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Case Study

Georgia: Upper Apalachicola-Chattahoochee-Flint River Basin

Water Resource Strategies and Information Needs in Response to Extreme Weather/Climate Events

ACF Basin

Water Trends

The Chattahoochee River, its tributaries, and Lake Lanier provide water to most of the Atlanta and Columbus metro populations. The river is the most heavily used water resource in Georgia. The northernmost reservoir in the ACF Basin, Lake Lanier supports hydropower, flood management, navigation, fish and wildlife, recreation, water supplies, and water quality. Operated by the Army Corps of Engineers, it stores 65% of the basin's water, fed by the Chattahoochee River.

In the last 50 years (1960-2009), all major Georgia river basins, including the ACF, experienced intensified droughts: average rainfall declined between 9% and 16%, soil moisture between 3% and 6%, and watershed runoff between 16% and 27%; evapotranspiration increased between 1% and 3%. This trend is expected to continue. (Georgia Water Resources Institute, 2011). Projections of reduced rainfall and population growth, indicate that the ACF basin is likely to be vulnerable to water deficits by 2060.

In addition, the region experienced two 500-year floods between 2007 and 2012 as a result of record rainfall, demonstrating the potential for more frequent and extreme rainfall events in an increasingly urbanized setting.

Governing Structures

Protective legislation includes the federal Clean Water Act and state plans, such as the Water Stewardship Act of 2012, the State Drought Management Plan, the Flint River Drought Protection Act, and the 2004 Comprehensive State-Wide Water Management Planning Act. The latter calls for the state to prepare a comprehensive water plan. There are 11 regional water-planning councils. For the most part, water and wastewater utilities are under the jurisdiction of cities and counties.

The Story in Brief

Communities in the Apalachicola-Chattahoochee-Flint River Basin (ACF) in Georgia, including Gwinnett County and the city of Atlanta, faced four consecutive extreme weather events: drought of 2007-08, floods of September and winter 2009, and drought of 2011-12. These events cost taxpayers millions of dollars in damaged infrastructure, homes, and businesses and threatened water supply for ecological, agricultural, energy, and urban water users. Water utilities were faced with ensuring reliable service during and after these events.

Drought of 2007-2008 and 2012

Impacts

Northern Georgia saw record-low precipitation in 2007. By late spring 2008, Lake Lanier, the state's major water supply, was at 50% of its storage capacity. The drought, combined with record-high temperatures, caused an estimated $1.3 billion in economic losses and threatened local water utilities' ability to meet demand for four million people. Similar drought conditions unfolded in 2011-2012, during which numerous Georgia counties were declared disaster zones.

Reduced rain affected recharge of the surface-water-dependent reservoir. It reduced flows, dried tributaries, and caused ecological damage in a landscape already affected by urbanization, impervious cover, and reduced natural flows. Downstream, agricultural production was harmed, exacerbating tension over perceived levels of urban water use. Landscapers and nurseries, among major suburban economic sectors, were hurt by the outdoor water ban imposed by local governments. Simultaneously, hydropower energy production, which is dependent on Buford Dam releases, conflicted with the need to preserve water storage for municipal supplies. In short, decisions by independent sectors had cascading effects.

> **"There is nothing simple, nothing one sub-basin can do to solve the problem. The more we talk, the more we study, the more we find out how interrelated and complicated everything is."**
>
> *Charles Stripling, Chair, ACF Stakeholders*

Water utilities in Gwinnett, Cobb, and DeKalb counties were faced with two sets of challenges: Ensuring adequate supply to customers and complying with environmental regulations. Unlike with flood events, infrastructure damage was not a primary concern. Rather, utilities had revenue loss associated with their response actions. For example, utility revenues dropped when water restrictions were imposed, resulting in hiring freezes and cut contracts. Meanwhile, drinking water treatment costs rose due to increased turbidity (i.e., suspended solids when there is too little fresh inflow) from water sources.

To complicate matters, the Army Corps of Engineers granted the Georgia Environmental Protection Department (EPD) request to reduce water releases from Buford Dam to 650 cubic feet per second for three months to preserve water supply for the coming summer, below Atlanta's 750 cfs discharge permit standard. Environmental groups expressed alarm that this would harm downstream and Gulf ecosystems.

Utility and Community Response

Gwinnett County adopted a tiered billing structure in which water prices rose with use, reducing consumption by 20%. Priority responses focused on leak detection and repair. To deal with reduced revenue, the county renegotiated electrical rates, insourced capital project management, and closed older facilities. Neighboring Cobb County took the initiative to impose an outdoor water ban (an action the state later also implemented).

Recognizing the need to improve natural recharge of local streams, utilities promoted green infrastructure and conservation; metro Atlanta used 14% less water in 2011 than a decade earlier. Local environmental groups lobbied for increased water quality monitoring in the river; a second monitoring station was installed.

Several partnerships formed to address critical water resource issues. A notable example is ACF Stakeholders, formed in response to the drought in 2008 and composed of 70 members from Georgia, Alabama, and Florida, including agricultural users, community members, environmental groups, utilities, and several government agencies. In 2011 it approved a five-year plan aimed at reaching consensus on protecting the ecology and businesses that rely on the basin.

A series of workshops focusing on extreme events and water resources, co-sponsored by the National Oceanic and Atmospheric Administration (NOAA), US Environmental Protection Agency (US EPA), Water Environment Research Foundation (WERF), Water Research Foundation (WaterRF), Concurrent Technologies Corporation (CTC), and NOBLIS.

NOAA EPA WERF WaterRF CTC Noblis

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Floods of September 2009 and Winter 2009-2010

Impacts

In September 2009, intense and prolonged precipitation in north Georgia caused flooding over several days. Disaster areas were declared in 69 of the 159 counties, with the worst flooding in the Atlanta suburbs. Meanwhile, the Chattahoochee River reached the 500-year flood level. Lake Lanier rose by more than 18 feet, coming close to overtopping at Buford Dam upstream of Gwinnett County. Weather stayed wet through the winter of 2009-2010, with heavy rain causing more flooding from over-saturation, requiring carefully controlled dam releases.

In Gwinnett, 11 inches of rain fell in 18 hours, 28 storm culverts under roads collapsed, two wastewater pumping stations were shut down, water and wastewater treatment plants were flooded, and sewers and floodways were inundated. The costs just for stormwater infrastructure evaluation and repairs were $7.5 million.

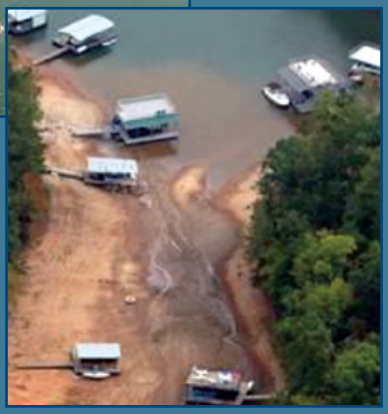
Neighboring Cobb County lost tertiary treatment at its R.L. Sutton wastewater treatment plant, had excessive damage to lift stations and underground infrastructure, and faced collapsed structures and fallen trees.

In Atlanta, the R.M. Clayton Water Reclamation Center had severe flooding and damage to primary clarifiers, biological nutrient removal basins, electrical gear, and the blower building. Power outages disrupted treatment processes. Despite extensive recovery efforts, damage remained as of mid-2012. Total wastewater treatment response costs totaled $55 million.

Utility and Community Response

Flooding presents sudden and urgent challenges, as well as long-term recovery efforts that impose large capital costs from damaged infrastructure. Utility managers must immediately restore critical potable water operations and wastewater treatment services to protect public health. Unreliable electric power, damage to roads and bridges, and lack of landfill capacity to take debris impeded utility efforts to recover and, in the long term, to remediate damage.

Gwinnett County officials report they were better prepared for flooding as a result of three major initiatives that began in the 1990s: the FEMA Floodplain Map Modernization Program, the USDA Natural Resources Conservation Services Watershed Dam Rehabilitation Program, and a new stormwater utility started in 2006 to provide funding for county stormwater operations and capital improvements. When the 2009 flood came, updated maps helped identify at-risk bridges and culverts and confirmed 10 of 14 dams were in compliance with standards due to a stepped-rate structure, which provided funding for infrastructure upgrades.



Consecutive extreme events hit north Georgia hard. (Top) Normal water levels at Lake Lanier are 1.8M acre feet. (Middle) By late 2008, drought put the reservoir at 50% capacity; the area suffered $326 million in recreational use and property value losses, plus tax and income losses. (Bottom) Flooding in 2009 at Gwinnett County's wastewater utility caused $7.5 million in repair work.

In Atlanta, the wastewater utility was prepared with a robust and tested emergency response plan. Priority areas were defined so operations could be conducted manually and alternative processes could be used. New emergency purchase authorizations were triggered to provide services for portable pumps and generators, equipment and building cleaning and drying, debris removal, chemical delivery, and full-site restoration. New worst-case scenario planning is helping plan for future "perfect storm" events.

Looking Forward

A broad array of concerned citizens, stakeholders, and government officials are coming to understand that managing water resources for multiple objectives in a context of changing climate requires foresight, communication, understanding, collaboration, and flexibility. Actions underway to build support and inform decisions include monthly conference calls with NOAA to help regional planners understand unfolding events and use of USGS tools, such as StreaMail, that provide real-time alerts. An ACF Stakeholders group enables constructive dialogue. Atlanta is promoting green infrastructure and adopting water conservation practices. The landscaping industry is re-organizing around water-efficient landscaping. The Lake Lanier Association is educating school children and the public about this threatened resource.

Intense dialogue is underway about ways (some controversial) to ensure adequate water supply against a backdrop of significant population growth and changing precipitation and watershed characteristics – debating ideas such as new or expanded reservoirs, inter-basin transfers, aquifer recharge systems, restoring natural hydrology, and expanding water conservation.

While the utilities themselves can only do what is under their control, they are working to leverage their approach toward integrated water resource management and adaptive preparedness to ensure reliable service.

To learn more about how the water sector is responding to extremes, visit:
http://www.cpo.noaa.gov/ClimatePrograms/ClimateSocietalInteractionsCSI/SARPProgram/ExtremeEventsCaseStudies.aspx

Lessons Learned

- Collaborating with other organizations and governing bodies responsible for water management helps foster integrated solutions.
- Communicating and collaborating with stakeholders, including the media and elected officials, is critical for educating the public and creating long-term solutions.
- Engaging with existing regional planning structures, such as water planning councils and state initiatives, is challenging but could help promote long-term planning for multiple objectives.
- Planning must integrate science, conservation, infrastructure, and management.
- "What if" planning for worst-case scenarios can help identify vulnerabilities for advance preparedness.
- Familiarity with how the Federal Emergency Management Agency (FEMA) operates helps with restoration efforts.

Useful Tools and Resources

- Georgia Water/Wastewater Agencies Response Network (GA WARN)
- NOAA National Integrated Drought Information System (NIDIS)
- US Geological Survey (USGS) WaterAlert and StreaMail

Information Needs

- Forecasts for short-term intense storms and longer-term droughts, especially at a local level
- Targeted vulnerability assessments
- Modeling for south Georgia that includes Florida
- Water demand and use estimates
- Updated floodplain maps
- Updated engineering design manuals