



Assessment and Planning with the Climate Resilience Evaluation & Awareness Tool

CRWU Webinar Series

US EPA

SPEAKERS

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April 24, 2013



CRWU Webinar Series

Topic	Next Event
Introduction to CREAT	May 8, 2013
Assessment and Planning with CREAT	June 5, 2013
Sustainability and Adaptation	June 19, 2013
Climate Change and Decision-Support	July 24, 2013
CRWU Tools Overview	TBD

- Additional topics and dates under consideration
- Visit <http://www.epa.gov/climateredyutilities> for updates



Housekeeping

- Polling questions
- Mute/un-mute
- Questions
- Technical difficulties



Climate Ready Water Utilities (CRWU)

CRWU Mission Statement

To provide the water sector (drinking water, wastewater, and stormwater utilities) with the practical tools, training, and technical assistance needed to adapt to climate change by promoting a clear understanding of climate science and adaptation options.



Climate Ready Tools & Resources

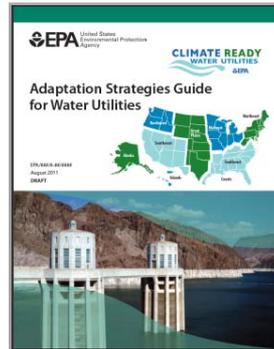
Climate Ready Process

Adaptive Response Framework



Explore Elements of Climate Readiness

Adaptation Strategies Guide



Learn Climate and Adaptation Basics

Toolbox

-  **Featured Resource**
-  **Region Map**
-  **Activities**
-  **Funding**
-  **Publications and Reports**
-  **Tools and Models**
-  **Training, Workshops and Seminars**

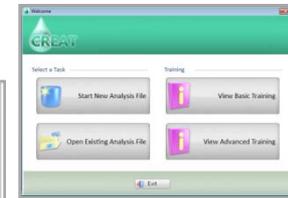
Research and Gather Information

Extreme Events Workshop Planner



Collaborate with Partners

Climate Resilience Evaluation and Awareness Tool



Assess Risks and Evaluate Opportunities



- About CREAT
- Evaluating resilience
 - Assessing risk
 - Mitigating consequences
 - Planning adaptation
- CREAT Training





Climate Resilience Evaluation & Awareness Tool (CREAT)

Assess risks and evaluate opportunities



About CREAT

- Software tool for conducting a **risk assessment** of potential climate change impacts at your utility
- Multiple climate scenarios provided to help **capture uncertainty**
- Assessments will help inform **adaptation planning**
- Results from CREAT help utilities compare potential **costs, risk reduction and energy implications** of different options



What Can You Do in CREAT?



Build Awareness

- Explore local climate data
- View links to publications, models and other tools



Assess Risk

- Catalog data and assumptions
- Understand and assess climate impacts



Plan Adaptation

- Compare adaptation options
- Generate reports to support decisions



CLIMATE READY WATER UTILITIES



CREAT Process

Setup



CREAT captures a variety of information about your utility, including size and ownership structure. You also specify other options used during analysis.

Threats



CREAT provides a set of descriptive narratives regarding climate change impact and potential threats associated with them. You can select the threats applicable to your utility and define custom ones.

Assets



CREAT provides a standardized list of assets. You can modify the asset inventory to reflect your specific facility.

Baseline Analysis



After establishing your initial facility setup, you can determine your current risk level associated with asset/threat combinations over the specified time periods.

Resilience Analysis



After conducting a baseline analysis, you can move forward and consider potential adaptations to your facility to lower the risk associated with specific asset/threat combinations.

Adaptation Planning



Use Adaptation Planning to review your existing and potential adaptive measures, and to develop packages of adaptive measures that you may consider for implementation over future time periods.

Results & Reports



Generate reports of the analysis results developed around your inventories of assets, threats, time periods, or various sorting of any analysis you have conducted.



CREAT Introduction

- Setup and assets
 - Utility and location information
 - Time periods and analysis parameters
- Building awareness
 - Using climate data
 - Identifying challenges (threats)
 - Researching adaptation



CREAT Worksheets

- Templates for collecting information in preparation for using CREAT
- Four worksheets provided:
 - Pre-assessment discussion
 - Climate data
 - Setup data
 - Adaptation preparation

The image shows a worksheet titled "Climate Resilience Evaluation and Awareness Tool (CREAT) PRE-ASSESSMENT DISCUSSION-WORKSHEET 1". It includes a CREAT logo, an introduction paragraph, a section for identifying the analyst with input fields for Name, Phone, Email, and Dept, a section for Overall Goals with a list of checkboxes and a large text box, and a section for identifying participants with a list of checkboxes and a text box for listing specific persons and organizations. A "Continued on page 2" note is at the bottom right.

CREAT Climate Resilience Evaluation and Awareness Tool (CREAT)
PRE-ASSESSMENT DISCUSSION-WORKSHEET 1

Before you begin using CREAT, you may want to take the opportunity to discuss some fundamental questions related to the process with others at your utility, including managers, operators, engineers, and technical staff. These discussions will lay a foundation for the anticipated scope of the assessment.

Analyst: _____

CREAT allows you to identify a person or office as the analyst conducting the assessment. This person or group would be identified in some of the reports as the point-of-contact and follow-up.

Name: _____ Phone: _____
Email: _____ Dept: _____

Overall Goals: _____

It is beneficial to set priorities for your assessment before starting the CREAT process. These priorities may involve consideration of only a portion of your facility, a single aspect of climate change, specific challenges that may be experienced as the climate changes, or some combination of these focus areas. Begin with your goals for the current application of CREAT. You should revisit goals and additional conditions as new assessments are planned for future CREAT sessions.

Consider climate impacts on only a portion of utility assets Focus on one aspect of climate change
 Identify a short list of climate change-related challenges (e.g., floods, droughts)
 Review climate data and information for my location

Overall goals of CREAT assessment:

Participants: _____

The process of using CREAT to learn more about projected climate change and assess the potential risks to your operations and assets is an opportunity to collaborate with others at your utility, stakeholders, and partners in the region. Those parties that could inform data needs for use of CREAT (see other worksheets) or are critically dependent on your utility for services should be involved in parts of the CREAT process.

Customers and stakeholders List specific persons and organizations:
 Watershed partners
 Nearby utilities
 Scientific community
 Others (specify)

Continued on page 2



Evaluating Resilience: Assessing Risk

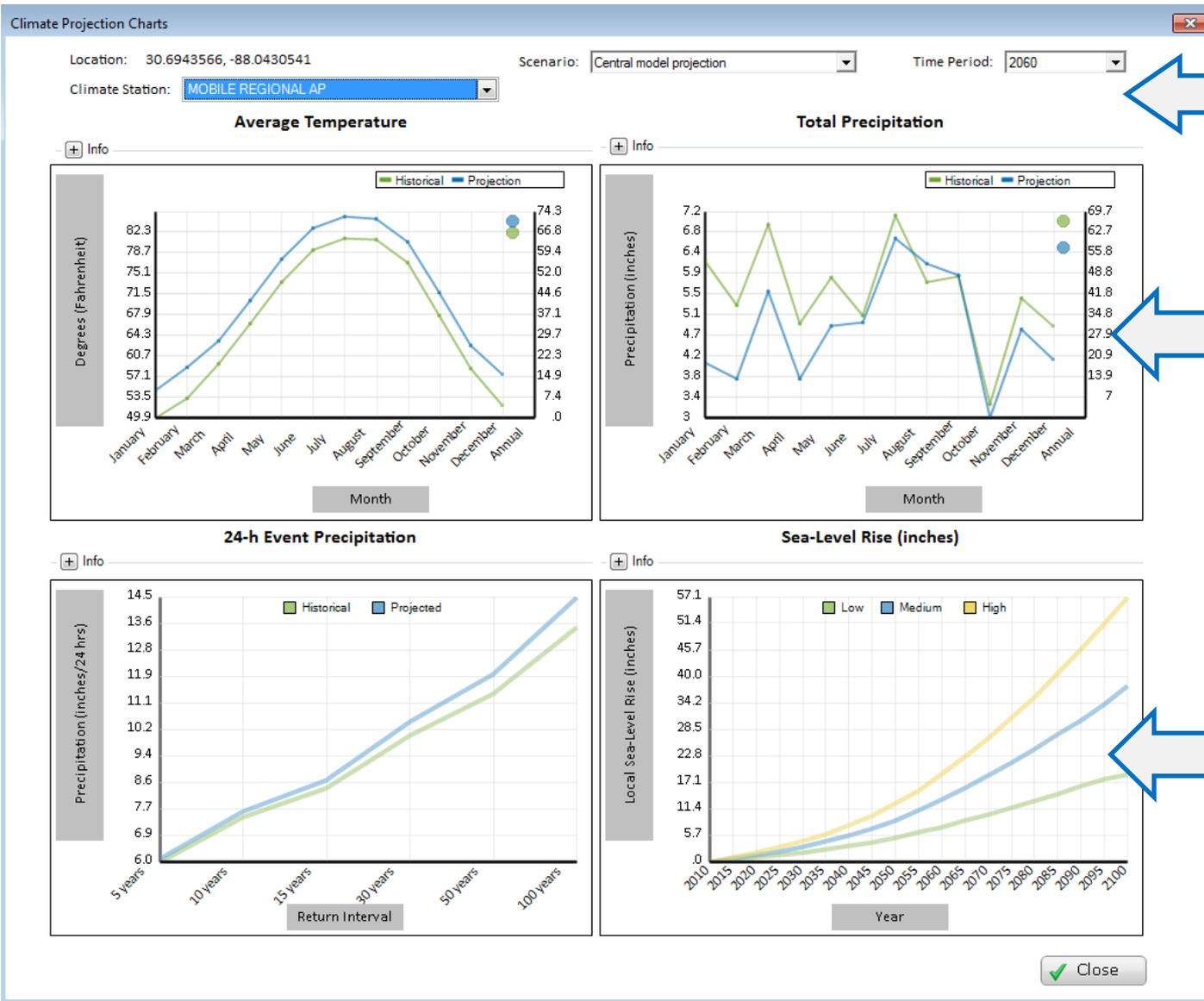
Evaluate potential consequences to assets from impacts related to climate change

Threat Groups in CREAT

- Increased incidence of droughts
- Increased flood frequency and extent
- Degraded water quality
- Altered or loss of ecosystem services
- Altered demand and competing use



Climate Data in CREAT



View data from multiple climate stations, scenarios and time periods

Annual and monthly temperature and precipitation

Intense precipitation events and sea-level rise

- Consider those assets vulnerable to identified threats
- Pairs are the basis for all risk assessments
- Risk assessed for each scenario and time period when a threat is applicable

Hot and dry model projection (\$1)		Central model projection (\$2)
Assets		Low/Low
<input type="checkbox"/> Assets		
<input type="checkbox"/> Natural Resources		
<input type="checkbox"/> Surface water		
<input checked="" type="checkbox"/> Navajo Reservoir		

Baseline Analysis

- Baseline shows current resilience
- Opportunity to consider and document benefit of what you already do
- Represents the risk of taking no action

WWTP (L1)	Reservoir (L2)	Location 3 (L3)	Location 4 (L4)	2015	2035	2060
Asset/Threat						
CREAT Categories						
Hot and dry model projection (S1)						
Infrastructure						
Wastewater treatment plant						
<i>Coastal storm surges (L1S1)</i>						
				2015	2035	2060
Collection and treated wastewater conveyance systems						
Mains and sewers						
<i>Changes in influent flow & temperature (L1S1)</i>						
				2015	2035	2060
Pump stations						
<i>Changes in influent flow & temperature (L1S1)</i>						
				2015	2035	2060
Warm and wet model projection (S3)						
Infrastructure						
Wastewater treatment plant						
<i>Coastal storm surges (L1S3)</i>						
				2015	2035	2060
Collection and treated wastewater conveyance systems						
Mains and sewers						
<i>Changes in influent flow & temperature (L1S3)</i>						
				2015	2035	2060
Pump stations						
<i>Changes in influent flow & temperature (L1S3)</i>						
				2015	2035	2060
Historical (no change) (S4)						
Infrastructure						
Wastewater treatment plant						
<i>Coastal storm surges (L1S4)</i>						
				2015		
Collection and treated wastewater conveyance systems						
Mains and sewers						
<i>Changes in influent flow & temperature (L1S4)</i>						
				2015		
Pump stations						
<i>Changes in influent flow & temperature (L1S4)</i>						
				2015		



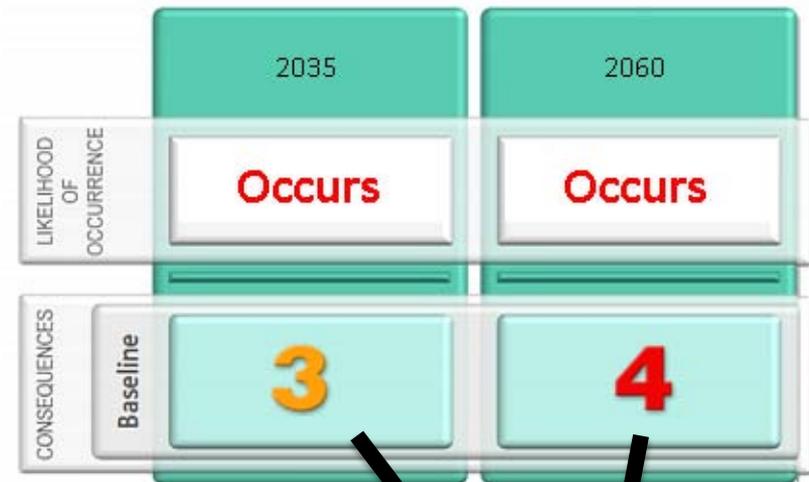
Assess Consequences

- You can assess the qualitative level of consequences for each category
- Tool combines these decisions into an overall level for asset-threat pair

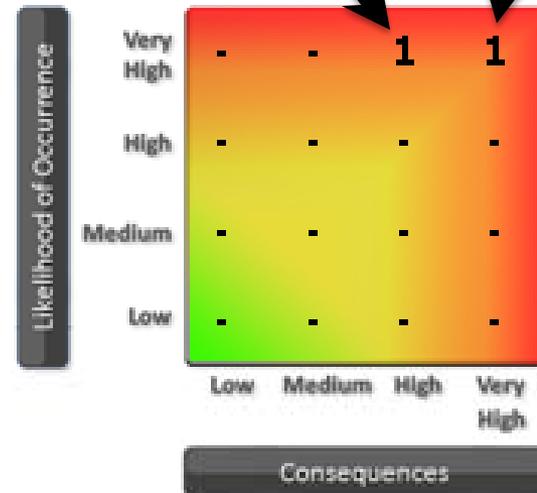
Utility Business Impacts	Utility Equipment Damage	Source/Receiving Water Impacts	Environmental Impacts	Community Public Health Impact
Weight: Highest	Weight: Highest	Weight: Highest	Weight: Highest	Weight: Highest
<input type="radio"/> Very High	<input type="radio"/> Very High	<input type="radio"/> Very High	<input type="radio"/> Very High	<input type="radio"/> Very High
<input type="radio"/> High	<input type="radio"/> High	<input checked="" type="radio"/> High	<input type="radio"/> High	<input type="radio"/> High
<input type="radio"/> Medium	<input type="radio"/> Medium	<input type="radio"/> Medium	<input type="radio"/> Medium	<input checked="" type="radio"/> Medium
<input checked="" type="radio"/> Low	<input checked="" type="radio"/> Low	<input type="radio"/> Low	<input checked="" type="radio"/> Low	<input type="radio"/> Low

Assessment Results

- Each assessment results in a specific combination of likelihood and consequences
- Results placed into bins of the risk matrix



Baseline

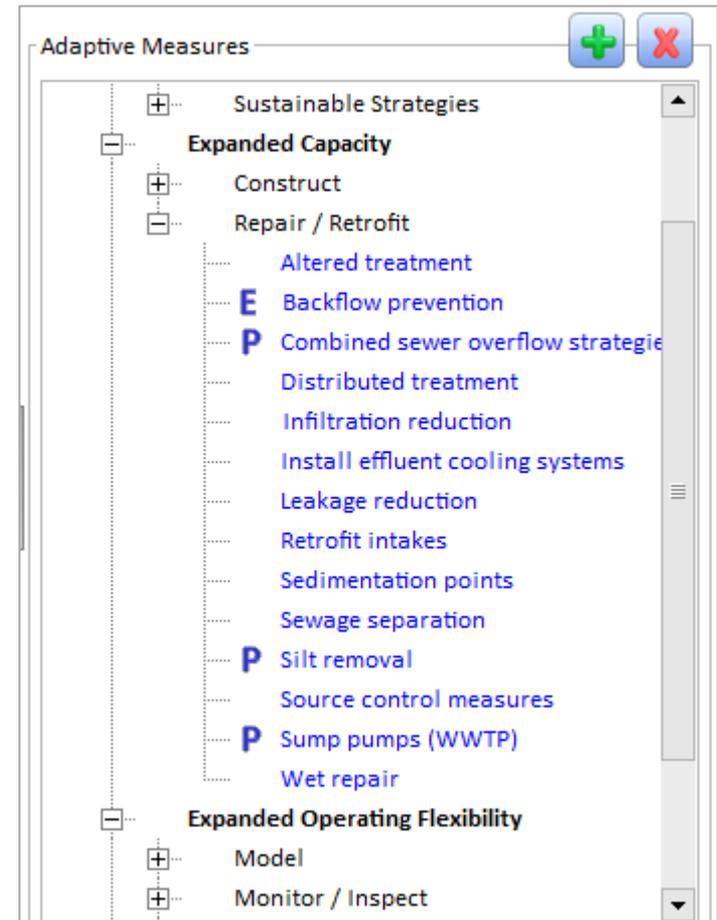




Evaluating Resilience: Reducing Consequences

Consider how adaptation options reduce the consequences to assets from threats

- Browse over 100 adaptive measures in CREAT
- Review descriptions and threat relevance to select those measures to include in assessments
- Keep track of existing and potential measures





Resilience Analysis

- Resilience Analysis results represent the benefits from adaptation
- As in Baseline, assessments conducted for asset-threat pairs and time periods
- Similar process encourages you to consider options for reducing risk



Select and Modify Measures

- Continue to build a list of adaptation options by identifying those that could be implemented to provide additional protection
- Explore ability to modify or improve existing measures, not just new practices or infrastructure

Selected Adaptations



Selected Adaptations

Renew drought contingency plans

Improved community outreach

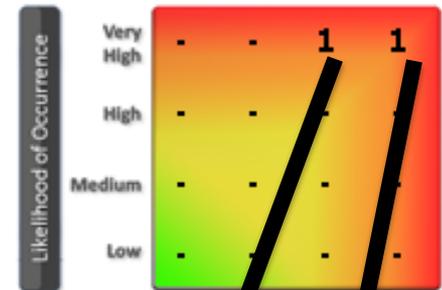
Agricultural and irrigation demand management (partners)

Adjust Consequences

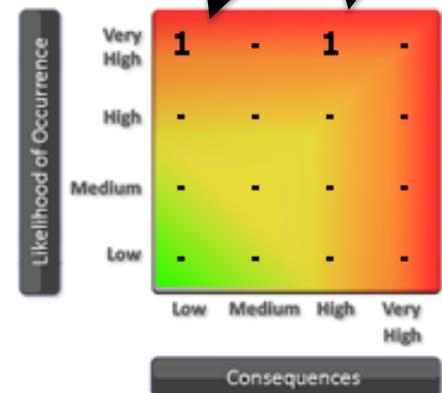
- Implementing adaptive measures should reduce consequences levels with respect to Baseline
- Difference in overall consequence level is translated into RRUs which are used to calculate the benefits of adaptive measures

		2035	2060
CONSEQUENCES	LIKELIHOOD OF OCCURRENCE	Occurs	Occurs
	Baseline	3	4
	Resilience	1	3

Baseline



Resilience





Evaluating Resilience: Planning Adaptation

Build and evaluate packages of actions for adapting to changing conditions



Adaptation Basics

- When possible, adaptation can be incorporated into existing planning practices
- A range of activities could build resilience at your utility
 - Enhanced operational flexibility
 - Expanded capacity
 - Alternate strategies
- Communicate and collaborate with other utilities and your community

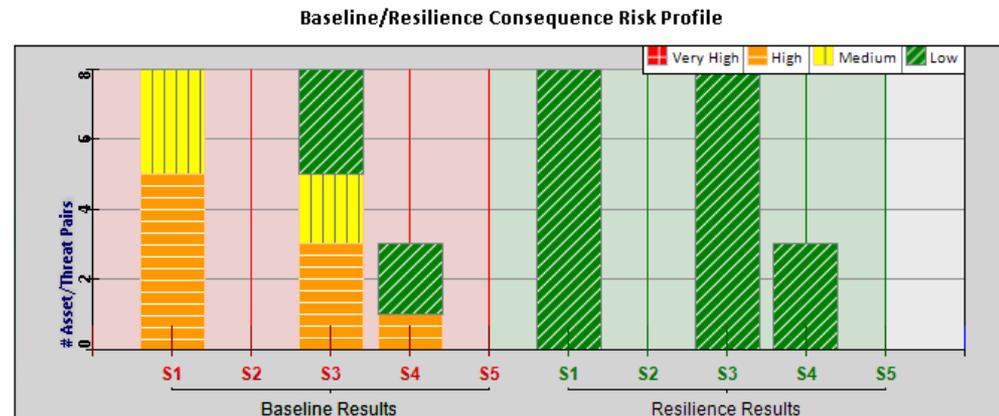
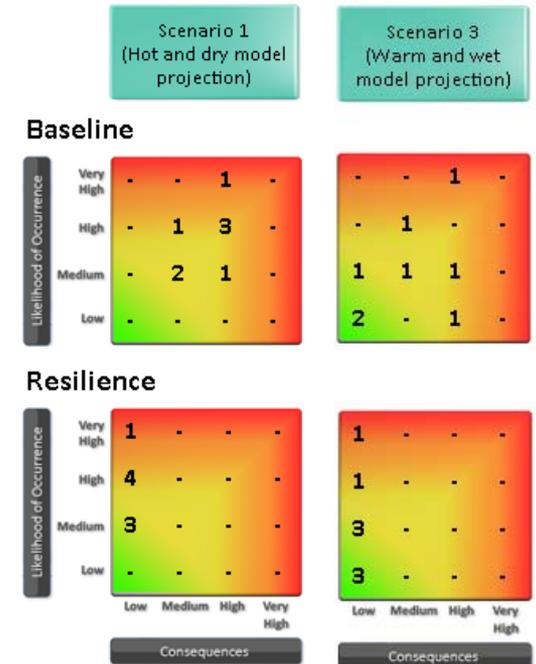
- Adaptation packages are possible plans for adapting to climate change
- Each measure contributes costs and RRUs as a measure of benefit
- Packages also defined in terms of energy implications of adaptive measures

Modernization Plan		Moder		
Adaptive Measure	Cap. Costs	Op. Costs	2015	2035
Combined sewer overflow strategies	\$25,000	\$100,000	3.5	10.9
Energy efficiency improvements	\$200,000	\$10,000	1.5	4.2
Green infrastructure in community	\$25,000	\$25,000	0.0	0.0
Increased capacity – wastewater / storm water	\$2,500,000	\$150,000	0.0	0.9

Quantitative Results

Results provided as

- Risk matrices: assessment results by likelihood and consequence
- Risk profiles: results counted by overall consequence
- Indices based on RRUs and distribution of results in matrices





Reports Available

- Data exports and summaries
- Narrative reports in MS Word
 - Summary
 - Climate data
 - Inventories (assets, threats, adaptive measures and assessment results)
- Data reports in MS Excel

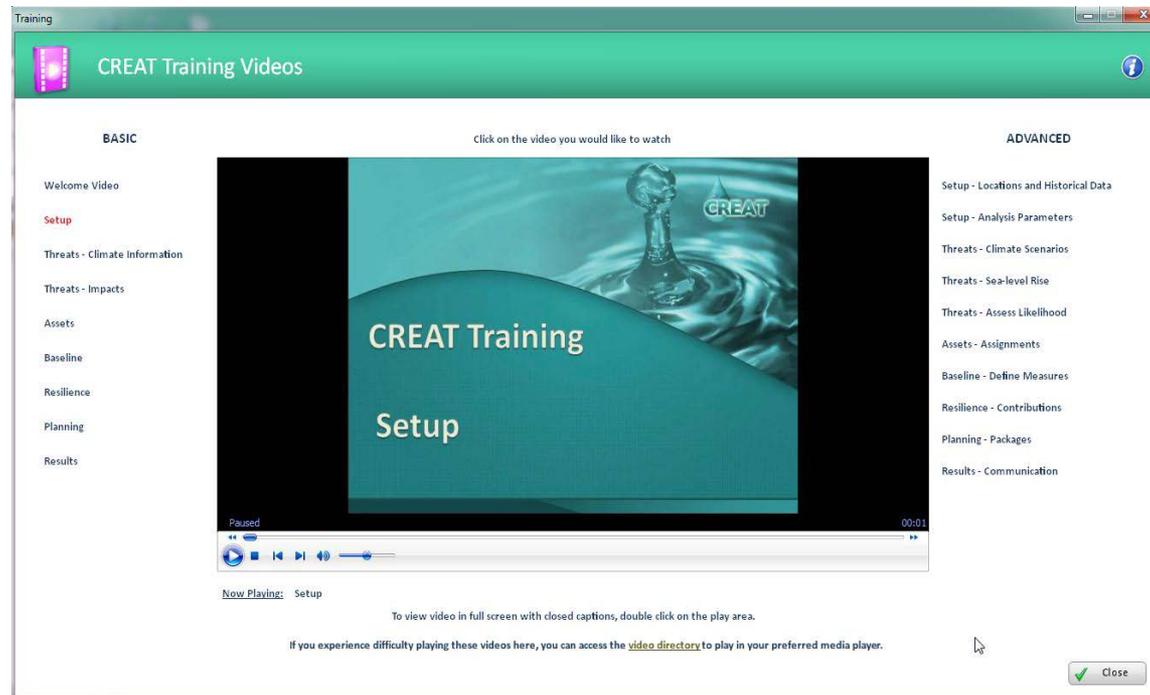


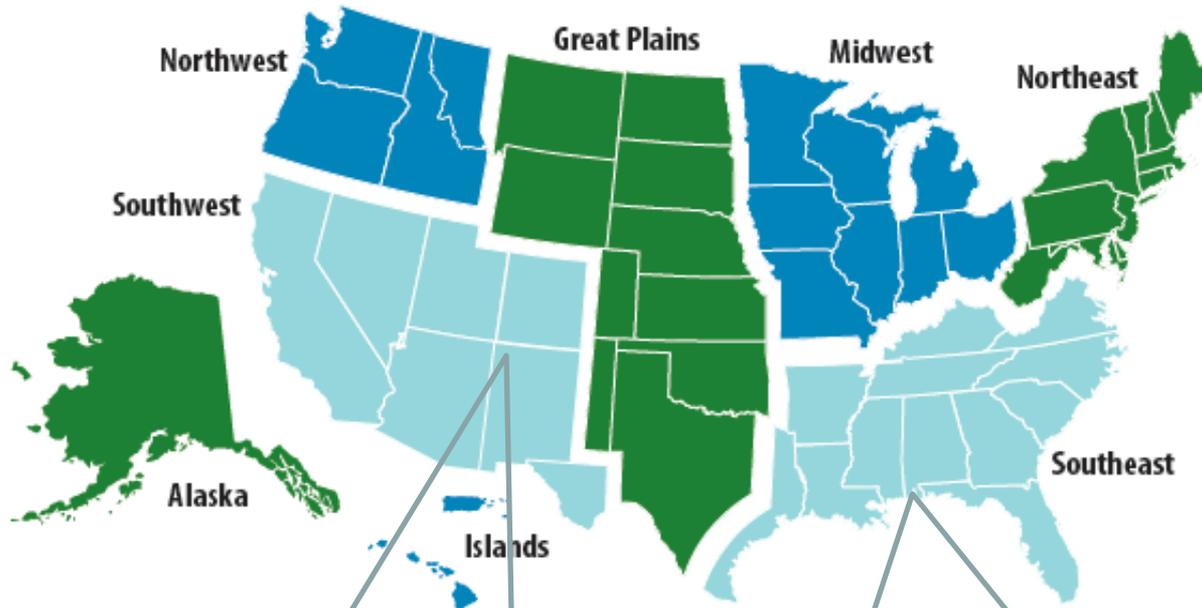
Summary

CREAT provides:

- Guided risk assessment process
- Qualitative and quantitative measures of risk reduction to compare with adaptation costs
- Support for adaptation planning and decisions
- Reports available for communication of results

- CREAT 2.0 is freely available for download from the CRWU website
- Training videos are integrated into software with example analysis files





Basic Training



Small, drinking water utility



Increasing drought severity with climate change

Advanced Training



Large, combined utility



Floods and water quality following storm events





Utility Experience using CREAT

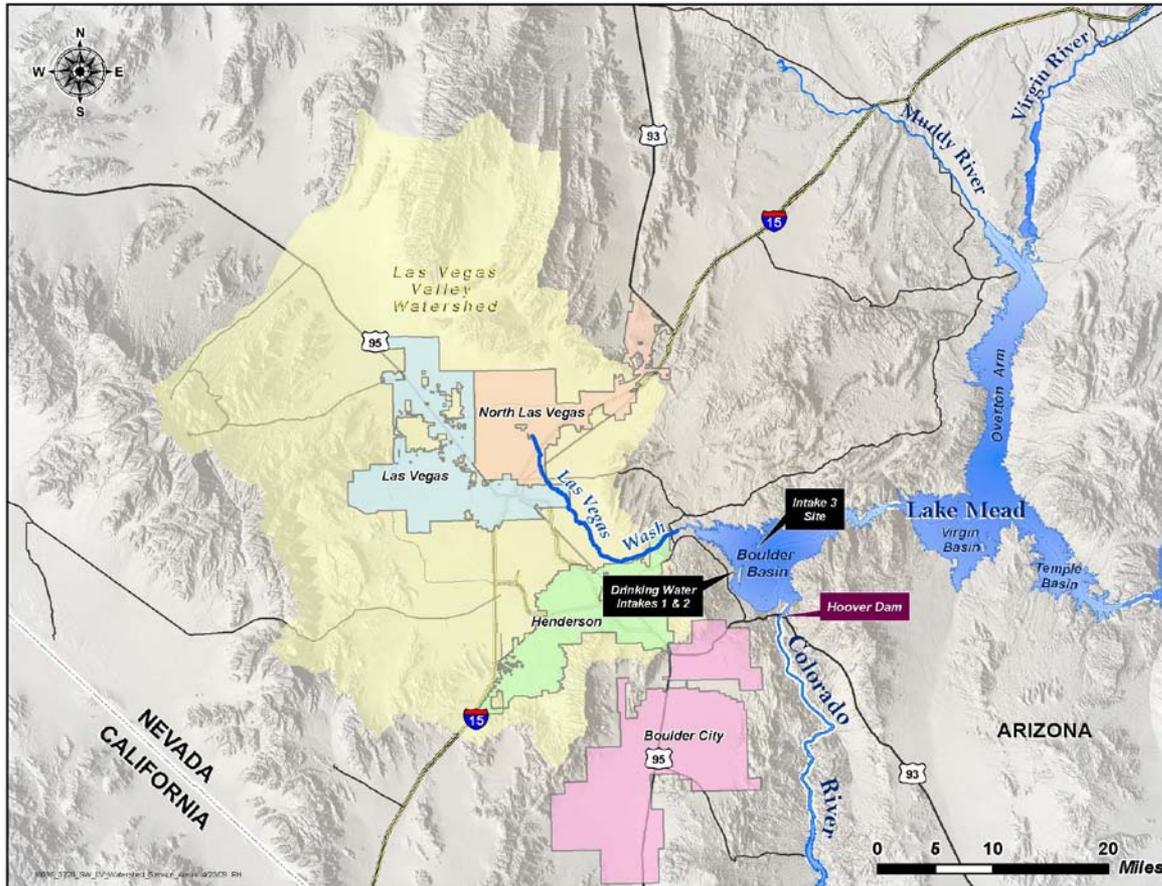
Keely Brooks

Southern Nevada Water Authority

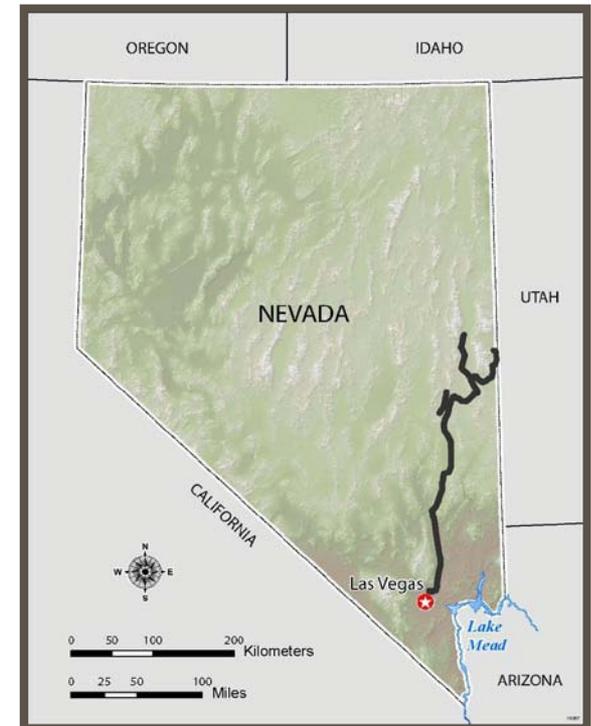


Las Vegas Valley

Supply



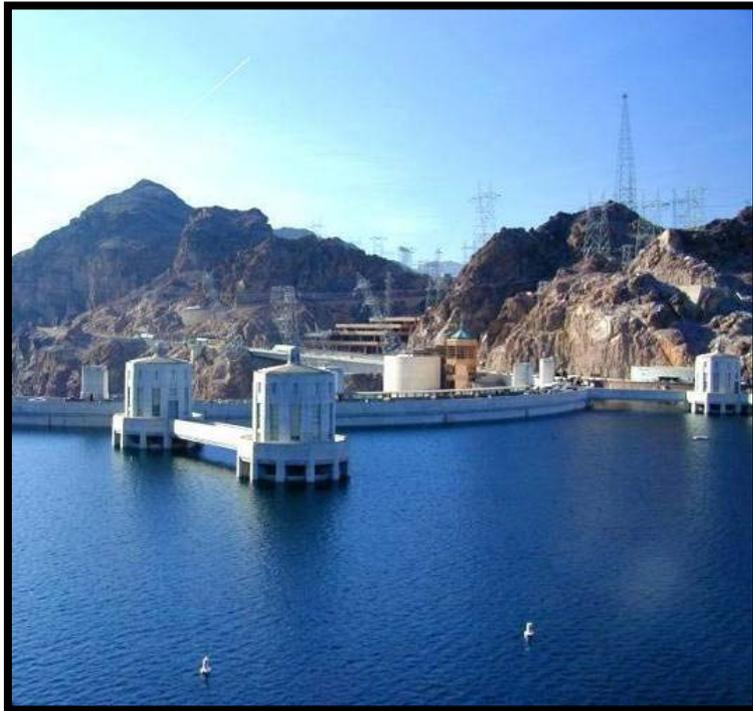
- 90 % Colorado River
- 10 % Other



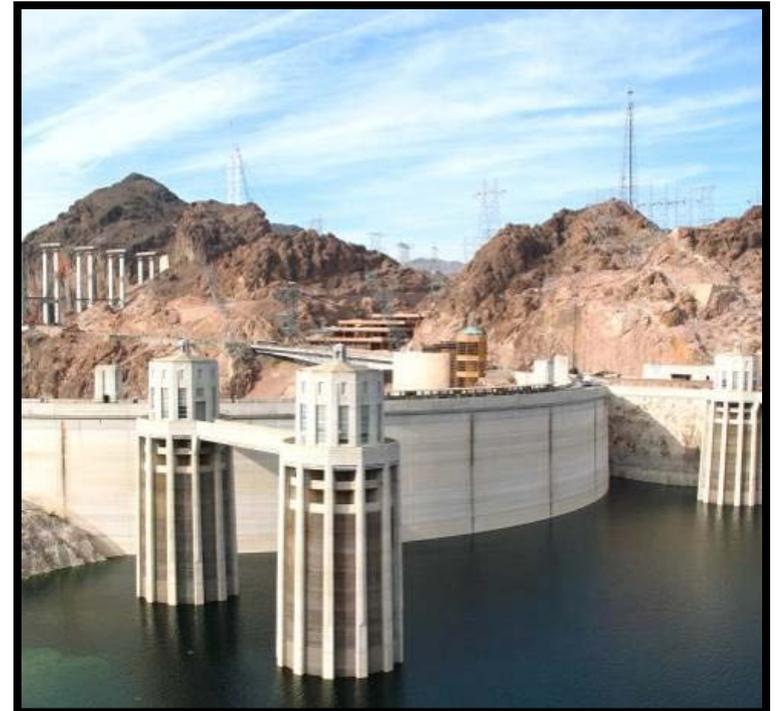
- Serve ~ 2 million residents
- 40 Million Visitors Annually



Persistent Drought



Lake Mead, 2000

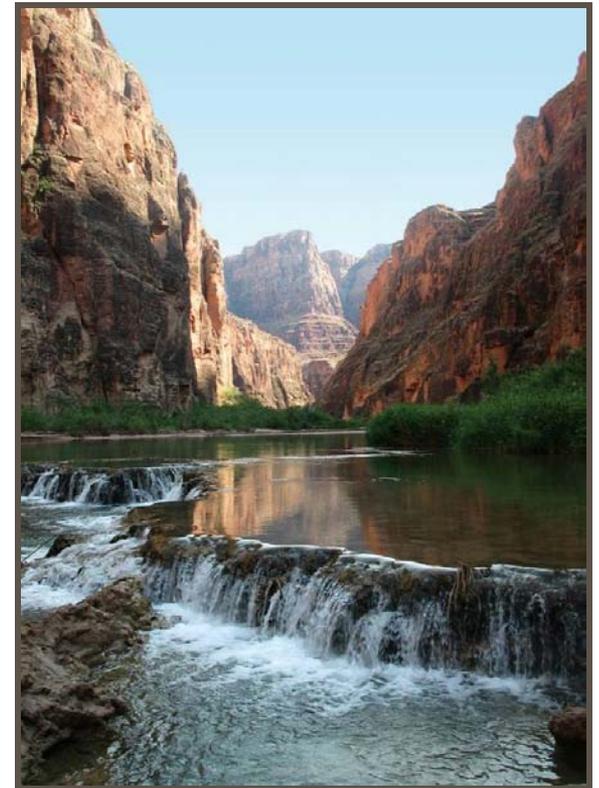


Lake Mead, 2009



Approach

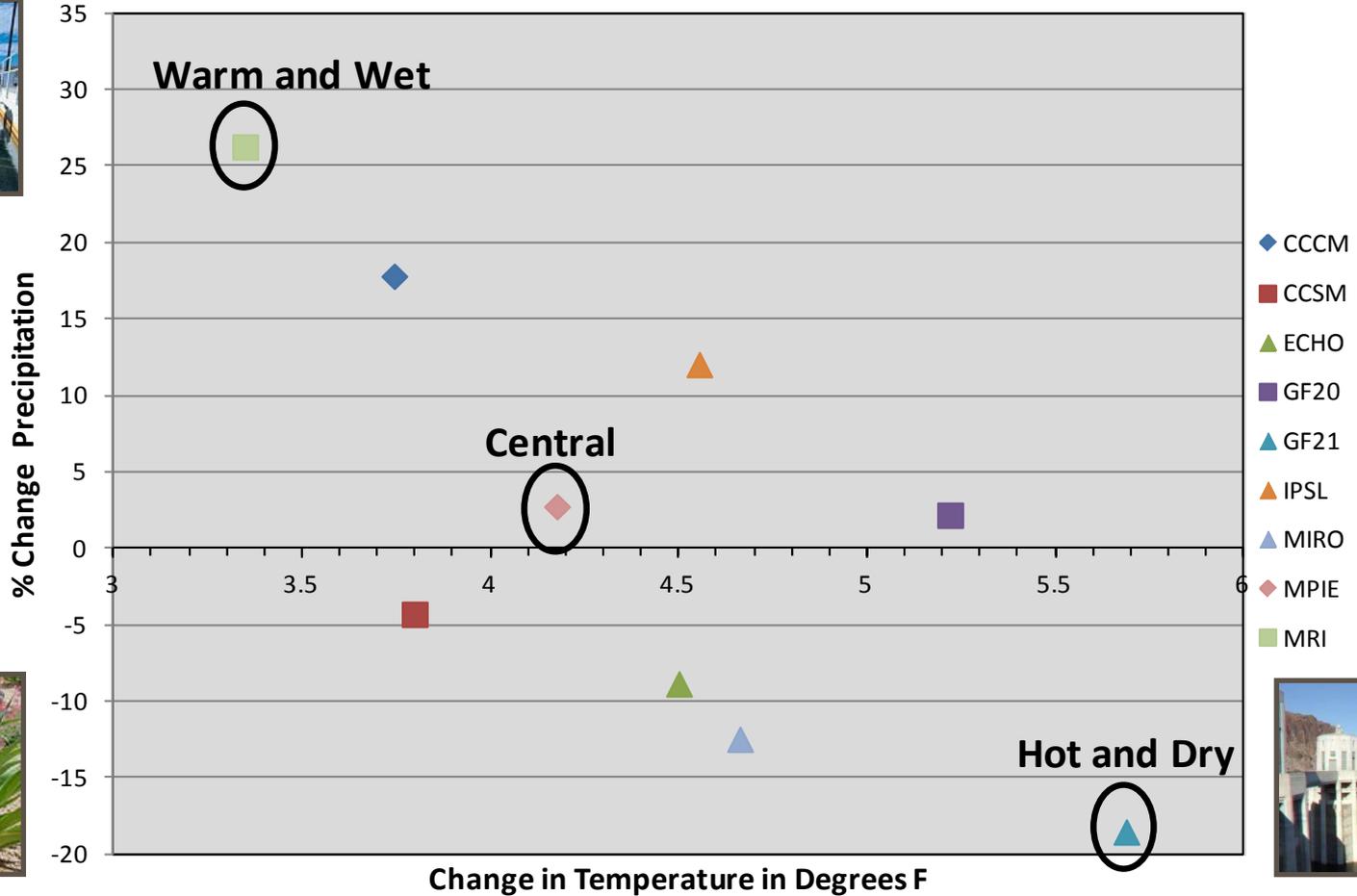
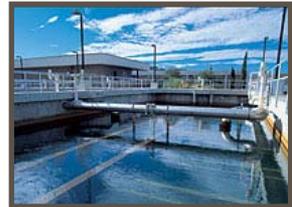
- **Critical Assets**
- **Hot/Dry Scenario Threats**
- **Developed Consequence Rankings**
- **Conducted Baseline**
- **Future Work: Adaptation Planning and Cost Estimates for Resilience Assessment**





Climate Scenarios for Las Vegas, NV

Model Projections for Las Vegas, A1B Emission Scenario, 2060





Asset/Threat Pairs for Hot Dry 2060 Scenario

Threat List
* Low Lake Mead
* Extreme Low Lake
* Warm H2O in Distribution
Water Quality at Intake
Changing Outdoor Irrigation Demand
Decrease in Power Grid Reliability
Increase Invasive Species
Increase Fire
Increase Flood
Reduction in Groundwater Recharge
Change in Runoff Timing
Decreased Snowpack
Reduced Wetlands
High Temps (outdoor workers)
Higher Water Cost (outdoor workers)
Unhealthy Air Quality (outdoor workers)
Higher Living Cost (outdoor workers)

- **Low Lake (1075-1000 ft)**
 - Impacts to supply, source quality, and water treatment
- **Extreme Low Lake (below 1000 ft)**
 - Impacts to supply, source quality, and infrastructure
- **Warm water in distribution system**



Preliminary Consequence Matrix Criteria

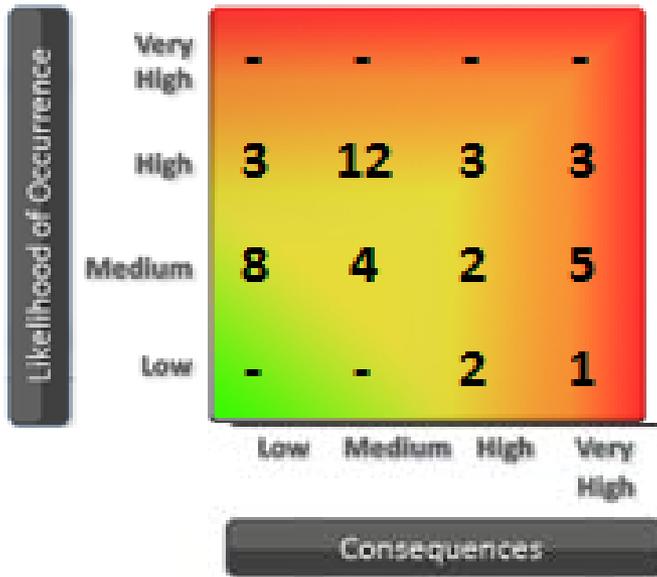
Category	Utility Business Impacts	Utility Operational/ Equipment Damage	Source Water Impacts	Environmental Impacts	Community/Work Force Health Impact
Description	Revenue or operating income loss	Cost of replacing service or equipment	Quantity and Quality	Resource loss and compliance with environmental regulations	Duration and spatial extent of impacts
Very High	> \$5M	> \$5M	> 40 KAF loss for 3+ years	Long term regulatory non-compliance	Long term and widespread
High	\$5M-1M	\$5M-1M	20-40 KAF loss for 3+ years	Persistent environmental damage - may incur regulatory action	Short term and localized
Medium	\$100k-\$1M	\$100k-\$1M	<20 KAF loss for 3+ years	Short-term - compliance can be quickly restored	Minor public health impacts
Low	< \$100k	< \$100k	Minor, short term	No and low impact	No and low impact



Exercise Outcomes

Scenario 1
(Hot and dry model
projection)

Baseline

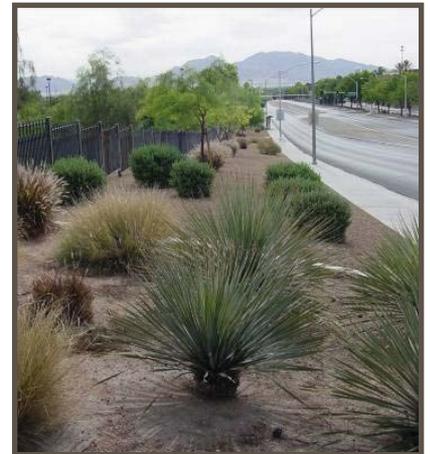
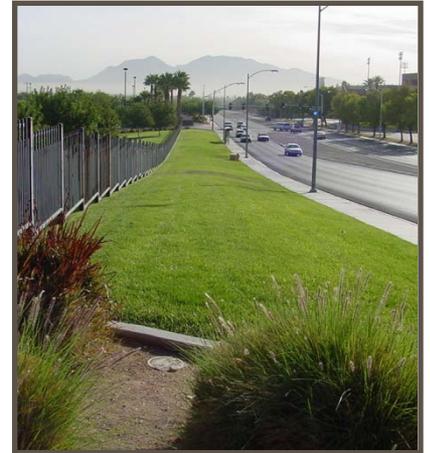


Preliminary Baseline Risk Matrix
(highest-level consequence weighting method)

- SNWA work group capacity
- Provided framework for assessment
- Prioritization for future adaptation planning
- Database for future iterations
- Connected us with peers



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Climate Ready Tools & Resources

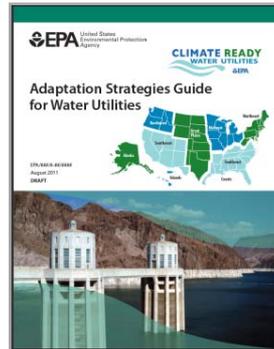
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Learn Climate and Adaptation Basics

Toolbox

-  **Featured Resource**
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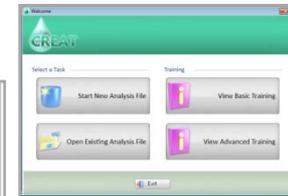
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Connect with CRWU

Please send questions and feedback to
CRWUhelp@epa.gov

- Host pilot projects and exercises to improve and learn about available tools
- Share your success stories with CRWU and other utilities as part of future releases
- Visit EPA climate change page:
<http://epa.gov/climatechange>



Upcoming Events

Next Event	Date
Introduction to CREAT	<i>May 8, 2013</i>

Coming Soon	Date
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Sustainability and Adaptation	<i>June 19, 2013</i>
Climate Change and Decision-Support	<i>July 24, 2013</i>
CRWU Tools Overview	<i>TBD</i>

To register for these events and download resources, visit the CRWU website:

www.epa.gov/climateredyutilities



Thank you

Any questions?

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