Status of Recent U.S. Geological Survey NAWQA Cycle 3 Activities in Alabama

Amy Gill
USGS
Alabama Water Science Center
USGS NAWQA Program

- **Was created**
  - to better understand the current status of water quality
  - to discern trends in water quality conditions over time
  - to identify the most important natural and anthropogenic factors contributing to changes in water quality.

- **NAWQA began in 1991- first decade (Cycle 1)**
  - focused on water quality within 51 study areas nationwide

- **Cycle 2 (2001-2012)** – focused on regional assessments, trends in water quality, modeling
NAWQA Cycle 3
Study Components

1. National Fixed Site Network - 100 streams monitored for long-term trends
2. Regional Stream Quality Assessments - Intensive single season studies
3. Principal Aquifer Surveys - Groundwater quality
4. Integrated Watershed Studies - GW-SW relations in a few settings
5. Forecasting - Models of surface- and groundwater quality and effects on aquatic ecology

USGS
2 Funded Fixed Large River Sites in Alabama
NFSN in Alabama

- Tombigbee River below Coffeeville Lock and Dam
- Mobile River near Mt. Vernon, AL
- Samples collected monthly most months and bimonthly during several growing season months.
- Samples analyzed for nutrients, major ions, sediment, pesticides.
- Add-on samples have included glyphosate, bacterial DNA, and stable isotope analyses.
NAWQA Cycle 3 (2013-2023)

- Groundwater – Principal Aquifer Studies
  - Evaluate the quality and availability of groundwater for drinking water supply
  - Improve understanding of where and why groundwater quality is degraded
  - Assess how groundwater quality could respond to changes in climate and land use
Principal Aquifers
### Unconsolidated and semiconsolidated sand and gravel aquifers

- 1. Basin and Range basin-fill aquifers
- 2. Rio Grande aquifer system
- 3. California Coastal Basin aquifers
- 4. Pacific Northwest basin-fill aquifers
- 5. Columbia Plateau basin-fill aquifers
- 6. Snake River Plain basin-fill aquifers
- 7. Puget Sound aquifer system
- 8. Willamette Lowland basin-fill aquifers
- 9. Northern Rocky Mountains Intermontane Basins aquifer system
- 10. Central Valley aquifer system
- 11. High Plains aquifer
- 12. Pecos River Basin alluvial aquifer
- 13. Mississippi River Valley alluvial aquifer
- 14. Seymour aquifer
- 15. Surficial aquifer system
- 16. Unconsolidated-deposit aquifers (Alaska)
- 17. South Coast aquifer (Puerto Rico)

### Sandstone aquifers

- 23. Colorado Plateaus aquifers
- 24. Denver Basin aquifer system
- 25. Lower Cretaceous aquifers
- 26. Rush Springs aquifer
- 27. Central Oklahoma aquifer
- 28. Ada–Vamoosa aquifer
- 29. Early Mesozoic basin aquifers
- 30. New York sandstone aquifers
- 31. Pennsylvanian aquifers
- 32. Marshall aquifer
- 33. Cambrian–Ordovician aquifer system
- 34. Jacksonville aquifer
- 35. Lower Tertiary aquifers
- 36. Upper Tertiary aquifers

### Carbonate-rock aquifers

- 42. Basin and Range carbonate-rock aquifers
- 43. Roswell Basin aquifer system
- 44. Ozark Plateaus aquifer system
- 45. Blaine aquifer
- 46. Arbuckle–Simpson aquifer
- 47. Silurian–Devonian aquifers
- 48. Ordovician aquifers
- 49. Upper carbonate aquifer
- 50. Floridan aquifer system
- 51. Biscayne aquifer
- 52. New York and New England carbonate-rock aquifers
- 53. Piedmont and Blue Ridge carbonate-rock aquifers
- 54. Castle Hayne aquifer
- 55. North Coast Limestone aquifer system (Puerto Rico)
- 56. Kingshill aquifer (Virgin Islands)

### Sandstone and carbonate-rock aquifers

- 38. Edwards–Trinity aquifer system
- 39. Valley and Ridge aquifers – Carbonate-rock aquifers are patterned
- 40. Mississippian aquifers
- 41. Paleozoic aquifers

### Igneous and metamorphic-rock aquifers

- 57. Southern Nevada volcanic-rock aquifers
- 58. Pacific Northwest basaltic-rock aquifers
- 59. Snake River Plain basaltic-rock aquifers
- 60. Columbia Plateau basaltic-rock aquifers
- 61. Hawaiian volcanic-rock aquifers – Locally overlain by sedimentary deposits
- 62. Piedmont and Blue Ridge crystalline-rock aquifers

### Other

- Rocks that are minimally permeable but may contain locally productive aquifers
• Represent 85 percent of the groundwater pumped for domestic supply
• Represent 76 percent of the Nation’s groundwater pumped for Public Supply

20 Principal Aquifers selected for intensive study during Cycle 3

http://water.usgs.gov/nawqa/studies/praq/LargePAMap.html
Principal Aquifer Studies - Alabama

- 5 Principal Aquifers (PAs) sampled in Alabama
  - Coastal Lowlands
  - Southeastern Coastal Plain
  - Valley and Ridge Carbonate
  - Piedmont and Blue Ridge
  - Mississippi Embayment

- In 2013, Public Water Supply (PWS) wells from 30 systems representing 3 PAs
- In 2014, 4 PWS wells from 2 more PAs

USGS
Samples are analyzed for:

- Nutrients
- Major ions
- VOCs
- Trace elements
- Hormones
- Pharmaceuticals
- Radionuclides
- Age Dating
- Coliphage & Fecal indicator bacteria
What will Participants Gain from the NAWQA Principal Aquifer Survey?

The survey will provide water utilities and resource managers with information about the following:

- Regulated and unregulated constituents from natural or human sources.
- Pesticides, pharmaceuticals, hormones, and other constituents of concern for human health.
- Baseline groundwater quality for comparison with future conditions.
What will Participants Gain from the NAWQA Principal Aquifer Survey?

- Regional and national statistics on water quality, as context for individual wells.
- A comparison of water quality in the shallow and deep parts of aquifer systems.
- Environmental tracers that can be used to understand sources and sustainability of groundwater supplies.
- Improving understanding of local, regional, and national hydrogeology.
NAWQA Cycle 3
(2013-2023)

- Surface Water - Regional Studies
  - Nutrients
  - Contaminants
  - Sediment
  - Streamflow Alteration

- Stream Quality Assessments seek to further understanding of the relationships of these stressors to ecological conditions within study regions.
Evaluation of Candidate Regions

Aggregated level 2 Ecoregions

Farm Resource Regions

USGS
Current Studies

- MSQA
- CO flow
- SESQA
- NE flow recon
Southeast Stream Quality Assessment (SESQA)

121 Sites

- 59 Urban
- 5 CAFO
- 13 Reference
- 44 Hydro
Southeast Stream Quality Assessment (SESQA)

- Ecological Condition
- Water Sampling
- Integrated Samplers
- Sediment Sampling
- Toxicity Testing
- Continuous Monitoring
- Daily Pesticide Sampling
All SESQA Sites (including 44 Hydro)

• Ecological Survey and sediment sample:
  • Algae, inverts, fish, and habitat using modified NAWQA protocol
  • Large volume composite sediment sample (not all parameters in all samples)
    • Current use pesticides, major and trace elements, radionuclides, OWI, PAHs, halogenated compounds, hormones
  • Toxicity testing (CERC)
Piedmont Sites (Regular)

- **Regular Sites – 10 water samples:**
  - EWI samples from teflon churn (not all parameters in all samples)
    - pesticides, nutrients, major ions, pharmaceuticals, glyphosate, suspended sediment
  - Grab samples (not all parameters in all samples)
    - DOC, chl-a, Hg, N&O isotopes
  - Passive Samplers (CERC) – twice, March-May and May-July
    - POCIS for current use pesticides
Piedmont Sites (Reference)

- Reference Sites – 4 water samples:
  - EWI samples from teflon churn
    - pesticides, immuno assays, nutrients, major ions, suspended sediment
  - Grab samples
    - DOC, chl-a, Hg
  - Passive Samplers (CERC) – once, May-July
    - POCIS for current use pesticides
Southeast Stream Quality Assessment (SESQA) in Alabama

2 Reference Sites for Piedmont –

- Hatchet Creek near Rockford, AL
- Hillabee Creek near Hackneyville, AL
Hydro Sites

- Hydro Sites – 1 water sample:
  - EWI samples from teflon churn
    - pesticides, immuno assays, nutrients, major ions, suspended sediment
  - Grab samples
    - DOC, chl-a, Hg
Southeast Stream Quality Assessment (SESQA) in Alabama

3 Hydro Sites—

- Blackburn Fork
- Little Warrior
- River near Holly Springs

- Little Cahaba River at Cahaba Beach Road

- Chewacla Creek at Chewacla State Park
Further Information

- Principal Aquifer Studies
  - USGS Fact Sheet 2014-3024; April 2014
  - Gulf Region Coordinator – Jeannie Barlow, jbarlow@usgs.gov

- Southeast Stream Quality Assessment
  - USGS Fact Sheet 2014-3023; March 2014
  - Contacts: Pete van Metre, pcvanmet@usgs.gov or Celeste Journey, cjourney@usgs.gov