South Carolina DNR’s Groundwater Monitoring Network

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March 2014
South Carolina Ground-Water Monitoring Network

• Collaborative effort between 3 agencies:
  • South Carolina Department of Natural Resources (SCDNR) - 122 wells
  • South Carolina Department of Health and Environmental Control (SCDHEC) - 41 wells
  • United States Geologic Survey (USGS) - 18 wells

“The goal of this cooperative effort is to develop and maintain a statewide ground-water monitoring network that provides scientifically defensible information for use in planning, managing, and developing South Carolina’s ground-water resources in a responsible and sustainable manner for all current and future users.”
Purpose of the Monitoring Network

- Establish a long-term groundwater dataset to support:
  - Groundwater management and permitting
  - Drought assessments
  - Identification of long-term trends
  - Groundwater flow modeling
  - Water-level (potentiometric) mapping
  - Evaluation of groundwater availability
SCDNR Baseline Groundwater Monitoring Network

- 122 wells – most owned by SCDNR.

- 86 wells – Equipped with automatic data recorders (ADRs) which record hourly water levels.

- 36 wells – Periodic measurements made every 2-3 months.

- Periods of Record:
  - range from several months to over 50 years.
  - 10-15 years is typical.
SCDNR Baseline Network

Wells
122 monitoring wells
104 Coastal Plain
18 Piedmont
85 equipped with recorders
37 manually measured
22 sites have been cored
21 sites are well-clusters (two or more wells)

Aquifers
5 Surficial
11 Tertiary sand
27 Floridan
29 Black Creek
31 Middendorf
2 Cape Fear
3 Saprolite
14 Crystalline rock

Explanation
- Monitoring site that has been cored
- Monitoring site that has not been cored
- Number of wells being monitored at site
Methods

- Field visits are taken every 2-3 months:
  - Manual measurements are recorded.
  - ADRs (predominantly of the pressure transducer variety) are downloaded.
  - ADRs are calibrated, fixed or replaced as needed.
- Manual and downloaded hourly data are checked for quality assurance and quality control and entered into SCDNR database.
- Daily average water levels are computed from hourly data and converted to depths below land surface.
Principal Coastal Plain Aquifers

[Diagram of coastal plain aquifers with labels for Columbia, Orangeburg, St. George, and Charleston. The diagram shows the land surface, surficial aquifer, Tertiary sand, Floridan, Black Creek, Middendorf, and Cape Fear aquifer. The vertical axis is not to scale.]

Legend:
- Aquifer
- Confining unit
- Crystalline rock

Scale: 0 10 20 30 40 50 miles
Interpreting Groundwater Behavior Can Be Challenging:

- Some sites have inadequate periods of record from which to evaluate long-term trends.
- Can be difficult to distinguish between the impacts of drought and impacts of pumping.
- Limited spatial distribution of wells.
- Incomplete groundwater use data (historically and currently).
- Incomplete data on where wells are screened.
Crystalline Rock/Saprolite Aquifer System
• Strong drought signature
• Typically recovers from drought

• Weak drought signature
• Weak recovery after 1998-2002 and 2007-2008 droughts and overall downward trend

• Strong recovery after 1998-2002 and 2007-2008 droughts, but no recovery after 2012 drought
Middendorf Aquifer
- Significant recovery after City of Florence supplemented ground-water supply with Pee Dee River.

- Decline likely due to pumping on Hilton Head.
- Little to no recovery after 1998-2002 drought
- Overall downward trends

- Smaller downward trends,
- Stronger recovery from drought
- Evidence for recent increased pumping
Black Creek Aquifer
• Industrial and Municipal Pumping in southeastern Florence County

• Steady decline over past 10 years likely due to municipal pumping
• Strong seasonal signature - likely due to irrigation
• Little to no 2013 seasonal decline

• Decline, in part, due to 2007-2008 drought
• Significant recharge related to 2013 summer rainfall
Floridan Aquifer
- Recovered well from past droughts
- No long-term decline

- Long-term downward trend
- Noticeable 2013 summer recharge
Water levels have leveled off after declines during the 1960s, 1970s and 1980s, but have greater seasonal variations.
Many of our well sites are experiencing downward trends.
  - Declines are generally more severe along the Coastal counties.
  - Largest declines associated with known pumping centers
  - Substantial number of sites had little to no recovery after 1998-2002 drought.
  - Water level behavior likely a function of increased drought frequency and local/regional pumping.
  - Noticeable recharge from 2013 rainfall in the Floridan and Black Creek aquifers in some areas

Long-term upward trends associated with areas where water users have supplemented water supply with surface water or transitioned from ground water to surface water.
Future Work/Considerations

- Need a detailed study of water withdrawals from each aquifer to better understand ground water trends:
  - *How much of a decline is due to the severe droughts over the last 15 years and how much is due to pumping?*

- Need a better understanding on the significance of water level declines:
  - *When is a decline severe enough to cause concern?*

- Need to *strategically* expand our baseline monitoring network
Recent Drilling Activities

Lee State Park in Lee County – 3 wells
Wee Tee State Forest in Williamsburg County – 1 well
Creston Fire Station in Calhoun County – 4 wells
Continuous core to 1,057 feet at Creston, Calhoun County
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400-ft core hole in Marlboro County
4 additional wells at Little Pee Dee State Park
800-ft core hole in Georgetown County at the Baruch Institute

Saltwater intrusion monitoring program along entire coast
• Hydrographs and other information about the network can be found in:
  • *Ground-Water Levels in South Carolina, 2006-2010*
  South Carolina Department of Natural Resources
  Water Resources Report 50

• Report is available at:
  [http://dnr.sc.gov/water/hydro/PubsDNRrep.htm](http://dnr.sc.gov/water/hydro/PubsDNRrep.htm)

• Data are available at:

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End of presentation.