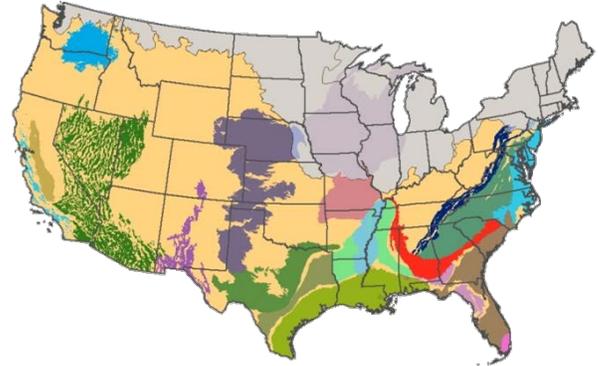


## The Quality of Our Nation’s Groundwater

Every day, millions of gallons of groundwater are pumped to supply drinking water for about 142 million people in the United States. The U.S. Geological Survey National Water-Quality Assessment (NAWQA) project evaluates the quality of groundwater across the Nation to improve our understanding of where and why groundwater quality is degraded and to assess how groundwater quality could respond to changes in climate and land use. In short,



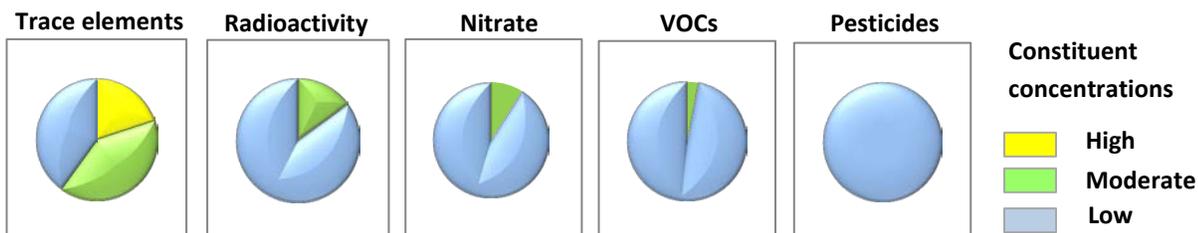
NAWQA addresses the following policy questions related to groundwater quality:

- What is the quality of the Nation’s groundwater?
- Has it gotten better or worse over time?
- How might it change in the future?

### The Quality of Groundwater Used for Public Supply

NAWQA is assessing groundwater quality in 20 Principal Aquifers that together supply 90 percent of the pumping for public supply in the U.S. From 2013 – 2023, 1,500 public-supply wells are being sampled for a myriad of water-quality constituents, including trace elements, radionuclides, nutrients, VOCs, pesticides, microbiological constituents, pharmaceuticals, hormones, major ions, DO, redox, pH and tracers of groundwater age.

Assessments are nearing completion for five aquifers. Trace elements are the drinking-water contaminants most prevalent at high concentrations in these aquifers at the depths used for public supply. Constituents of note are: manganese, arsenic, gross alpha radioactivity, fluoride and nitrate. Microbial constituents are more common in carbonate rocks compared with other aquifer materials. Pie charts showing which constituent groups occur most frequently at concentrations that are high relative to human health benchmarks in groundwater samples from the Basin and Range Principal Aquifer (dark green on upper map) are shown below.



*“The USGS NAWQA project’s broad overview of water quality in each aquifer system, which doesn’t stop at state borders, provides insights out of reach of any single state, as well as vital research for understanding the occurrence of toxicologically-important radionuclides.”*

**Jim Jacobus, Toxicologist/Research Scientist, Minnesota Department of Health**

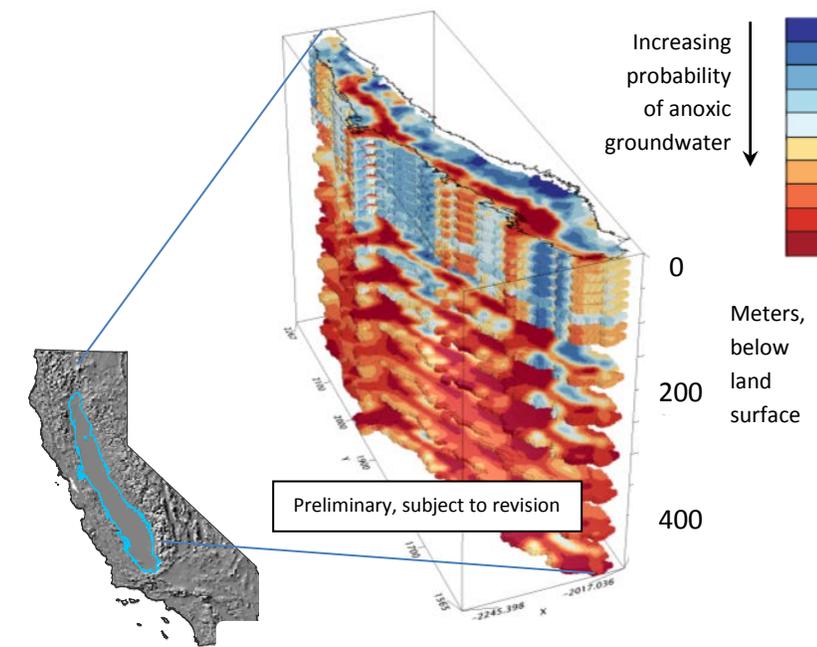
## Decadal Changes in Groundwater Quality

Decadal changes in groundwater quality in shallow-monitoring and domestic-well networks have been evaluated to provide a national perspective on change <http://pubs.usgs.gov/sir/2012/5049/>. Results can be explored in a soon-to-be-released trends mapper. Important patterns in groundwater-quality over time, such as observed increases in chloride concentrations in urban areas of the Northeast and Upper Midwest, are revealed.



## Modeling Geochemical Conditions in Support of Contaminant Prediction

Statistical models are used to map groundwater quality in unsampled areas and depth zones. 3-D aquifer maps of geochemical information help pinpoint where drinking-water contaminants will remain dissolved in groundwater, react with aquifer solids, or degrade before reaching a well or stream. The 3-D map of anoxic conditions in the Central Valley (shown below) is the first of its kind. This information is providing insight into observed nitrate and arsenic concentrations in the Central Valley and will be used to support contaminant predictions.



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Rosecrans et al., written commun.

*"Working with USGS scientists and having results of NAWQA sampling and modeling is crucial to the success of the Wisconsin Nitrate Demonstration. The comprehensive sampling, age dating and modeling work being done by NAWQA gives our partners confidence that they are working in the right place on the landscape and that their actions have the highest likelihood of success."*

**Mary Ellen Vollbrecht, Chief, Groundwater Section, Wisconsin Department of Natural Resources**