Drought Response Examples

John Boyer

Agenda Item 7

Question From January Meeting

- What can we learn from other areas that have been through drought and what have they implemented in their basin?
- What has worked for them and what has not worked?

Drought in urban water systems: Learning lessons for climate adaptive capacity

Lisa Dilling[a,*], Meaghan E. Daly[b], Douglas A. Kenney[c], Roberta Klein[d], Kathleen Miller[e], Andrea J. Ray[f], William R. Travis[g], Olga Wilhelmi[e]

[a] Environmental Studies Program and Western Water Assessment, UCB 397, University of Colorado Boulder, Boulder, CO 80309, United States
[b] Department of Environmental Studies, University of New England, 11 Hills Beach Road, Biddeford, ME 04005, United States
[c] Western Water Policy Program, UCB 401, University of Colorado Boulder, CO 80309-0401, United States
[d] Center for Science and Technology Policy Research, UCB 0488, University of Colorado Boulder, Boulder, CO 80309, United States
[e] Research Applications Laboratory, National Center for Atmospheric Research, 3090 Center Green Drive, Boulder, CO 80301, United States
[f] NOAA Earth System Research Laboratory, Physical Sciences Division, 325 Broadway, Boulder, CO 80305, United States
[g] Department of Geography and Western Water Assessment, UCB 260, University of Colorado Boulder, Boulder, CO 80309, United States

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ABSTRACT

In this paper we examine current policies to combat drought in urban areas in the United States to illuminate lessons learned for building climate adaptive capacity. We conducted interviews with practitioners involved in drought management at urban water utilities across the U.S. to understand: 1) both short- and long-term actions taken in response to drought; 2) perceptions of what constitutes an 'effective' drought response and whether and how this was measured; and 3) limitations to drought response. We apply criteria from a theoretical framing of adaptive capacity and then 'reason by analogy' to understand how adaptive capacity may be built or constrained in the future by such responses, including how future actions may be otherwise limited by political, social, physical and other factors. We find that drought responses overall are seen as successful in reducing water demand and helping to maintain system reliability, but can also reduce flexibility and introduce other limitations. Public perception, the multi-purpose nature of water, revenue structures, expectations and other social factors play a dominant role in constraining drought response options. We also find that some urban water utilities face challenges in measuring the effectiveness of demand reduction strategies because it can be difficult to attribute water savings, especially those related to outdoor water use. The limitations in drought policies experienced by urban utilities offer important lessons for the ability of systems to innovate toward more sustainable water systems for the future.

The authors interviewed water utility managers from 19 urban areas to understand…

1. What were the short- and long-term actions taken in response to drought?

2. What constitutes an effective drought response and how was this measured?

3. What are the limitations to drought response?

Table 1
Most commonly mentioned responses to drought across the cities sampled.

	Policy Instrument	Examples
Demand Focused		
Mandatory Outdoor Use Restrictions	Watering schedules	Limited to certain days of the week
	Prohibiting certain uses	Filling ornamental fountains, pools, or washing car
	Enforcement	Ticketing, hotlines to "report" neighbors
Voluntary Outdoor Use Restrictions	Customer education, outreach	Advertising, targeted meetings, using local media
Incentives for Permanent fixture or landscaping changes	Rebates, fixture give aways,	Low flow toilets, money toward efficient appliances, money for removing turf
Rate adjustments	Tiered water rates, drought surcharges, raising water rates	
General public education on saving water	Customer education, outreach	
Planning	drought triggers, drought plan	Lake or reservoir levels, regional plan, interruptible supplies
Supply Focused		
New reservoir/increasing size of reservoir		
New long term contract		
New connection		New pumping connection, new way to alternate between sources
Diversifying water sources		Adding surface and desalination
Upgrading infrastructure		Fixing aging wells
Purchasing new water rights		Agricultural water
New ways of reusing wastewater		Pumping into lake to be retreated, use of greywater
Governance Changes	Complete reorganization of water delivery into centralized authority with obligation to provide water in return for agreed price, and environmental safeguards	
No action taken/solidarity		Sympathy program; or does not think about drought

What constitutes an effective drought response and how was this measured?

1. Reduction in per capita or overall water use
2. Ability to avoid mandatory restrictions
3. How supportive the public was in implementing response strategies
4. Ability to discontinue polices that limit use
5. Getting a positive response to communication efforts

They also gaged effectiveness of drought response in terms of…

1. **Robustness** - being less sensitive to changing conditions

2. **Flexibility** - the ability to change in response to altered circumstances

3. **Uncertainty** over how policies will work (if the measures rely on actions taken by others)

4. **Efficiency**, **Equity** and **Legitimacy**

What Are Some Lessons Learned and Limitations to Drought Response?

- Voluntary measures or community education initiatives were vastly preferred compared to mandatory restrictions.
- Public perception – neither supply side responses nor demand side responses were immune from public criticism.
- Drought surcharges were rarely utilized as they were seen to be quite unpopular.
- Being part of a regional plan provided a sense of solidarity.

What Are Some Lessons Learned and Limitations to Drought Response?

- Permanent reductions in demand allowed for a cushion between water supply and demand that could allow for banking water but made it difficult to achieve additional reductions in highly urban, low outdoor use contexts.
- Most utilities are not yet weighing the tradeoffs that may be present in dealing with drought risk in the near term and climate change in the long term.

What Are Some Lessons Learned and Limitations to Drought Response?

- Restrictions are more effective than pricing policies and tend to be more equitable across different income groups than pricing measures are, which fall more heavily on poorer households.
- A drought event itself may galvanize political will to implement policies that in normal years may not be publicly acceptable.
- Nearly every manager interviewed considered demand management an integral part of their practices: "***Our customers expect us to be in the business of encouraging efficient and environmentally sound use of resources***".

What Are Some Lessons Learned and Limitations to Drought Response?

"The issue of certainty in supply that we all grew up with no longer exists and we don't know how different it's going to be in the future, but we do know it's going to be different. *From a public policy perspective, we do well to prepare our organizations and our infrastructure to be flexible enough to deal with whatever comes at us, because we have that unequivocal obligation to meet demand. It's not only a contractual obligation. We're the people who produce the supply that puts out the fires and washes babies, so we've got to have the supply no matter what. When we fail, there's a whole lot of problems. We've got to be in a position to not fail."*

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Drought in the Southeast: Lessons for Water Management

John Manuel

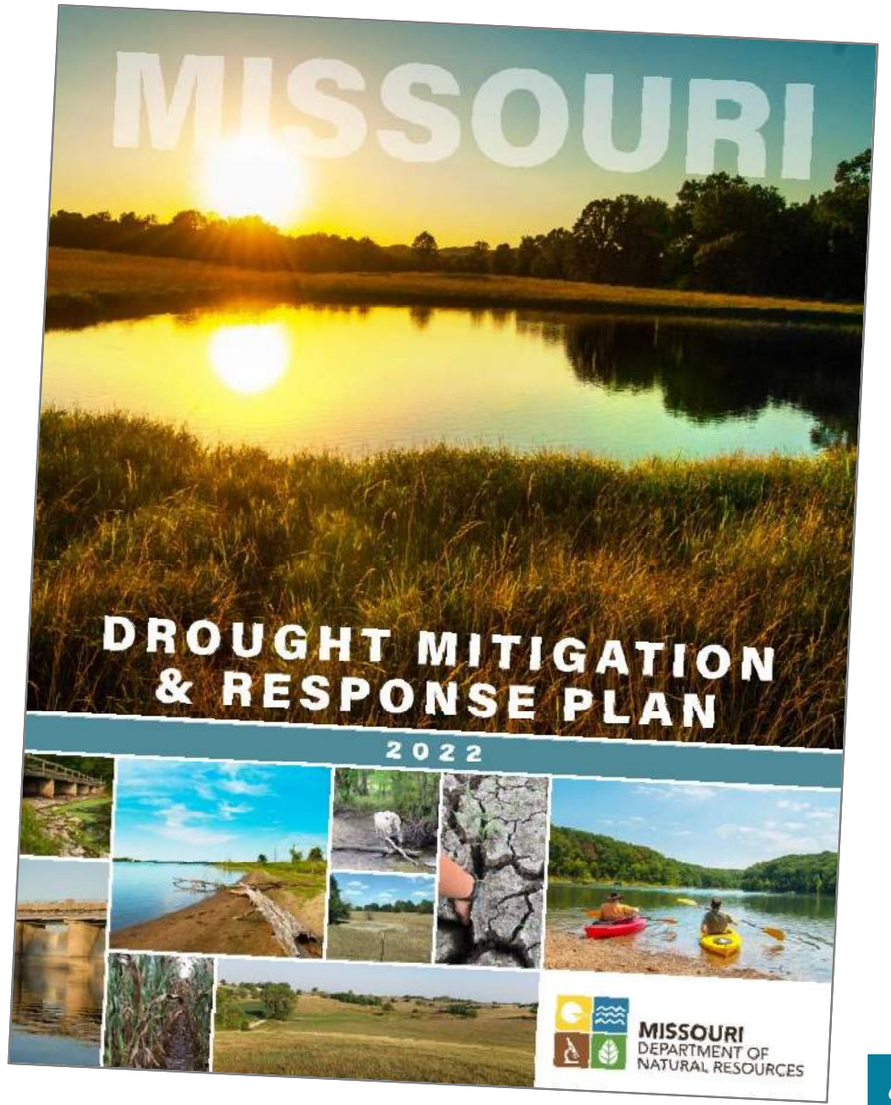
Long spared the persistent droughts that have plagued the western United States this century, the Southeast suddenly finds itself the most rain-starved region of the country. In the face of this threat, policy makers and utility companies are struggling to identify sensible, sustainable options for managing the region's water. Although there currently is no immediate public health threat posed by the Southeastern drought, it does point to a very real situation in regions around the world that struggle to maintain an adequate supply of potable water.

According to the Intergovernmental Panel on Climate Change report *Climate Change 2007: The Physical Science Basis*, as global temperatures increase due to rising atmospheric concentrations of carbon dioxide, so does evaporation. That, combined with cyclical drought, could pose dire threats to water supplies. By one model, published in volume 78, issue 5 (2006) of the *Journal of Hydrometeorology*, if global warming–related precipitation changes continue apace, the percentage of the Earth's surface in severe drought could rise from the current 3% to 30% by 2100.

The Southeastern drought has already had serious economic consequences, according to the National Drought Mitigation Center at the University of Nebraska, which estimates in its Winter 2008 *DroughtScape* newsletter that 2007 losses to major field crops including corn, wheat, soybeans, cotton, and hay totaled more than $1.3 billion. Cattle farmers, nursery and landscape businesses, and recreation and tourism also have been hard hit. Low lake levels have forced power companies such as the Tennessee Valley Authority (TVA) and Duke Energy in North Carolina to reduce electricity generation from cheap, renewable hydropower and substitute more expensive and polluting fossil fuels. By the same token, if cooling reservoir levels were to fall far enough, it could force the shutdown of nuclear power plants.

The 2022 Missouri Drought Mitigation and Response Plan:

1. Describes the **types of droughts** that may occur and their **impacts** in Missouri.
2. Assesses **resiliency to drought** – how prepared are water users in mitigating impacts from and responding to drought?
3. Quantifies potential **economic impacts** from drought.



Drought Mitigation and Response Plan Goals

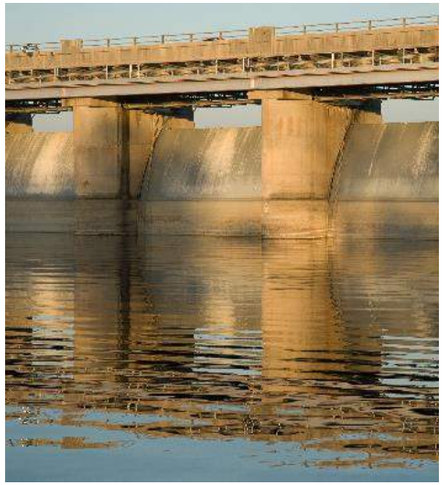
Topic	Plan Goal
Reducing Impacts	Reduce the impacts from drought to Missouri's economy, people, state and local assets, and environment
Increasing Public Awareness	Increase public awareness and provide education about drought planning, mitigation and response
Enhancing Resiliency	Promote and help develop opportunities to enhance resiliency to drought through interconnections, identification of back-up supplies, water reuse and other means that increase sources of supply
Promoting Water Conservation	Encourage water conservation and promote efficient water use to reduce long-term vulnerability, and as temporary drought response actions

Drought Mitigation and Response Plan Goals

Topic	Plan Goal
Adapting to Changing Climate	Evaluate and prepare for impacts from changing climate conditions, including the potential for increased frequency, duration and severity of drought events
Improving Monitoring	Improve water availability monitoring, stay informed of evolving drought monitoring programs, and continue to refine triggers for the initiation and termination of drought mitigation and response programs
Planning the Response	Develop, review and update drought response plans and procedures
Clarifying Roles & Responsibilities	Clarify the roles, responsibilities, and capabilities of State and other agencies in preparing for and responding to drought conditions

How Will the Plan be Used?

- Section 8 of the Plan includes a **matrix** of over **100 mitigation** and **response actions** and **strategies**.
- Actions are identified for different **water use sectors.**
- Some actions are intended to be implemented at a **local level**, others at the **state level.**
- Actions identified based on their ability to **reduce impacts**, **lower susceptibility**, or **improve resilience**.
- Many actions are **region specific.**
- The matrix is intended to be **regularly updated** to capture new strategies and eliminate ineffective actions.



Example 1: Edisto RBC's Low Flow Management Strategy

The strategy serves to augment statewide and municipal drought management plans by triggering tiered withdrawal curtailment by the ***largest surface water users*** in the basin when Edisto River flow reaches certain low levels.

Incremental Percent Below 20% of Median Flow	Edisto River Flow Range (cfs) at Givhans Ferry		Reduction Goal for Surface Water Withdrawals
	Lower	Upper	
0-20%	266	332	20%
20-40%	199	266	40%
40-60%	133	199	60%
60-80%	66	133	80%
80-100%	0	66	100%

Example 2: CWWMG Low Inflow Protocol

Stage *	Water Use Reduction Actions		
	Licensee (Duke)	Public Water Suppliers	Owners of Large Water Intakes
0	Reduce Wylie Recreation Flow Releases	None	None
1	Reduce Project Flow Requirements	Implement voluntary water use restrictions, 2 day/wk irrigation, reduce vehicle washing **GOAL: 3-5% water use reduction**	Request voluntary reductions of customers/employees
2	Eliminate recreation flows, further reduce other Project Flow Requirements	Implement mandatory water use restrictions, 2 day/wk irrigation, eliminate vehicle washing **GOAL: 5-10% water use reduction**	Request voluntary reductions of customers/employees
3	Reduce releases to Critical Flows	Implement increased mandatory water use restrictions, 1 day/wk irrigation, limit other outdoor water uses **GOAL: 10-20% water use reduction**	Request voluntary reductions of customers/employees

**** Triggers for each stage are based on a storage index, Drought Monitor 3-month avg, and 6-month average streamflows***

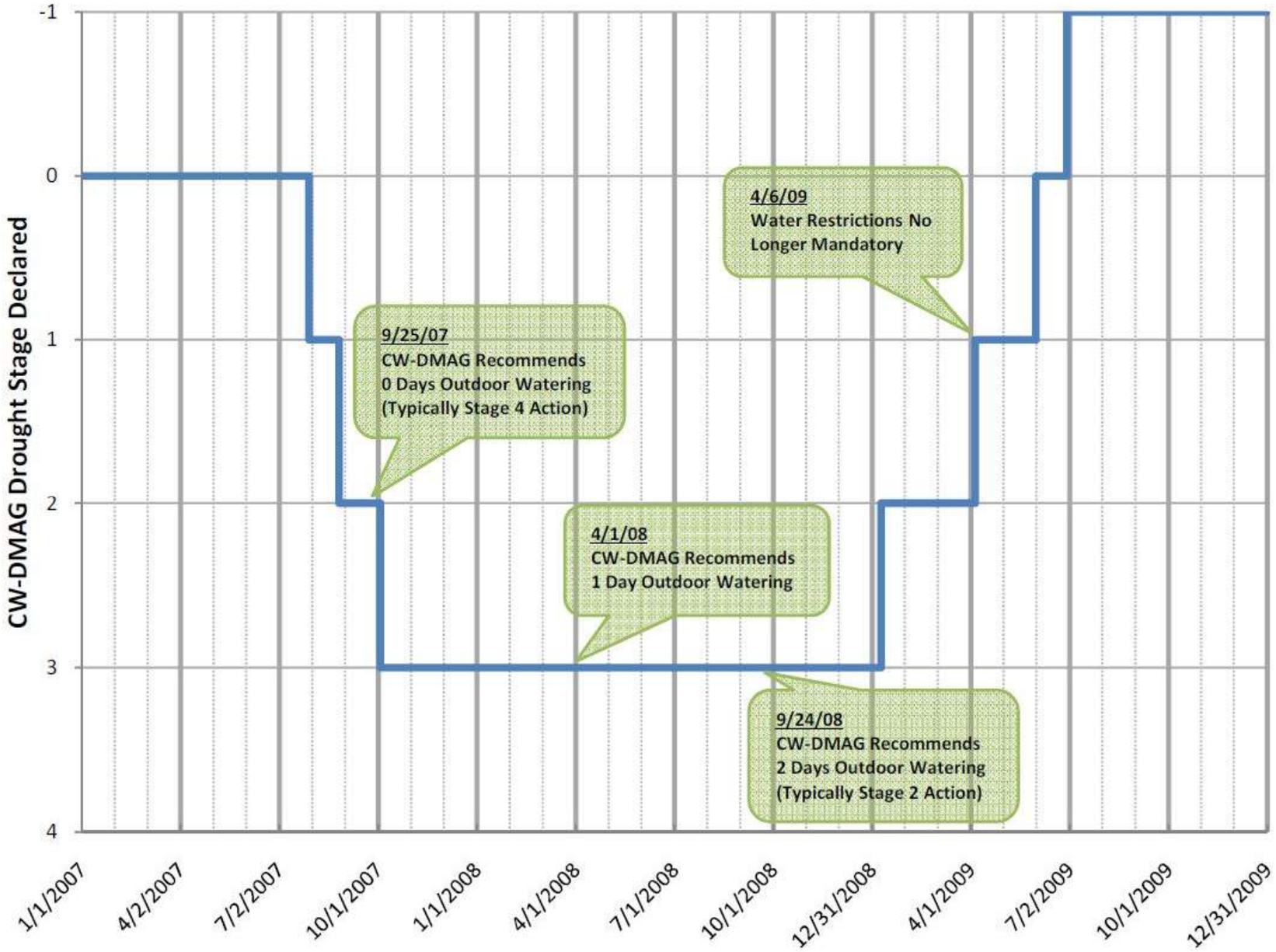
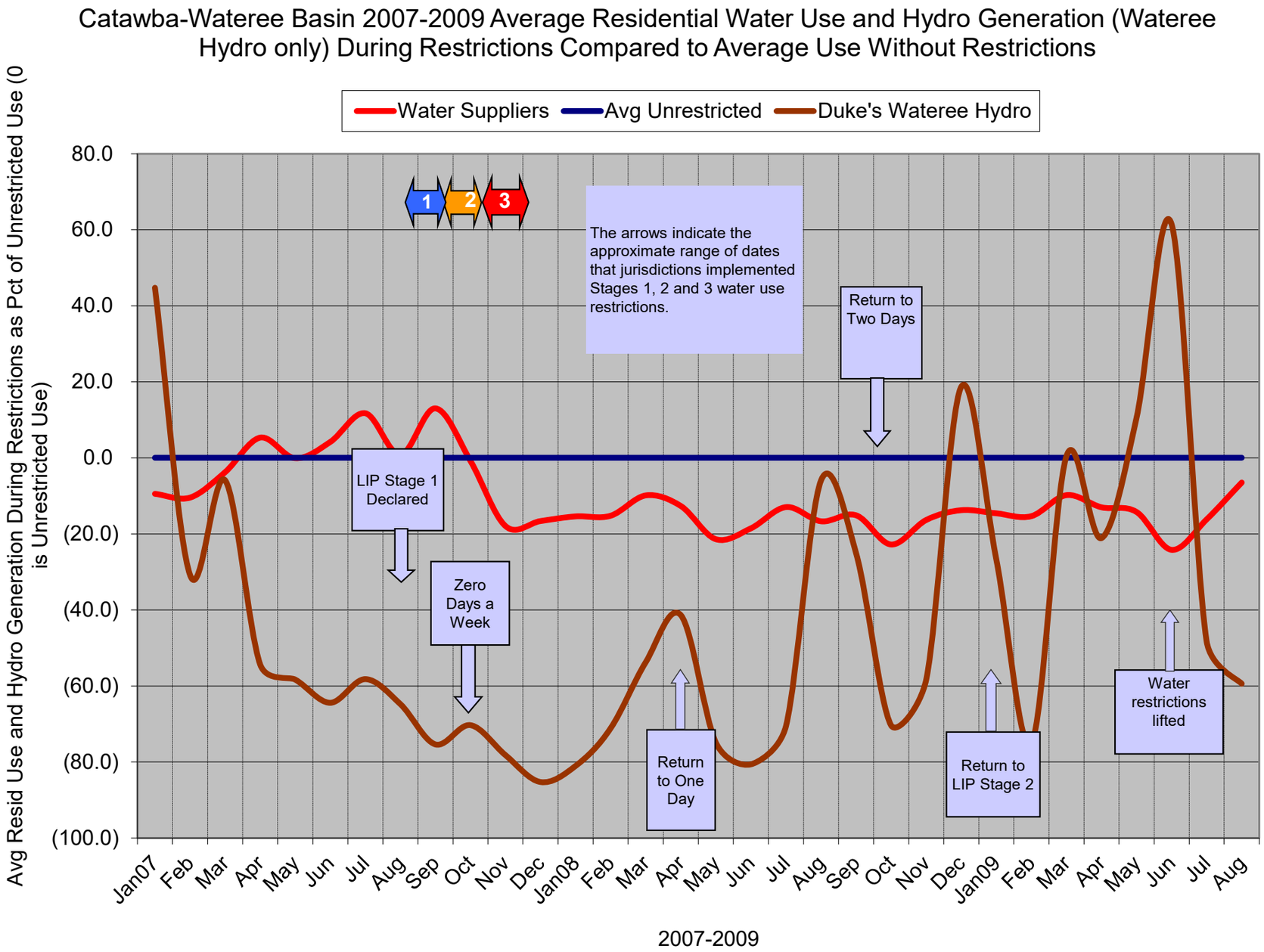


Figure 3.1 – Historical Timeline of LIP Stage and Water Restriction Actions During the Drought


Catawba-Wateree Basin 2007-2009 Average Residential Water Use and Hydro Generation (Wateree Hydro only) During Restrictions Compared to Average Use Without Restrictions
Water Suppliers
Avg Unrestricted
Duke's Wateree Hydro
Avg Resid Use and Hydro Generation During Restrictions as Pct of Unrestricted Use (0 is Unrestricted Use)
80.0
60.0
40.0
20.0
0.0
(20.0)
(40.0)
(60.0)
(80.0)
(100.0)
1
2
3
The arrows indicate the approximate range of dates that jurisdictions implemented Stages 1, 2 and 3 water use restrictions.
Return to Two Days
LIP Stage 1 Declared
Zero Days a Week
Return to One Day
Return to LIP Stage 2
Water restrictions lifted
Jan07
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan08
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan09
Feb
Mar
Apr
May
Jun
Jul
Aug
2007-2009

Planning Framework Outline for **Chapter 8. Drought Response**

1. Summarize **existing drought plans** and **drought advisory groups**
2. Summarize any **drought response initiatives** developed by the RBC
3. List **recommendations** on drought management or drought management strategies
4. Include a **communication plan** to inform stakeholders and the public on current drought conditions and activities regarding drought response

Per the Planning Framework, the Specific Obligations of the RBC, with Support from the SCDNR, are:

1. Collecting and evaluating local hydrologic information for drought assessment.
2. Providing local drought information and recommendations to the DRC regarding drought declarations.
3. Communicating drought conditions and drought declarations to the rest of the RBC, stakeholders, and the public.
4. Advocating for a coordinated, basin-wide response by entities with drought management responsibilities.
5. Coordinating with other drought management groups in the basin as needed.