SCDNR Water Planning and Water Science

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South Carolina Water Resources Conference Columbia, South Carolina October 17th, 2018

Water Planning



Step 1. Surface-Water Availability Assessment

<u>Purpose</u>: To develop surface water quantity models for each basin.

- In August 2014, CDM Smith, Inc. was awarded a contract to develop surface-water quantity models for each basin using its *Simplified Water Allocation Model* (SWAM) modeling tool.
- Models submitted to SCDNR in June 2017.
 - Subset of models will be released this fall.
 - Some models still under final review.
- Funding source: State (DNR).





South Carolina's Major River Basins



Step 2. Groundwater Availability Assessment

Purpose: To update the 2010 groundwater flow model of the Coastal Plain.



- In February 2016, the USGS was contracted to update the groundwater flow model of the Coastal Plain using USGS's modular hydrologic model MODFLOW.
- The updated model is expected to be completed in August 2019.
- Funding source: State (DNR and DHEC), USGS and USACE (Charleston District).

DNR







Step 2. Groundwater Availability Assessment Hydrogeologic Framework <u>Purpose</u>: Update the hydrogeologic framework of the Coastal Plain

A fence diagram depicting aquifers and confining units in Aiken County.

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A 3-D hydrogeologic framework generated from the fence diagram using ARC-Hydro software.

Step 2. Groundwater Availability Assessment Groundwater Recharge Model

<u>Purpose:</u> To develop maps showing groundwater recharge rates for the Coastal Plain. Recharge rates will be used as input for the groundwater flow models.

Includes many data sources:

- Geology
- Land Cover
- Soils
- Climate









Step 3. Water Demand Projections

<u>Purpose</u>: To develop water demand projections for each basin from 2015-2065 in 5- and 10- year intervals.

- In August 2016, the USACE (Charleston District) and DNR were awarded a Planning Assistance to States (PAS) contract to develop water demand projections for the Savannah River basin.
- In July 2018, a second PAS agreement was signed to build upon work that had been done on the previous project.
- Funding source: USACE (Charleston District) and State (DNR)



US Army Corps of Engineers





DNR

Step 3. Water Demand Projections

- *Current work*: Formation of Technical Working Group (TWG) to develop projection methodologies
 - Public and Domestic Supply, Agriculture, Energy, Industry, and Golf Course
 - Includes stakeholders from each water sector
 - Meets every two weeks
 - Final report expected by February 2019
- *Planned work*: Develop projections for Savannah River Basin
 - Pilot planning basin
 - Stakeholder meetings planned to solicit feedback and recommendations
 - Draft projects expected to be completed by June 2019

Future Work: Develop projections for seven other basins (outside of scope of current PAS agreement) - Funding and timeline not yet determined

On the Web..



SW Assessments: http://www.dnr.sc.gov/water/ waterplan/surfacewater.html

Water Demand Forecasts: https://www.clemson.edu/public/waterassessment/water_demand_projections.html

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South Atlantic Water Science Center (SAWEC)

Update for the South Carolina Atlantic Coastal Plain Groundwater Availability Model

Overview Publications Maps Partners

Groundwater use from the Atlantic Coastal Plain aquifers in South Carolina has increased during the past 70 years as the population has increased along with demands for municipal, industrial, and agricultural water needs. While South Carolina works to increase development of water supplies in response to the rapid population growth, the State is facing a number of unanswered questions regarding availability of groundwater supplies and the best methods to manage these important supplies.



Contacts

The objective of the proposed investigation is to update the groundwater flow model of the South Carolina Coastal Plain presented in Campbell and Coes, 2010.

GW Assessments: https://www.usgs.gov/centers/sawater/science/update-south-carolina-atlantic-coastalplain-groundwater-availability-0?qtscience_center_objects=0#qt-science_center_objects



South Carolina Water Demand Projections

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Committee

Protections

Water Dertains



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Next Meeting Industry Sector Meeting

Step 4. Regional (Basinwide) Water Plans

Using the assessments and forecasts, and with oversight from State agencies, stakeholders will begin the process of developing regional water plans for each basin.

This step includes:

- The formation of River Basin Councils
- An evaluation of future water availability
- An assessment of management strategies to meet the future demands or to plan for potential changes in water availability



Regional Planning Vision Statement

"Reflecting our values of water as a shared resource and a shared responsibility, we will work together to develop and maintain an actionable state water plan balancing economic, environmental and social needs of South Carolina for generations to come"

Planning Process Advisory Committee, September 6, 2018



Planning Process Advisory Committee (PPAC)

Develop a guidance document for the regional water plans. Some of the subject matters addressed in the document will include:

- Vision and goals
- Process of designating members to the River Basin Councils
- Roles and responsibilities of the River Basin Councils
- Roles and responsibilities of the State agencies
- Council bylaws/operating charter for River Basin Councils
- Regional water plan format and contents
- Public and stakeholder participation
- Financing of regional water plans
- Implementation of regional water plans
- Outline how the regional water plans fit into the State Water Plan
- Administrative rules

PPAC is meeting on a monthly basis (First meeting held in March, 2018)

PPAC Committee Members

Jeffery Allen - Clemson University, South Carolina Water Resources Center Dean Moss, Jr – Citizen, Formerly of Beaufort-Jasper Water and Sewer Authority Scott Willett - Anderson Regional Joint Water System Charles Wingard - Walter P. Rawl & Sons, Inc. (Agriculture) Fred Castles, III - Catawba-Wateree Management Group J.J. Jowers, Jr - Edisto Engineers and Surveyors, Inc., Citizen Jill Miller - South Carolina Rural Water Association David Baize - WEASC/SCAWWA Gary Spires – South Carolina Farm Bureau David Bereskin - Greenville Water Jesse Cannon - Santee Cooper Clay Duffie - Mount Pleasant Waterworks Eric Krueger - The Nature Conservancy Jeff Lineberger - Duke Energy Erika Hollis - Upstate Forever Myra Reece - SCDHEC **Ken Rentiers - SCDNR** Bill Stangler - Congaree Riverkeeper

Step 5. Update the State Water Plan

Upon completion of the regional water plans, the State water plan will be updated by SCDNR.

- Assess the overall condition of water resources in the State
- Evaluate statewide trends in water use and availability
- Offer water-resource policy and program recommendations
- Introduce innovative practices



Water Information and Science

Hydrology Section

State Water Plan Update

- o Surface-water availability assessment
- o Groundwater availability assessment
- Water-demand forecasts
- o Regional water plans
- State Water Plan

Water Resources Monitoring and Mapping

- Groundwater monitoring network
- Saltwater monitoring network
- Water-level (potentiometric) mapping
- Aquifer delineation
- Surface water monitoring

Water Resources Data Collection

- Coring/drilling
- Geophysical logging
- Well inventory/database

Water Resources Policy and Management Guidance

- Savannah River basin study
- FERC relicensing
- Environmental reviews and drought assessments

WATER PLANNING



GROUNDWATER MONITORING



AQUIFER DELINEATION



Surface Water Monitoring

- Workshops were held to highlight monitoring needs
- Attended by a variety of stakeholders.
- 105 recommendations for flood forecasting, water planning, water quality, and ecological monitoring.
- DNR currently funds 16 USGS streamflow gages.





http://www.dnr.sc.gov/water/hydro/streamflow.html

Groundwater Monitoring

Total: 168 wells Coastal Plain: 153 Piedmont/Blue Ridge: 15 Automatic (ADR): 133 Manual: 35 Well-cluster sites: 32 Conductivity: 11 Telemetry sites: 9 Core holes: 28 Period of Record:

- Several months to over 50 years (BFT-101)
- 10-15 years is typical



http://www.dnr.sc.gov/water/hydro/groundwater/index.html

Long-term groundwater-level data will support:

- Groundwater management and permitting
- Drought assessments
- Identification of long-term trends
- Groundwater modeling
- Water-level (potentiometric) mapping
- Evaluation of groundwater availability







SC Drought Tabletop Exercise

80 participants from 40 agencies



WHAT

80 participants met to review the plans and procedures that govern state-, basin-, and local-level responses to drought and water shortages.

WHY

1) Identify and understand the strengths and breaking points in the <u>SC Drought Response</u> <u>Act</u>, <u>SC Drought Regulations</u>, <u>SC Emergency Response Plan</u> <u>Drought Annex</u>, and local drought plans and procedures

2) Improve awareness of local, state, and federal players in South Carolina's drought response

3) Identify key mission areas for each State Emergency Support Function

4) Collect ideas and strategies for future exercises

WHEN

September 27, 2017

WHERE

South Carolina Emergency Operations Center West Columbia, SC

ORGANIZERS



Additional information and

SOUTH CAROLINA DROUGHT & WATER SHORTAGE TABLETOP EXERCISE

About South Carolina Drought Response

Drought is a complex natural hazard that can cover large territories and last for months or years. Drought can have severe effects on water resources and water-dependent sectors. The South Carolina State Climatology Office, Department of Natural Resources, and Drought Response Committee routinely monitor conditions, evaluate impacts, and provide information to the public so that water managers and users can respond effectively.

The SC Drought Response Act and Regulations guide state actions during different stages of drought. The Drought Annex of the State's Emergency Operations Plan can be activated when drought threatens public health, safety, or welfare. The tabletop exercise allowed different agencies and water managers to walk through and discuss the effectiveness of drought response plans and procedures.



KEY NEEDS & ACTION ITEMS IDENTIFIED AT THE EXERCISE

1) PLANS AND PROCEDURES	2) COMMUNICATIONS	
<i>Identified Need:</i> Better coordinated and timely drought response	Identified Need: Improved Information sharing across agencies and with the public	
Proposed Action Items: » Fill Drought Response Committee vacancies » Review and update state and local plans and ordinances, Including the Drought Response Act, Drought Regulations, and Drought Annex of the Emergency Operations Plan	Proposed Action Items: » Formalize processes to promote information sharing, enhance awareness of regional and local issues, and facilitate better working relationships across different agencies » Develop clear, consistent water conservation messaging for different stages of drought	
3) EDUCATION & AWARENESS	4) DATA & INFORMATION	
Identified Need: Greater agency familiarity with the Drought Response Program and their role in drought response and mitigation	Identified Need: More Information to build common understanding of drought risks Proposed Action Items:	
Proposed Action Items: » Develop education and training modules for Emergency Managers and others to learn more about drought » Conduct future exercises at the regional and watershed level	 Identify and develop information that could enhance drought response and planning, such as - rainfall, weather and climate monitoring tools; water system intakes and interconnections; sector-specific impacts; resources for response and mitigation 	

http://www.scdrought.com/planning.html

Drought Response Committee Appointments

- 48 total drought response committee positions within 4 drought management areas
- 28 drought response committee members
- 20 vacant drought committee positions
- 5 additional state agency members



2017-2018 Governor McMaster

- 9 appointed:
 - Preston Pierce
 - David Evans
 - Yvonne Kling
 - Chris Rasco
 - Ed Saxon
 - Gregory Sprouse
 - Alan Stuart
 - Jason Thompson
 - Frank Williams
- 5 re-appointed:
 - James Bagley
 - Stephen Caston
 - Brad Powers
 - John Westcott
 - Scott Willett

Hurricane Florence Assistance









Tropical System Florence September 15-17, 2018 Preliminary Rainfall Totals http://cisa.sc.edu



Includes examples of 3-day totals that have 1-in-500 and 1-in-1000 chance of occurring in any given year

SC Impacts

 3-day rainfall total of 23.57", Loris 2.9 WSW, highest SC rainfall total caused by a tropical cyclone, replacing previous total of 17.45" caused by 1994 Tropical Storm Beryl

> Loris (CoCoRaHS) 500-yr: 17.2 1000-yr: 19.4 observed: 23.57

SC River Crest Records

River Gauge	Florence Crest (ft.)	Previous Crest (ft.)	Previous Crest Date/Event
Waccamaw at Longs	20.22	17.94	9/22/1999 - Hurricane Floyd
Waccamaw above Conway	19.82	15.77	10/16/2016 - Hurricane Matthew
Waccamaw at Conway	21.16	17.87	10/18/2016 - Hurricane Matthew
Pee Dee at Bennettsville	94.25	89.94	04/12/2003 - No Name Event
Black Creek near Quinby	17.37	16.81	10/05/2015 - October Flood
Little Pee Dee near Galivants Ferry	17.21	17.10	10/12/2016 - Hurricane Matthew



South Carolina State Climatology Office Preliminary Open File Report- Hurricane Florence http://www.dnr.sc.gov/climate/sco/Publications/FlorenceQuickReport_100518.pdf

Flood Inundation Map

- Mapped 8,600 square miles in 3 days
- Original based on forecasted rainfall
- Revised with observed conditions
- Flood Map (9/13/2018-10/4/2018): 440,713 hits Public Lands (10-4/2017-10/4/2018): 98,017 hits (normally SCDNR's most viewed web page)





Post Disaster Responsibilities

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Substantial Damage Assessments

- Bennettsville 293
- Dillon County 46
- Marlboro County 35
- Marion County 1,200
 - Nichols 283
- Conway 179
- Georgetown



The SDE is a tool to help local officials administer the Substantial D amage requirements of their floodplain management ordinances in keeping with the minimum requirements of the NFIP.

Substantial Damage Assessments



