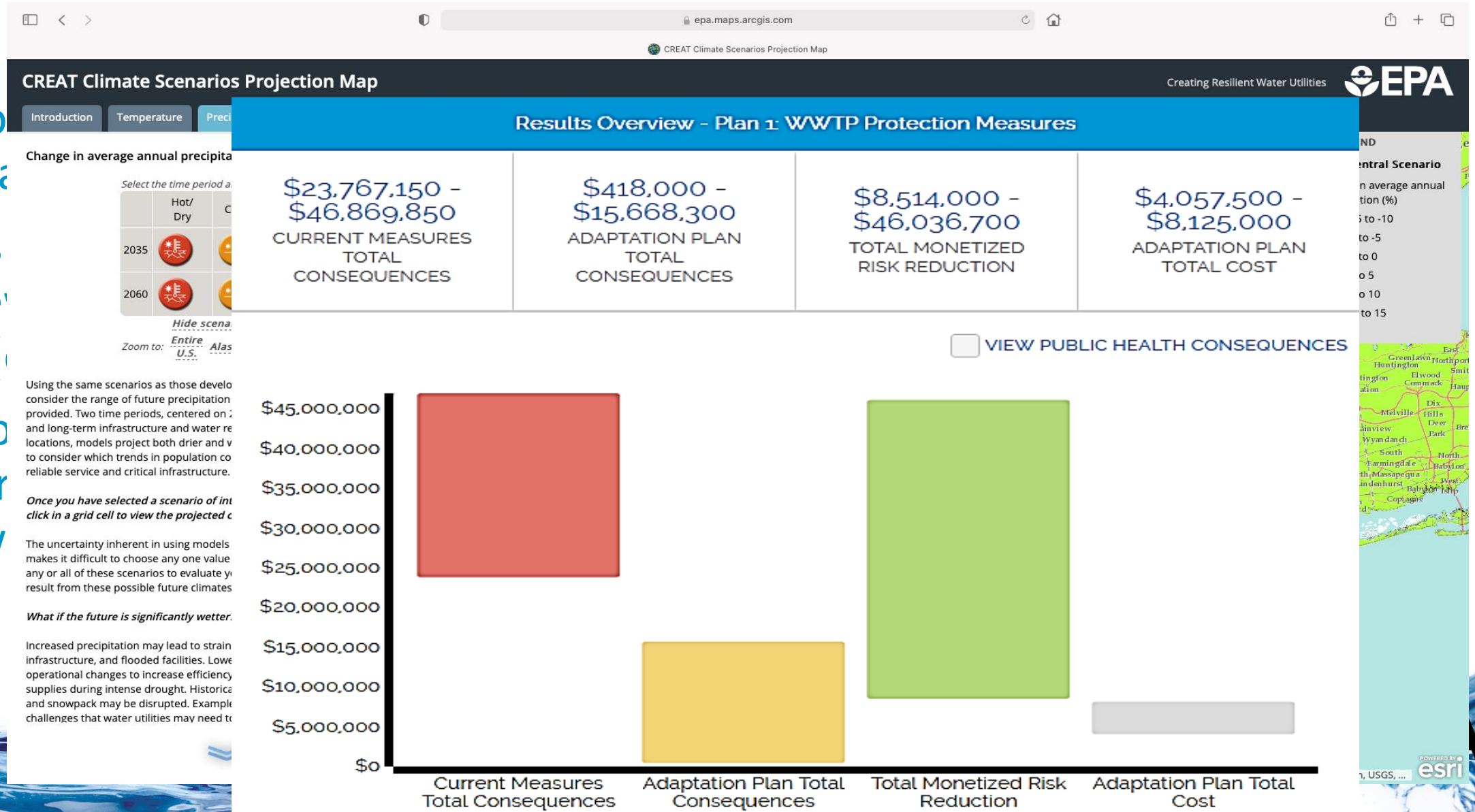
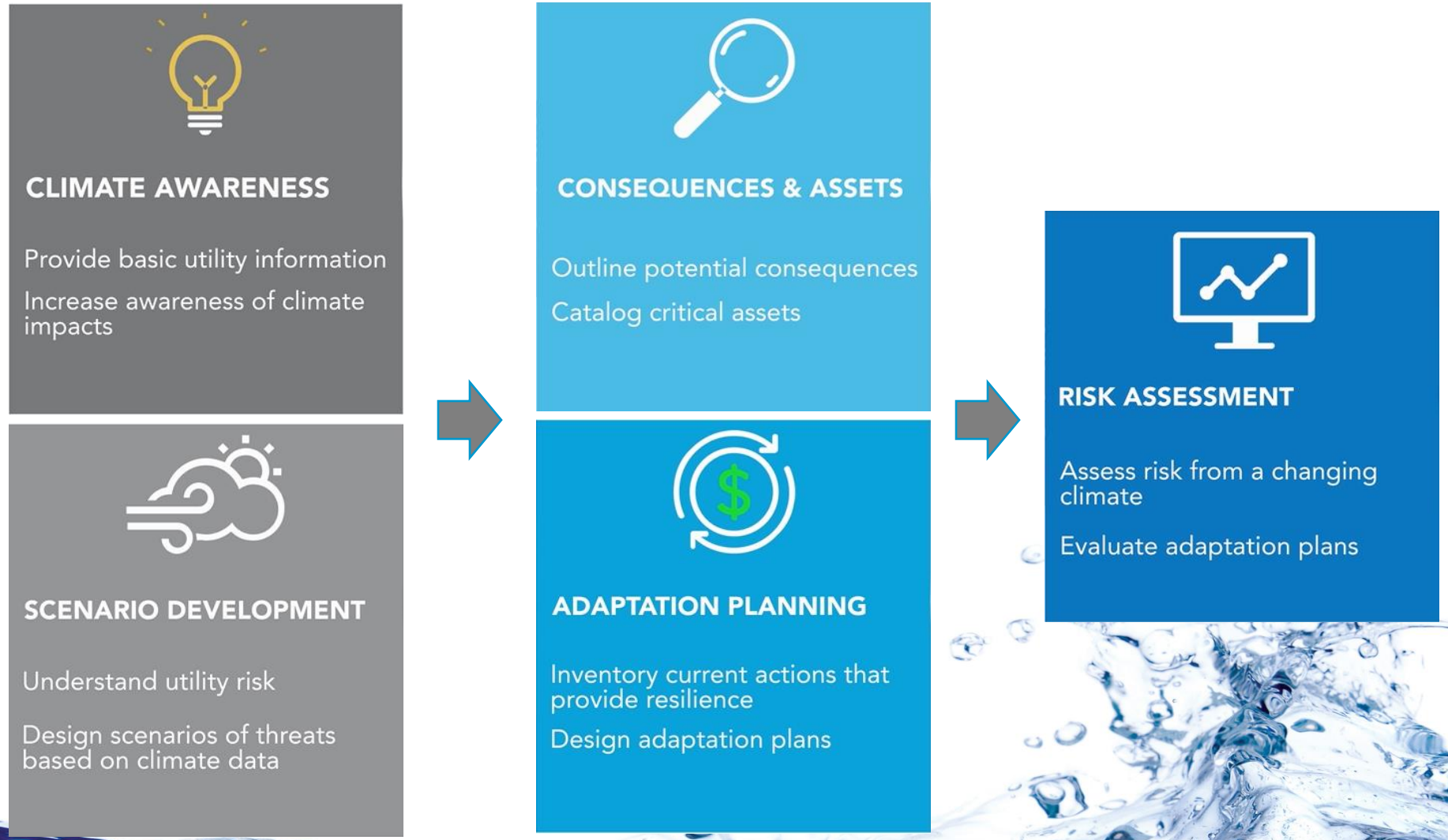
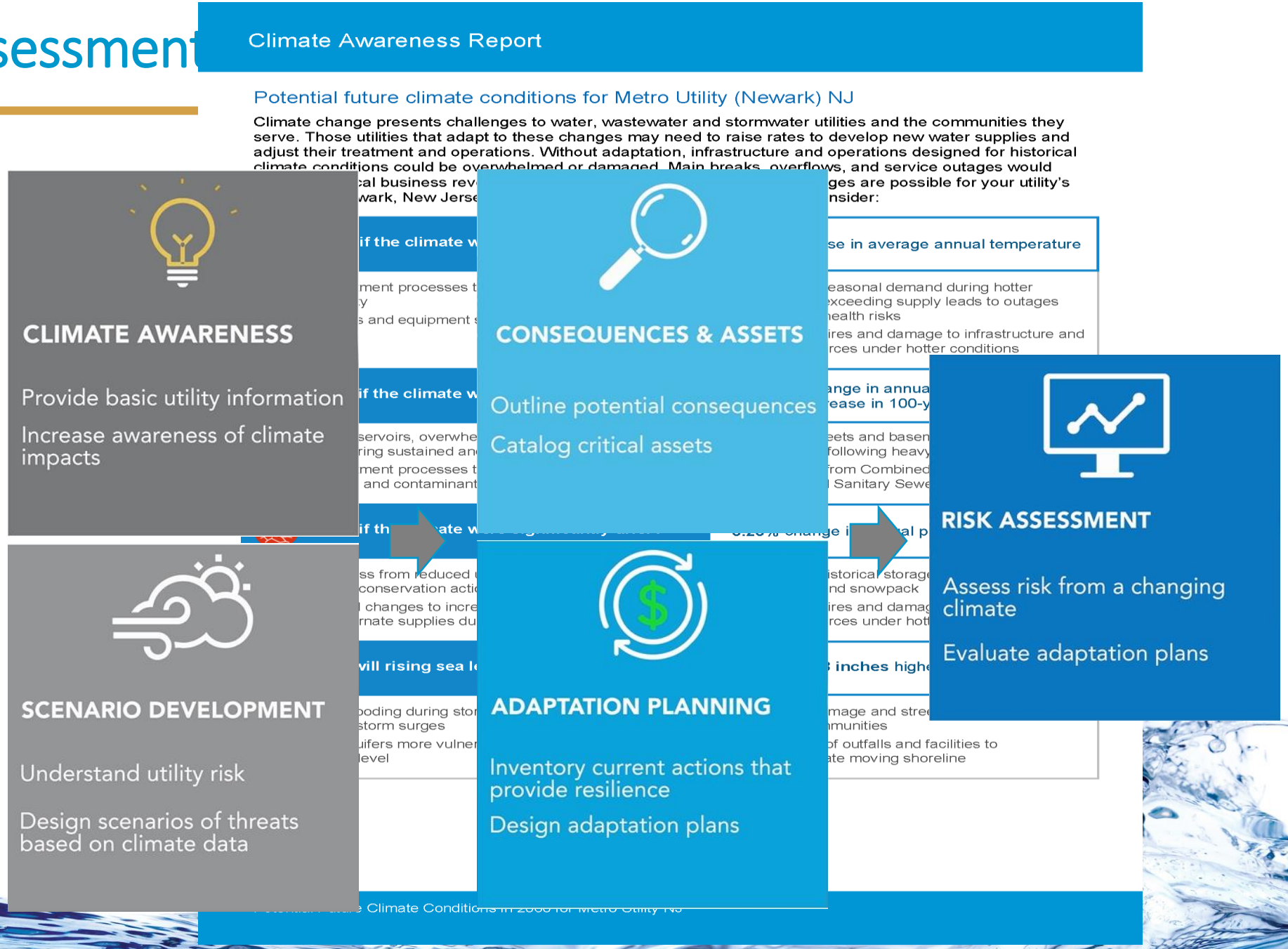


CREAT Assessment Process

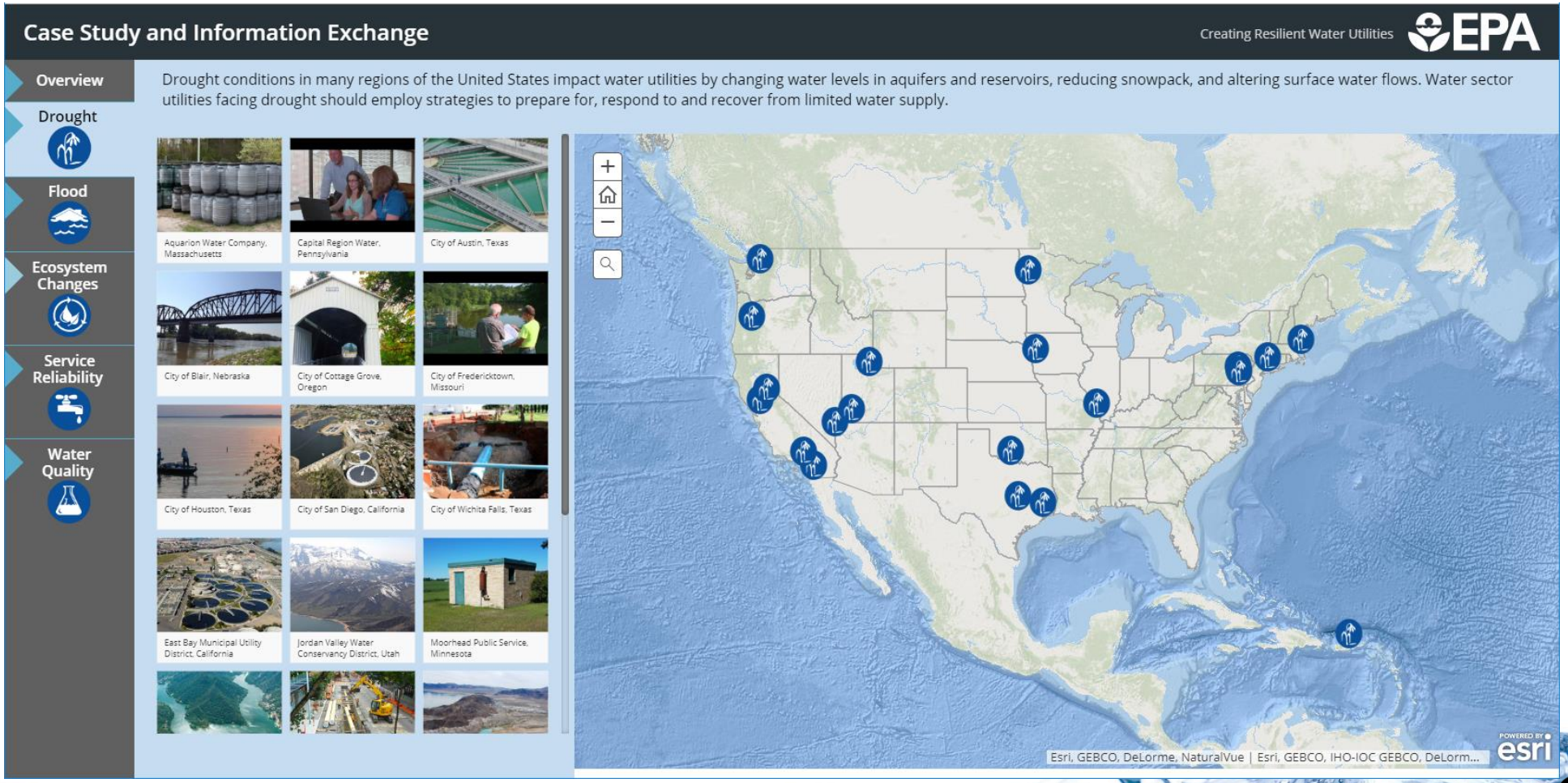


CREAT Assessment



Case Study and Information Exchange Map

More than fifty (50) utilities/communities addressing these climate-related concerns



EPA

Case Study and Information Exchange Map

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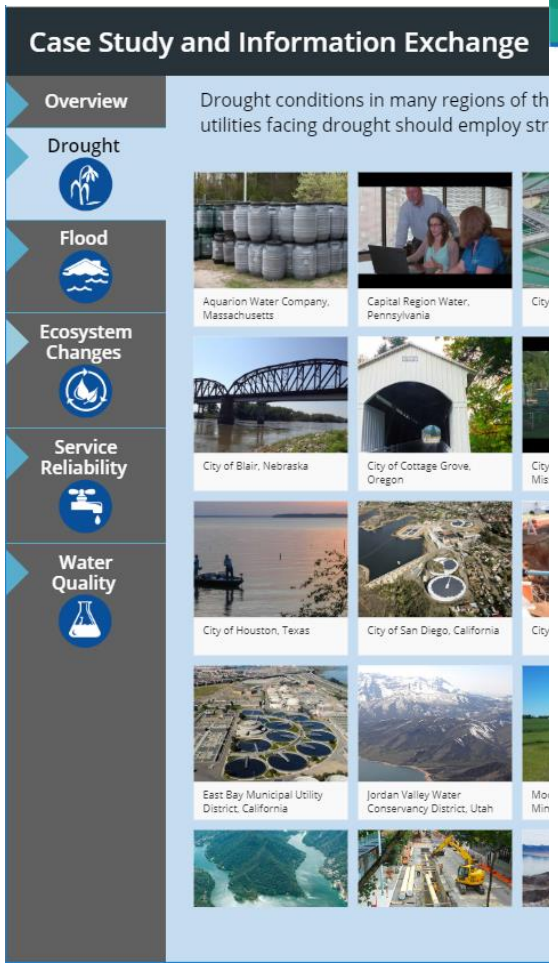


Case Study:
Water and Wastewater Utilities
Planning for Resilience

EPA

CITY OF FARIBAULT, MINNESOTA

Background

The City of Faribault provides wastewater services to residential and industrial customers in Faribault, Minnesota, which is located about one hour south of Minneapolis, Minnesota. About 50 to 60% of all wastewater flow is from industrial customers, including a laundry facility and a food packaging plant. The water reclamation facility (WRF) is designed to treat an average flow of approximately 3.5 million gallons per day (MGD) and a peak wet weather flow of 7 MGD.

Challenges

The WRF is located near the confluence of the Straight River and Cannon River and is at risk of flooding. The City previously experienced issues related to overflows and bypass as well as infiltration and inflow (I&I) from heavy precipitation events. The WRF was impacted by previous flooding events due to high river levels. During a flooding event in 2010, the WRF was inundated and taken completely offline for approximately two weeks due to a damaged siphon box through which all flows are conveyed under the Straight River to the WRF. During that time, a temporary above-ground collection system had to be constructed to convey the wastewater from the City to the WRF for treatment. Following that flooding event, WRF assets were relocated away from the river, however flooding concerns still exist if the river re-channels within the floodway. It is expected that floodwaters could still damage infrastructure assets at their new locations.

Planning Process

To better understand the resilience of their wastewater infrastructure and operations to extreme flooding, the City of Faribault assessed potential impacts of environmental change and extreme weather events using the U.S. Environmental Protection Agency's (EPA's) CREAT and enhanced resilience through long-term planning using EPA's *Planning for Sustainability Handbook*. The assessment brought together individuals from the City of Faribault, state agencies and EPA staff to think critically about potential impacts, priority assets, and possible resilience strategies.

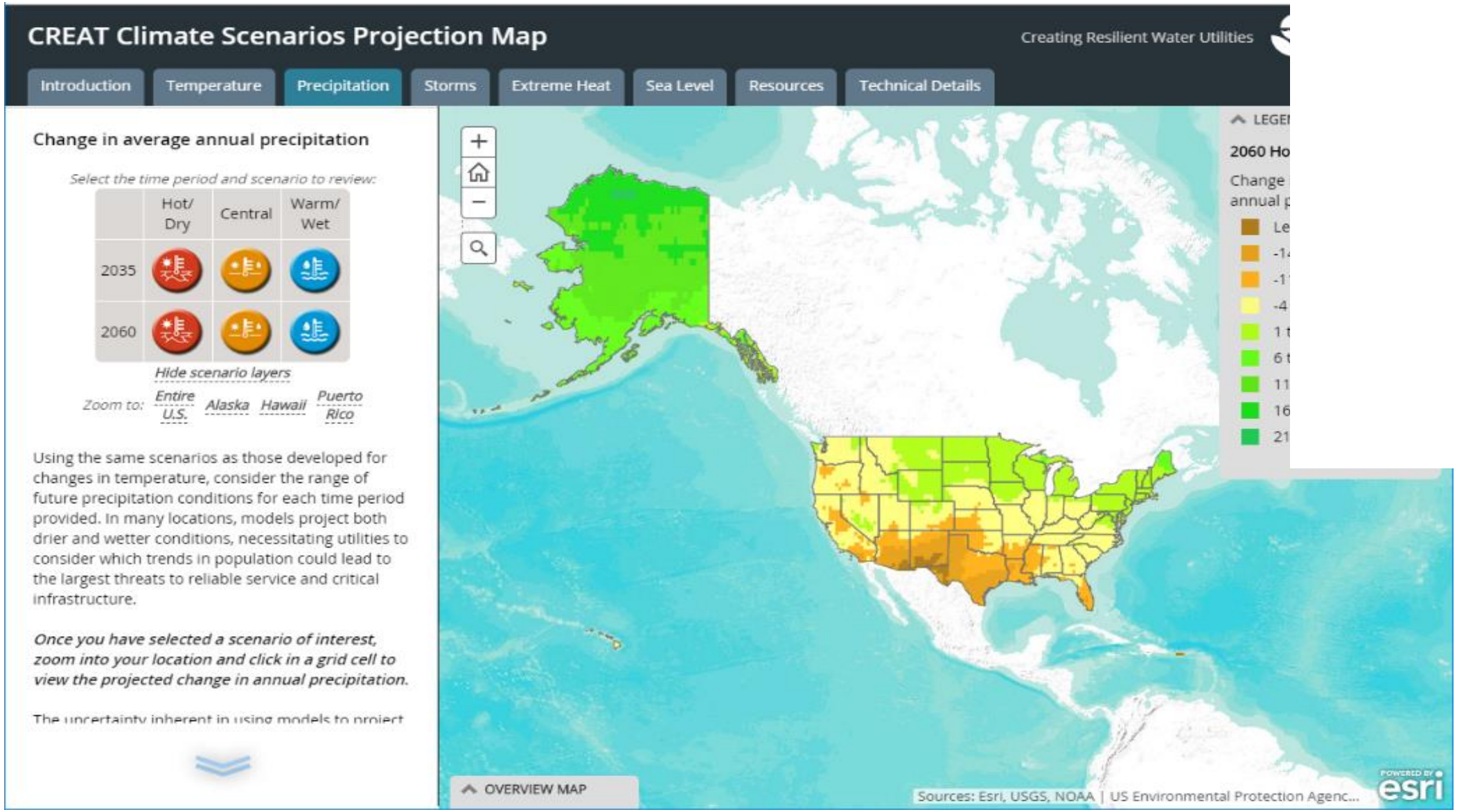
Resilience Strategies and Priorities

Based on experience with prior intense precipitation events, the City of Faribault has already taken action to protect their WRF from flooding and improve their overall resilience to extreme weather impacts. Using CREAT results, the City was able to evaluate the performance and costs of two priority actions that, if implemented, will provide additional protection to the facility: constructing a berm and building streambank stabilization. The City will continue to use the CREAT results and the information from EPA's *Planning for Sustainability Handbook* to conduct additional long-term infrastructure and financial planning. See the table below for all potential measures that were considered.

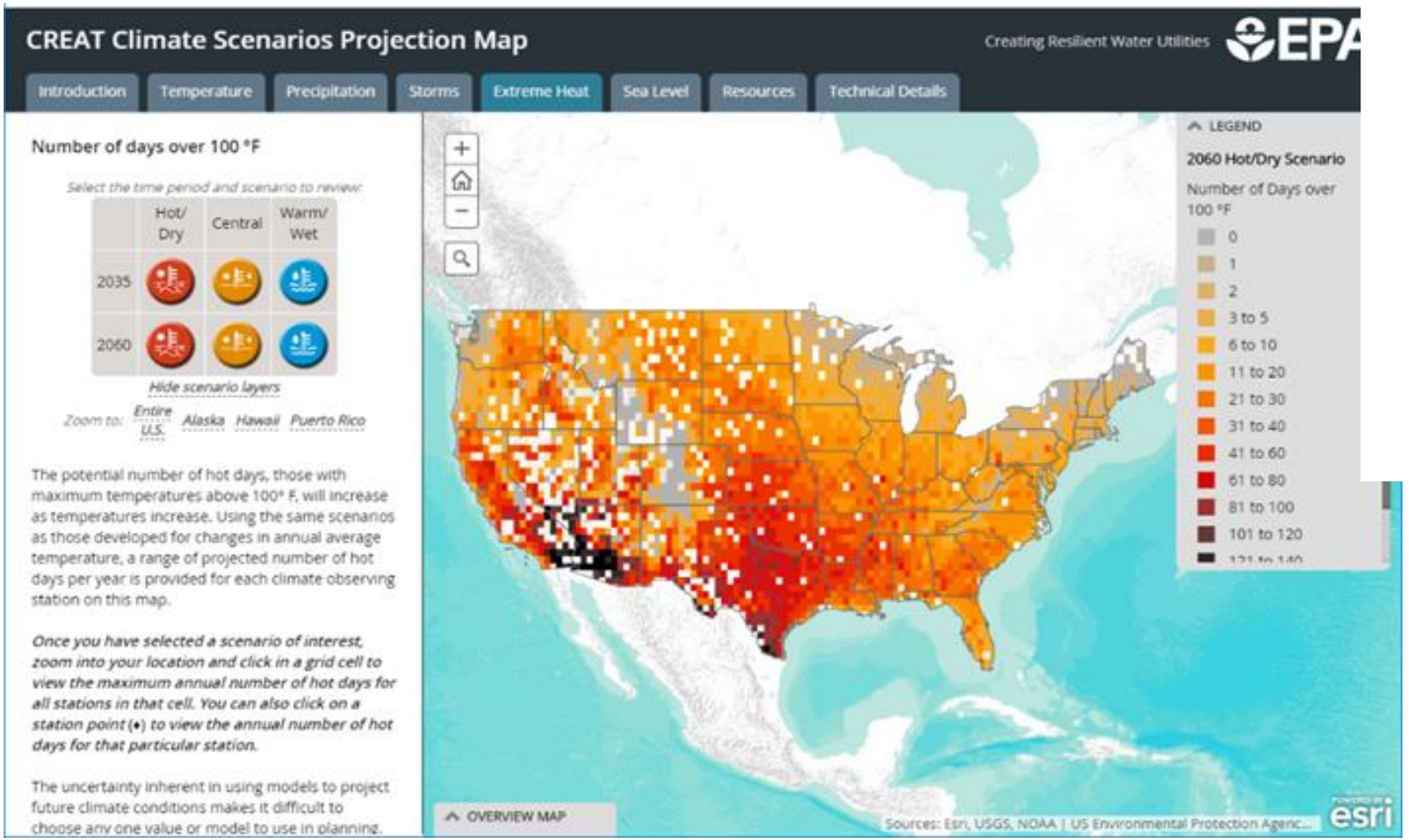
EPA

EPA

CRWU Data Services and Maps:
Climate Projections



Hot Days / Streamflow Map



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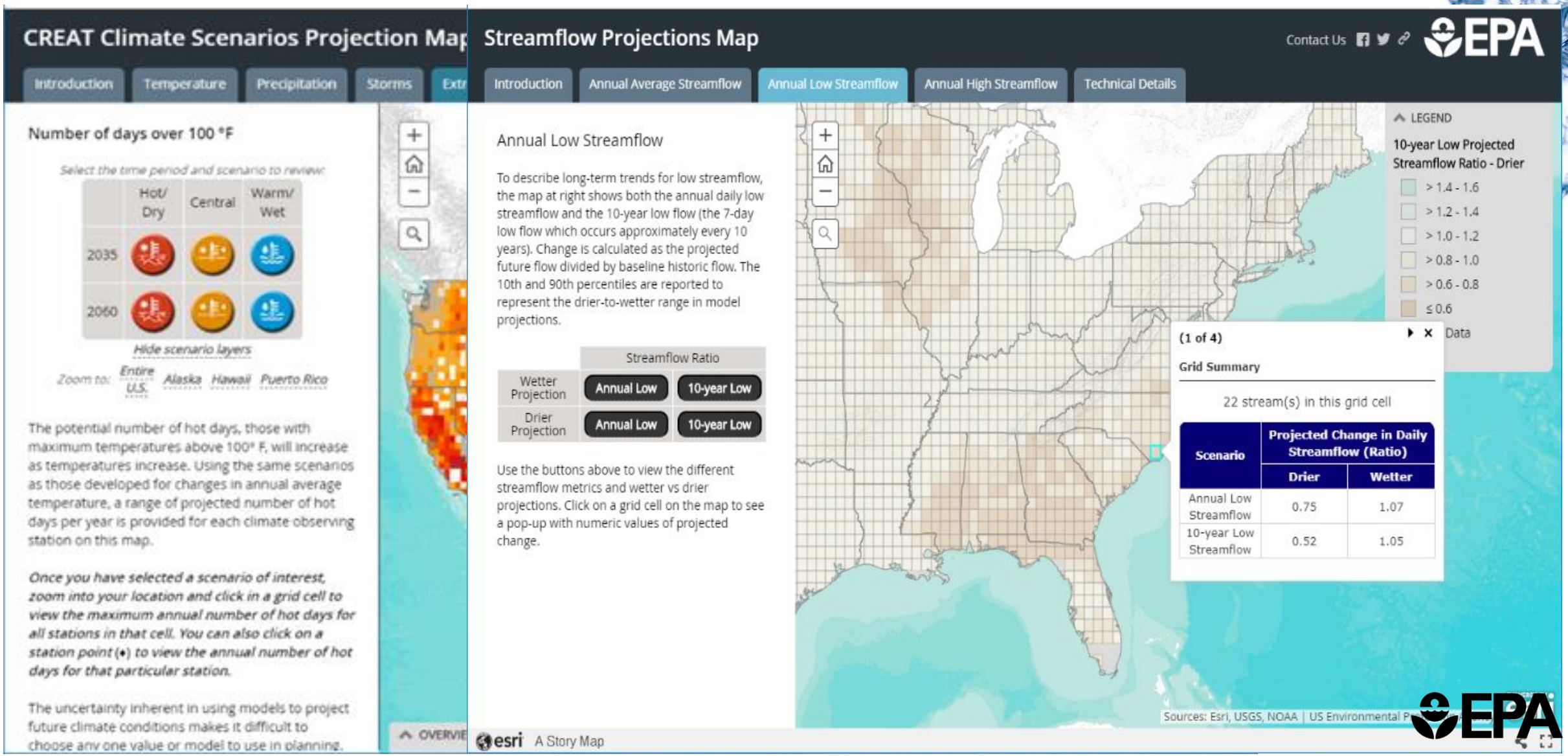
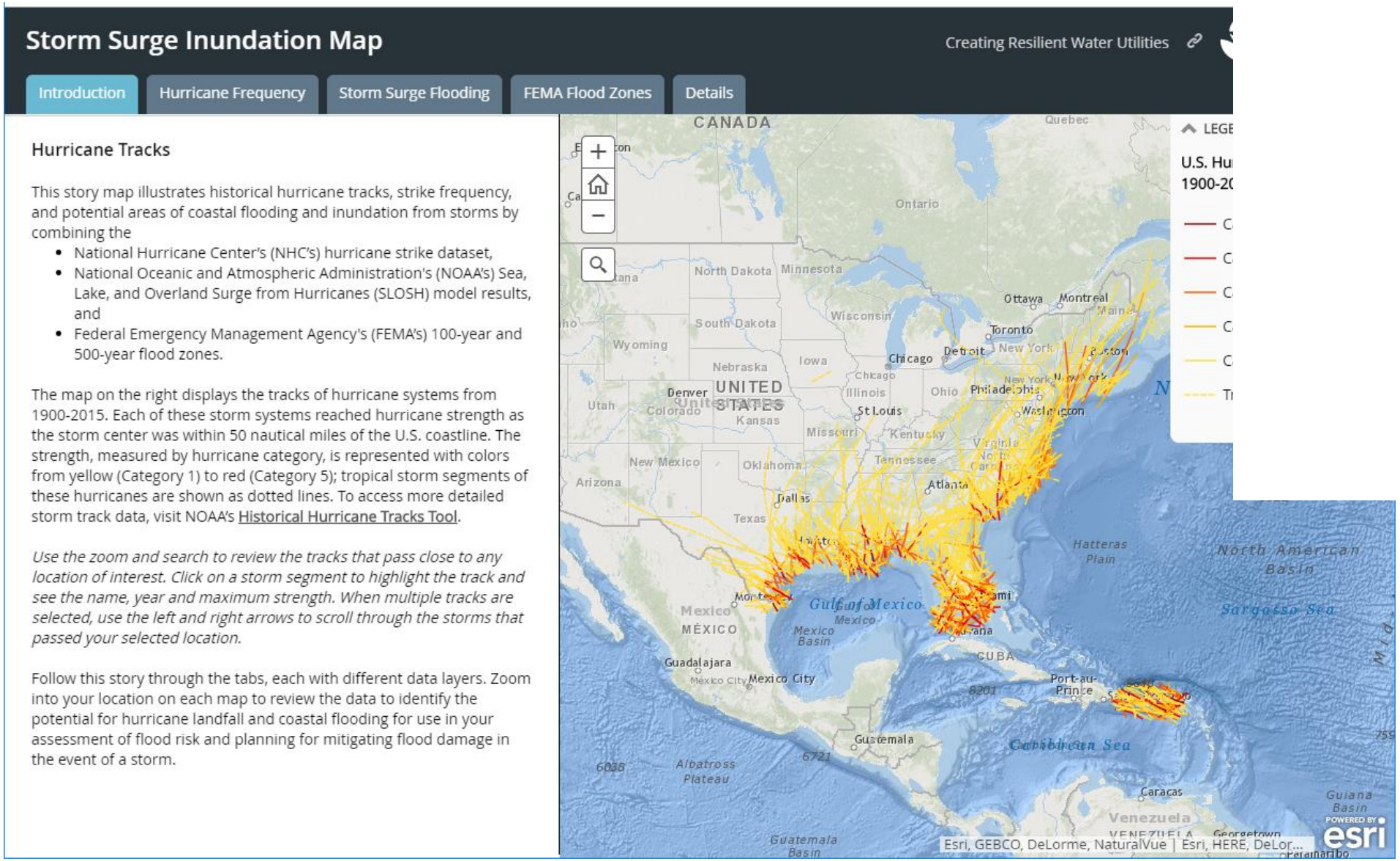
Hot Days / Streamflow Map



Storm Surge Inundation Map



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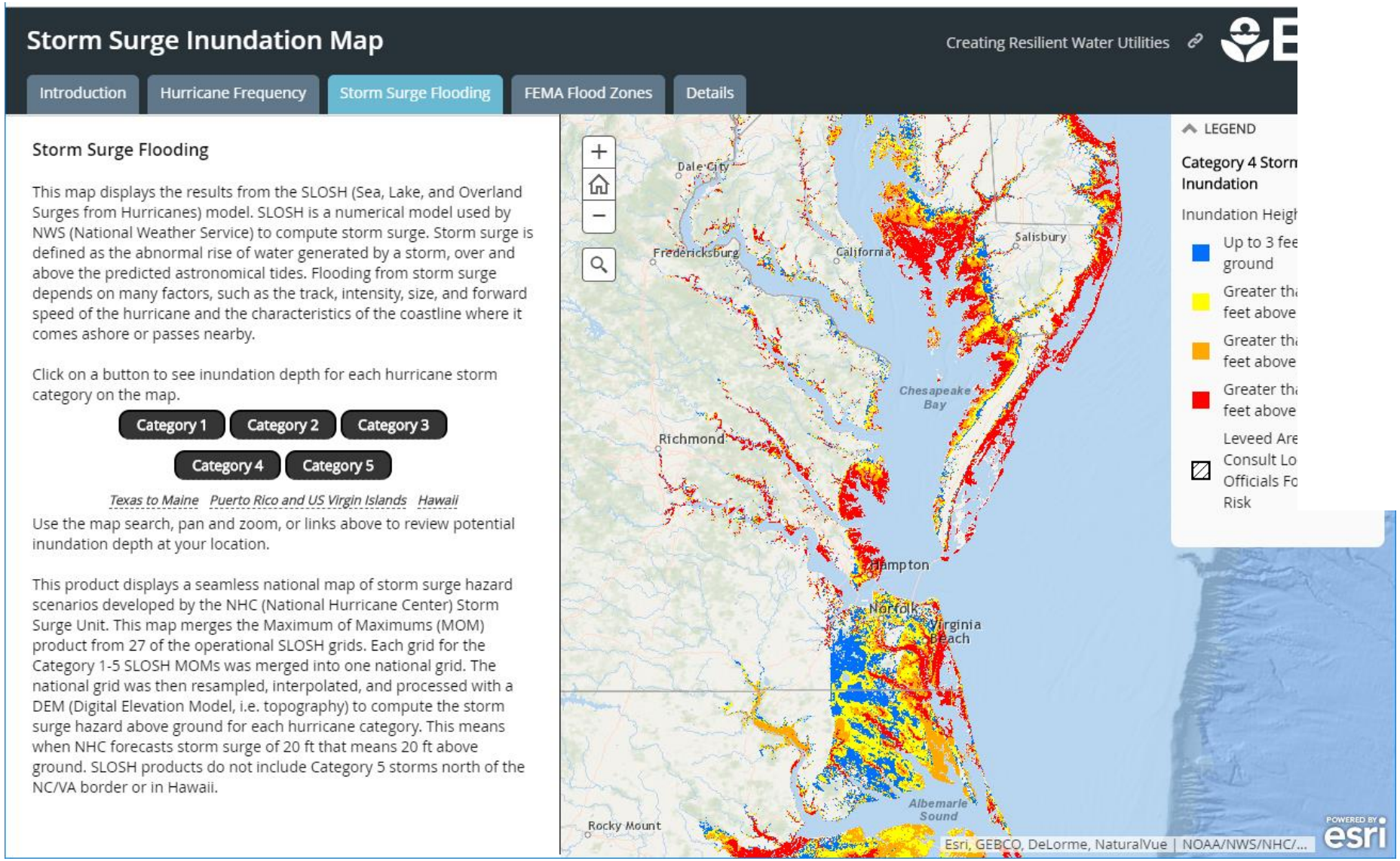
Storm Surge Inundation Map



Outreach and Training

- Training website
- Workshops
- Onsite technical assistance
- Website
- Newsletter

Contact Us

- Email: crwuhelp@epa.gov
- Curt Baranowski: Baranowski.curt@epa.gov
- Steve Fries: fries.steve@epa.gov
- Alex Horansky: Horansky.alex@epa.gov
- Wesley Wiggins: Wiggins.wesley@epa.gov
- Klara Zimmerman: zimmerman.klara@epa.gov

Poarch Band of Creek Indians Utilities Authority

Southeast Climate Region

Shaun Livermore
Utilities Operations Manager

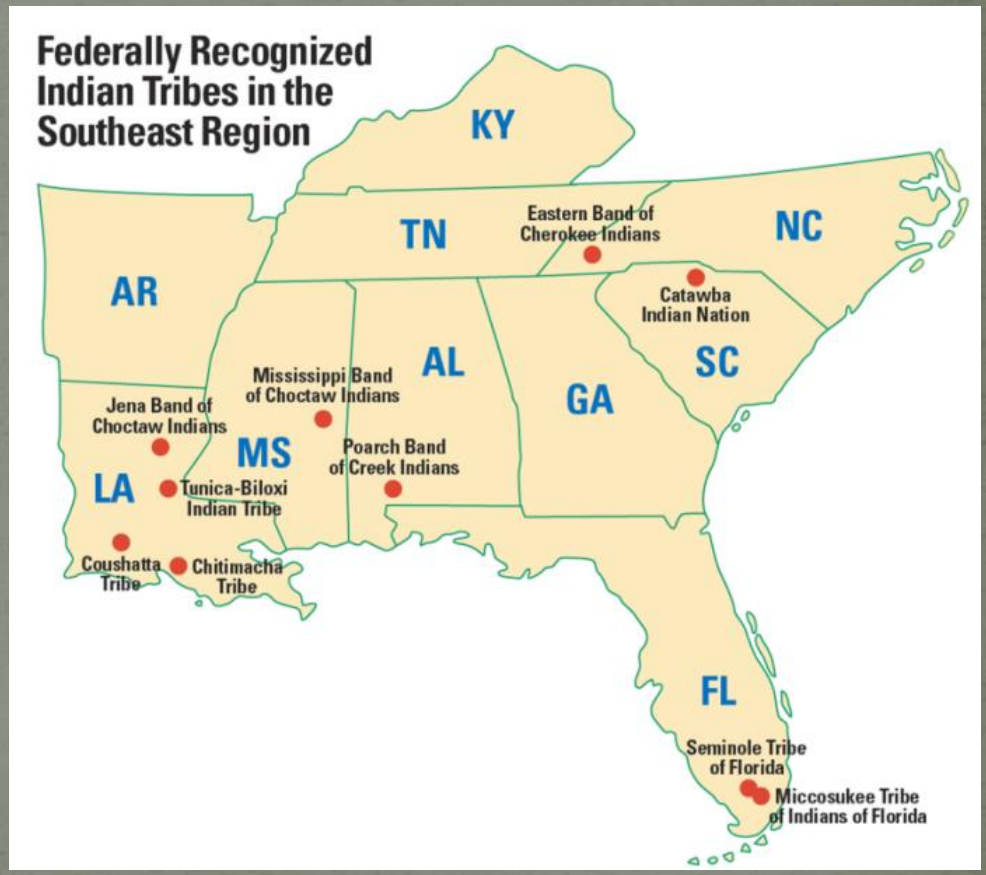
Poarch Band of Creek Indians

- The Poarch Creek Indians are descendants of a segment of the original Creek Nation that once covered almost all of Alabama and Georgia.
- Unlike many eastern Indian tribes, the Poarch Creeks were not removed from their tribal lands and have lived together for almost 200 years in and around the reservation in Poarch, Alabama.
- The reservation is located eight miles northwest of Atmore, Alabama in rural Escambia County, about 57 miles east of Mobile.

First Formal Leader

Federal Recognition

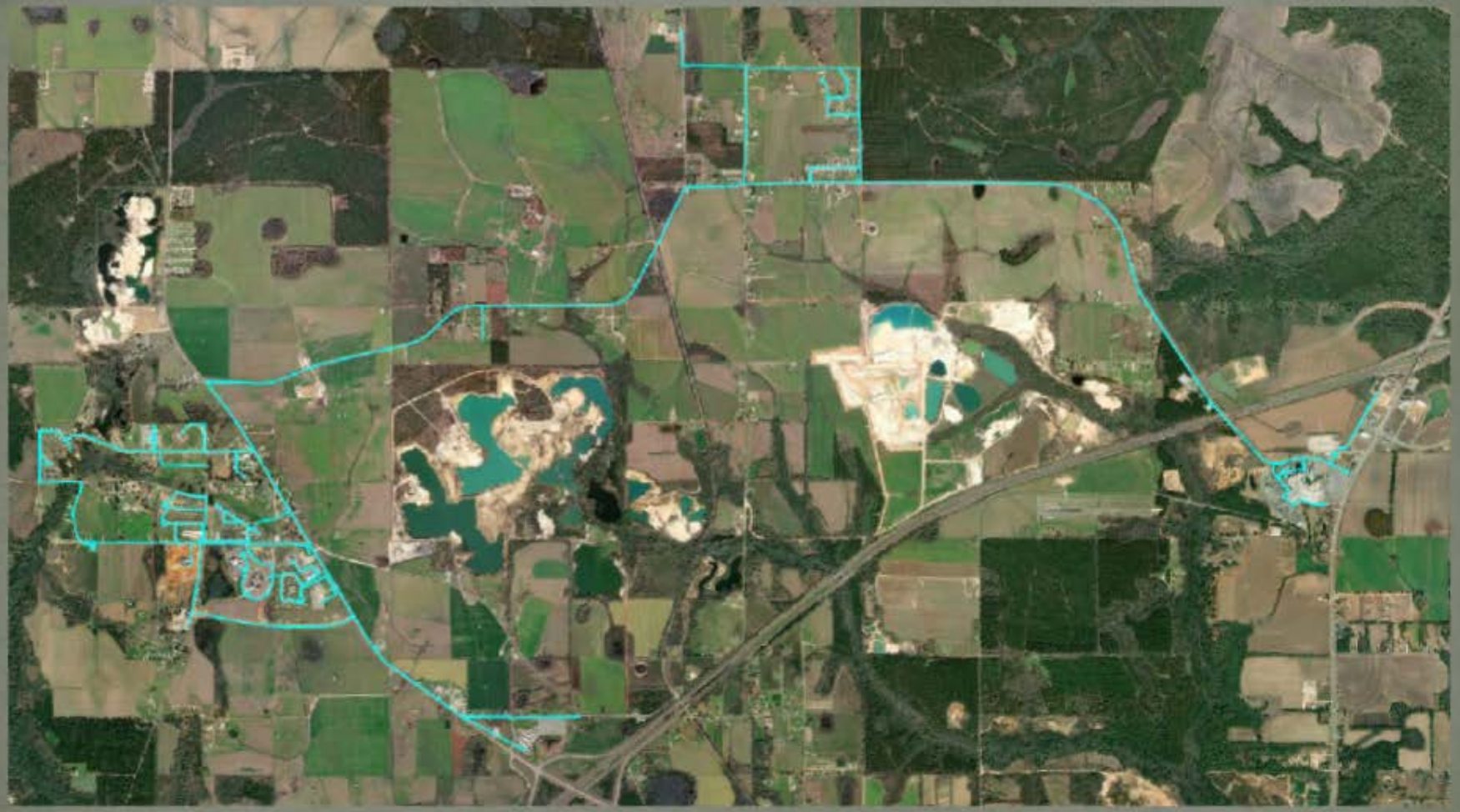
- On August 11, 1984, the U.S. formally acknowledged that the Poarch Creek Indians officially exists as an "Indian Tribe." A segment of the original reservation land of Lynn McGhee became the center of Tribal operations. It is the only land within the original domain of the Creek Confederacy to still be occupied by Creek people.



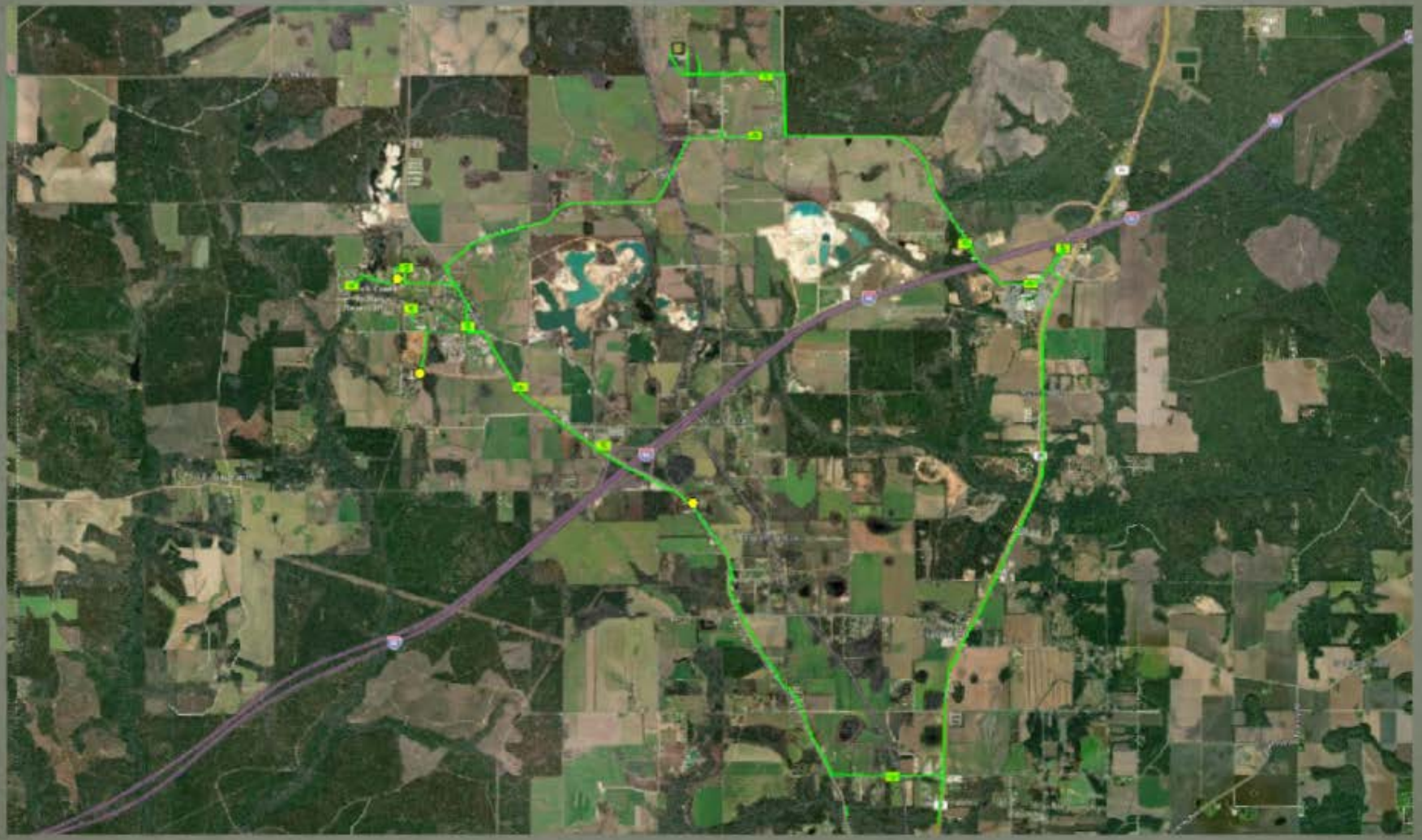
Utilities Authority

- The original Utilities Charter was signed on October 13th 1994.
- It was later revised on November 20th 2007
- Poarch Band of Creek Indians Utilities Authority (PCIUA) currently employs 14 people.
- PCIUA serves approximately 300 water/sewer connections in and around the reservation.
- PCIUA formed Escambia Community Utilities (ECU) to manage and own utility systems off reservation.
- ECU currently serves about 500 water connections.

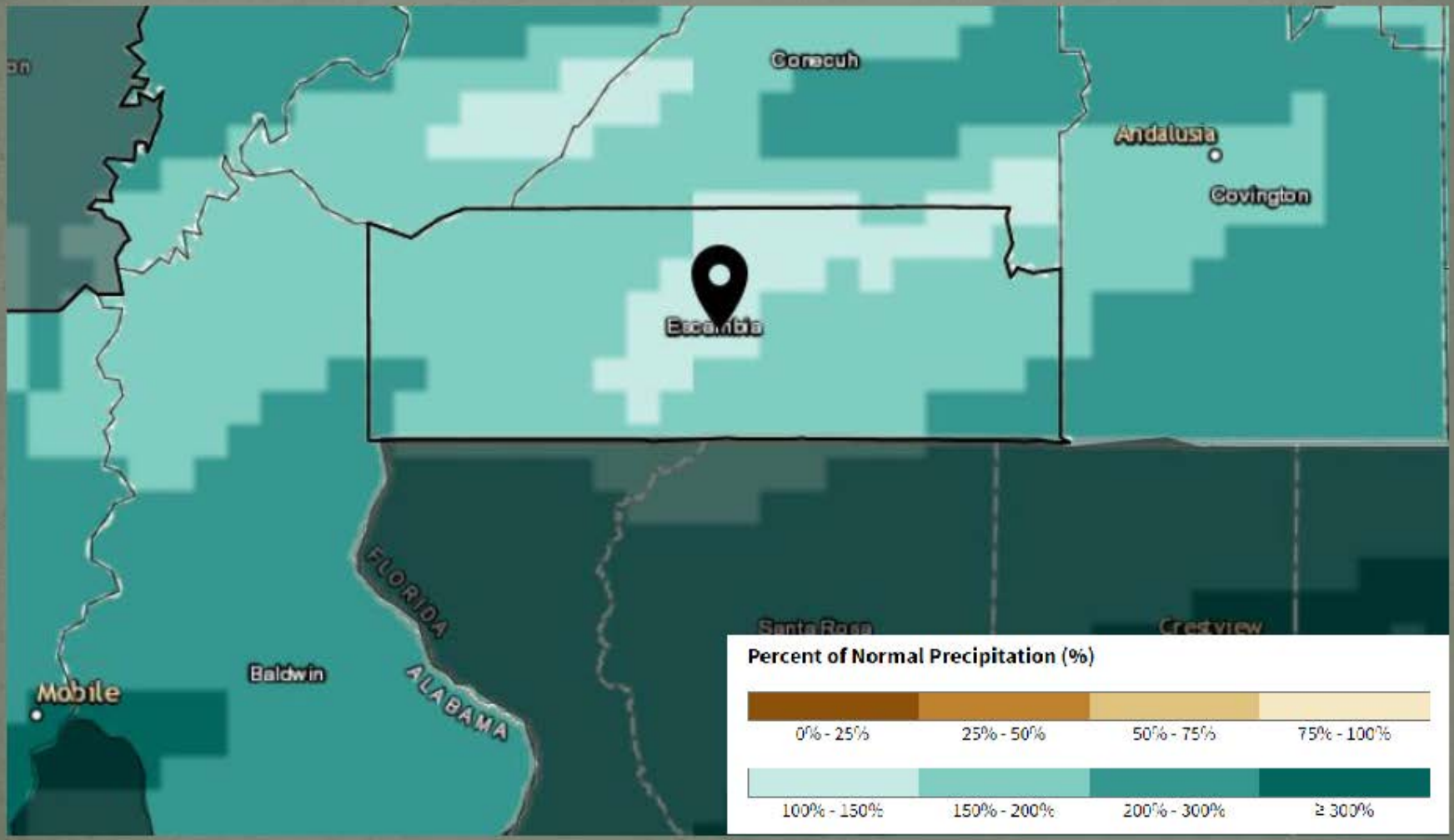
PCIUA Water System



PCIUA Sanitary Sewer System



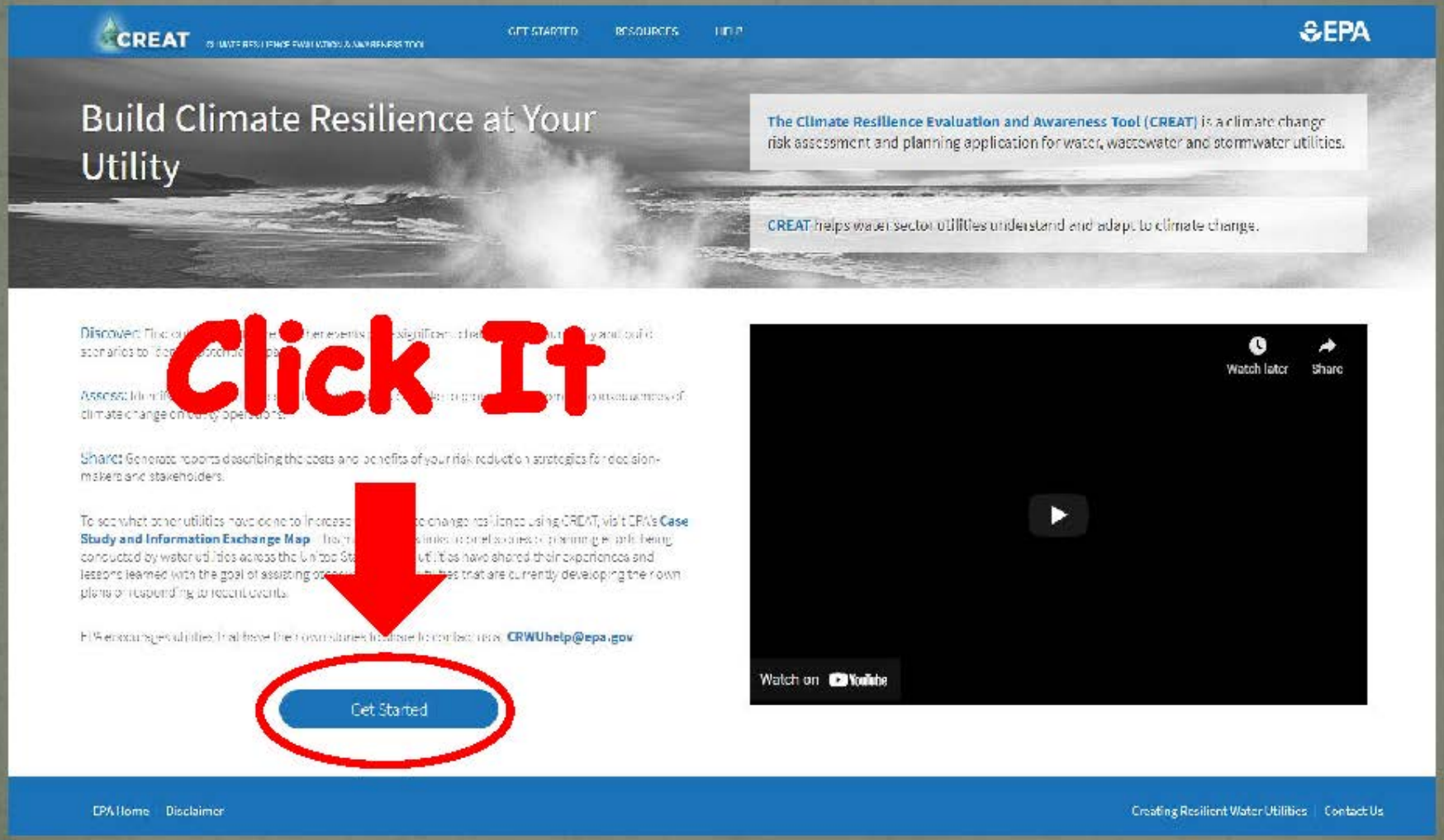
Escambia County 30 Day Rainfall



Drought versus Flood Risk

- Drought has been an issue in the region recently
- Rainfall patterns have changed
- Totals do not reflect the intensity of the rain events
- Floods are a higher risk to operations

DON'T BE A FAILURE



Climate Resiliency at MWRA

David W. Coppes, P.E.
Chief Operating Officer

July 29, 2021

Changing Precipitation Quantity and Patterns

- Currently, we average 104 rain events per year with an average of 44 inches of rainfall
- Models suggest we'll see longer dry spells with shorter, heavier rain
- An overall modest increase in total rainfall
- Examples:
  - 2016/2017 drought affects water supply of many in Massachusetts
  - Flooding during the January and March Nor'easters in 2018 impeded access to several MWRA facilities

No Longer A Theory: State Street, Boston – March 2018

AP/CityLab

Charlestown Navy Yard – March 2018

Eastern Avenue, Chelsea – March 2018

Shirley Street, Winthrop – March 2018

Nut Island, Quincy – March 2018

Preparing for Climate Change: Drinking Water System Is In Good Shape

- Quabbin Reservoir, Belchertown
  - 65 miles west of Boston
  - Elevation 528 feet
- Wachusett Reservoir, Clinton
  - 35 miles west of Boston
  - Elevation 395 feet
- Water treatment plant is in Marlborough
- 85% of water delivered by gravity
- Lowest elevation of a water tank is 192 feet above sea level

Significant Investment in Dams

- All MWRA dams, dikes, spillways and appurtenances are inspected routinely by licensed dam safety engineers and are in good condition
- MWRA has spent over $22 million on dam safety projects
- Quabbin and Wachusett spillways have been improved to be able to discharge the probable maximum flood

Quabbin Spillway Rehab

Wachusett Crest Gate

Adaptation for Sea Level Rise In The Design of Deer Island Treatment Plant

- Deer Island plant fully protected
  - 100-year flood
  - 1.9-foot (0.6 meter) sea level rise
  - Wave run-up of 14 feet (4.3 meters) on east side and 2 feet (0.6 meter) on west side
  - Nut Island headworks in Quincy similarly designed for sea level rise

Deer Island On-Site Power Plant

- On-site power plant ensures uninterrupted power supply to keep the plant operating for up to 90 days

MWRA Coastal Facilities

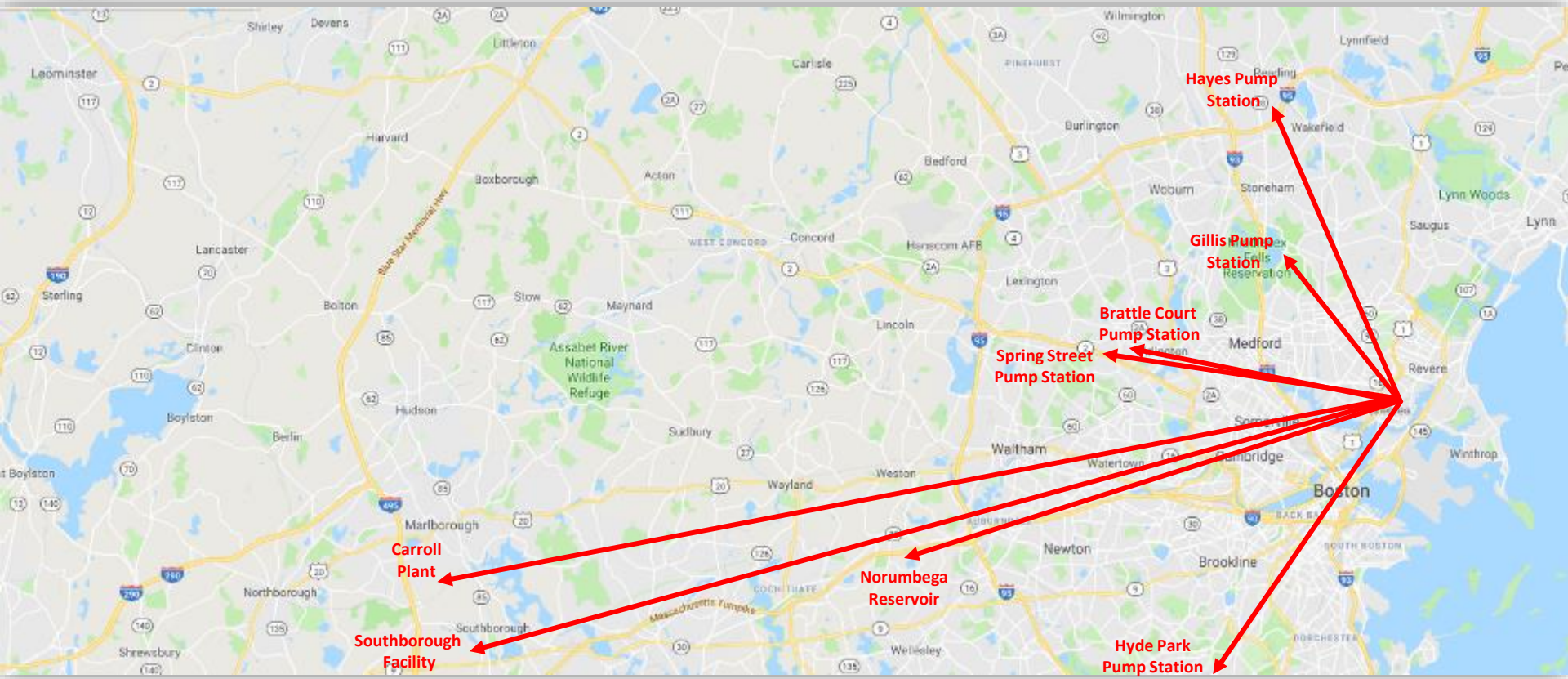
MWRA's Chelsea Facility

- Most of our staff and equipment is at our Chelsea Facility off of Eastern Avenue, across from the Chelsea Creek

Plans in Place to Pre-deploy Staff to Higher Ground

- Back-up water and wastewater operations control center created at Carroll Treatment Plant in Marlborough

Plans to Pre-deploy Staff and Equipment to Higher Ground



Benchmarks For Evaluating Facilities

- 100 year flood as determined by FEMA
- 100 year flood + 2.5 feet (NYC DEP, BHA)
- Hurricane flooding levels as determined by FEMA's SLOSH model (current evacuation planning recommendation) were reviewed
- Wave action (for facilities adjacent to FEMA Hazard Zone VE) was reviewed

MWRA's Approach

- Short-term
  - At-risk buildings are being fitted with temporary flood barriers
  - Expanding fuel storage at wastewater stations

- Long-term
  - Facility rehabilitation on a 20-year cycle
  - Future rehabilitation contracts will include protection measures

- May have to speed things up

Flood Elevations At Chelsea Creek Headworks

Flood Elevations At Chelsea Creek

Southwest Facility View

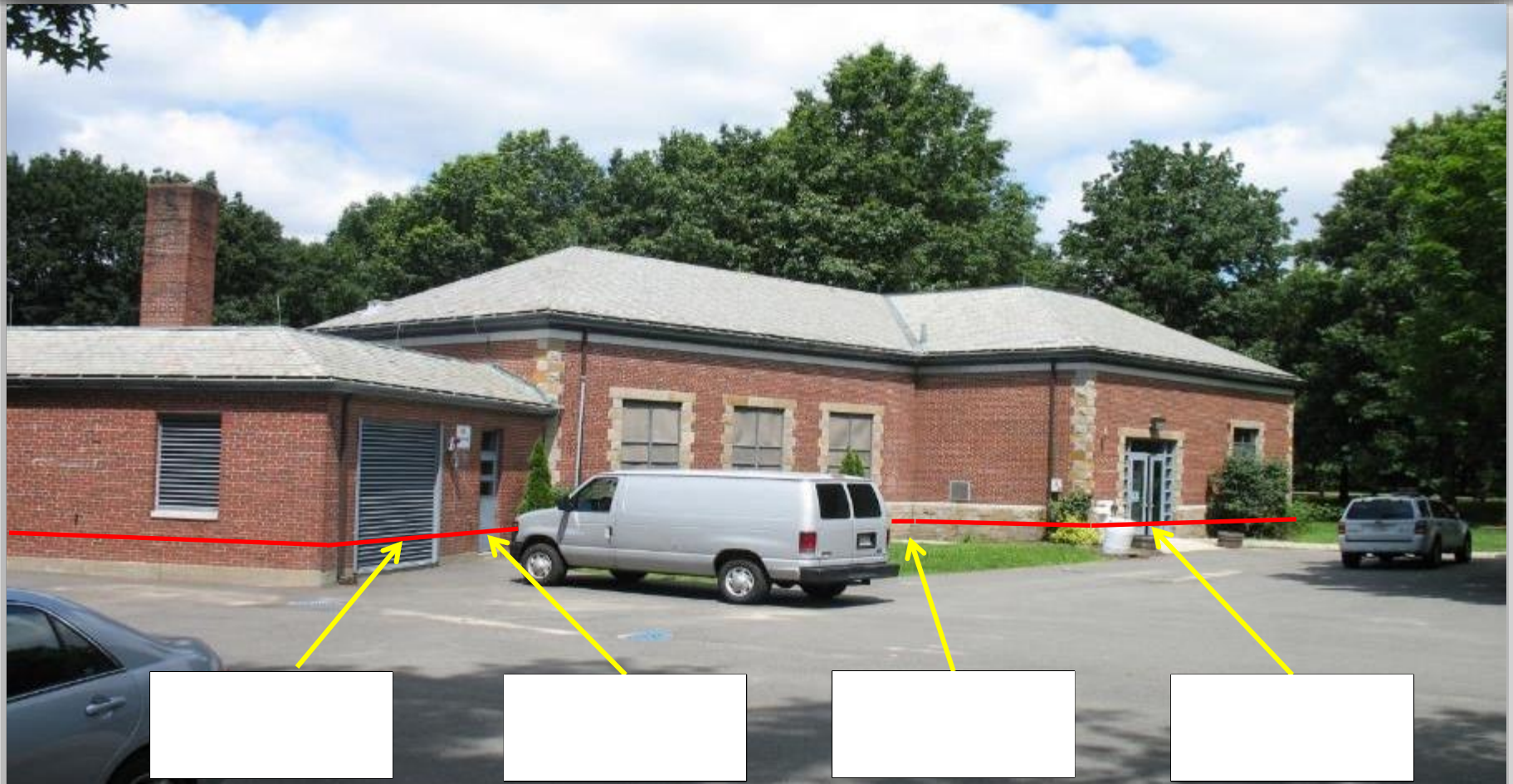
Backup Generator

New Flood Control Measures Are Being Added

Chelsea Headworks

Chelsea Headworks

Alewife Brook Pump Station

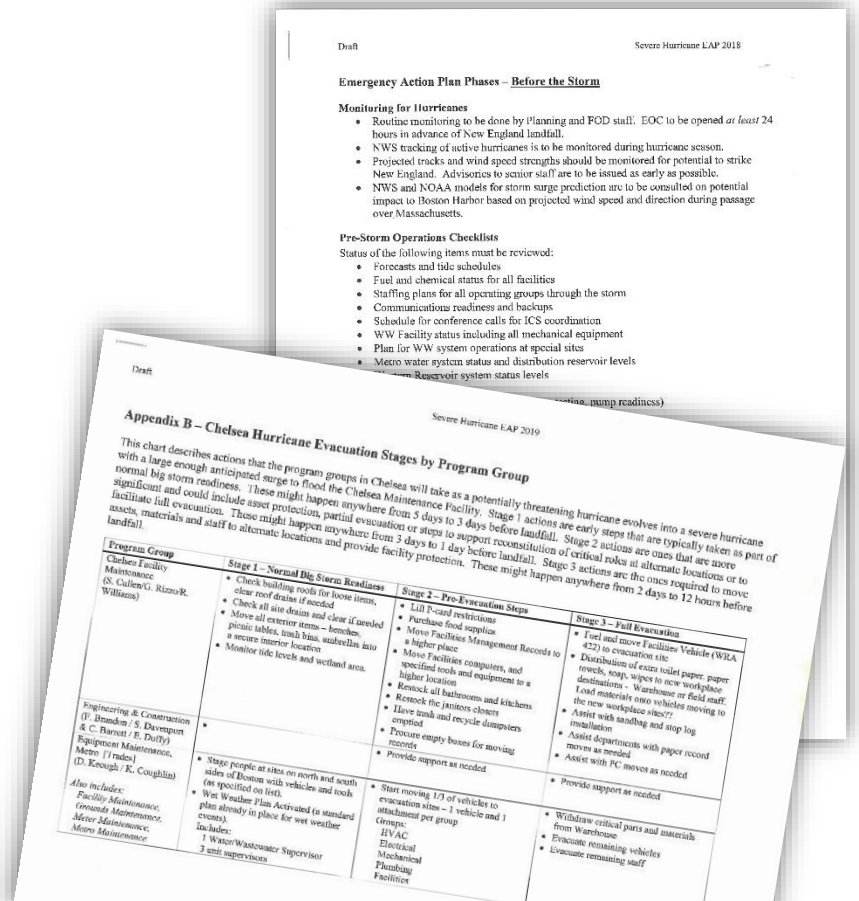


Alewife Brook Pump Station

Alewife Brook Pump Station

Working With Our Customer Communities

- MWRA works closely with its customer communities, providing training on Emergency Action Plans and guidance assistance with vulnerability assessments



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Severe Hurricane EAP 2018

Emergency Action Plan Phases – Before the Storm

Monitoring for Hurricanes

- Routine monitoring to be done by Planning and FOD staff. EOC to be opened *at least* 24 hours in advance of New England landfall.
- NWS tracking of active hurricanes is to be monitored during hurricane season.
- Projected tracks and wind speed strengths should be monitored for potential to strike New England. Advisories to senior staff are to be issued as early as possible.
- NWS and NOAA models for storm surge prediction are to be consulted on potential impact to Boston Harbor based on projected wind speed and direction during passage over Massachusetts.

Pre-Storm Operations Checklists

Status of the following items must be reviewed:

- Forecasts and tide schedules
- Fuel and chemical status for all facilities
- Staffing plans for all operating groups through the storm
- Communications readiness and backups
- Schedule for conference calls for ICS coordination
- WW Facility status including all mechanical equipment
- Plan for WW system operations at special sites
- Metro water system status and distribution reservoir levels
- [illegible] Reservoir system status levels

[illegible] pump readiness)

Draft

Severe Hurricane EAP 2019

Appendix B – Chelsea Hurricane Evacuation Stages by Program Group

This chart describes actions that the program groups in Chelsea will take as a potentially threatening hurricane evolves into a severe hurricane with a large enough anticipated surge to flood the Chelsea Maintenance Facility. Stage 1 actions are early steps that are typically taken as part of normal big storm readiness. These might happen anywhere from 5 days to 3 days before landfall. Stage 2 actions are ones that are more significant and could include asset protection, partial evacuation or steps to support reconsistution of critical roles at alternate locations or to facilitate full evacuation. These might happen anywhere from 3 days to 1 day before landfall. Stage 3 actions are the ones required to move assets, materials and staff to alternate locations and provide facility protection. These might happen anywhere from 2 days to 12 hours before landfall).

Program Group	Stage 1 – Normal Big Storm Readiness	Stage 2 – Pre-Evacuation Steps	Stage 3 – Full Evacuation
Chelsea Facility Maintenance (S. Cullen/G. Rizzo/R. Williams)	• Check building roofs for loose items, clear roof drains if needed • Check all site drains and clear if needed • Move all exterior items – benches, picnic tables, trash bins, umbrellas into a secure interior location • Monitor tide levels and wetland area.	• Lift P-card restrictions • Purchase food supplies • Move Facilities Management Records to a higher place • Move Facilities computers, and specified tools and equipment to a higher location • Restock all bathrooms and kitchens • Restock the janitors closets • Have trash and recycle dumpsters emptied • Procure empty boxes for moving records • Provide support as needed	• Fuel and move Facilities Vehicle (WRA 422) to evacuation site • Distribution of extra toilet paper, paper towels, soap, wipes to new workplace destinations – Warehouse or field staff. Load materials onto vehicles moving to the new workplace site(s) • Assist with sandbag and stop log installation • Assist departments with paper record moves as needed • Assist with PC moves as needed • Provide support as needed
Engineering & Construction (F. Brandon / S. Davenport & C. Barrett / E. Duffy) Equipment Maintenance, Metro Trades) (D. Keough / K. Coughlin) Also includes: Facility Maintenance, Grounds Maintenance, Meter Maintenance, Metro Maintenance	• Stage people at sites on north and south sides of Boston with vehicles and tools (as specified on list). • Wet Weather Plan Activated (a standard plan already in place for wet weather events). Includes: 1 Water/Wastewater Supervisor 3 unit supervisors	• Start moving 1/3 of vehicles to evacuation sites – 1 vehicle and 1 attachment per group Groups: HVAC Electrical Mechanical Plumbing Facilities	• Withdraw critical parts and materials from Warehouse • Evacuate remaining vehicles • Evacuate remaining staff


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