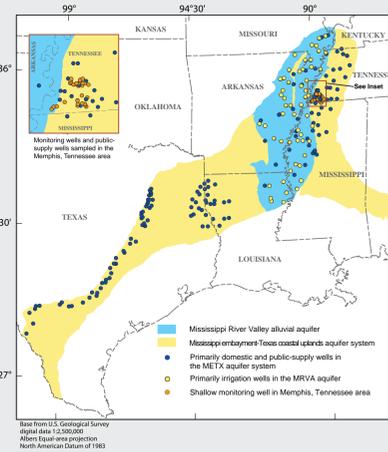


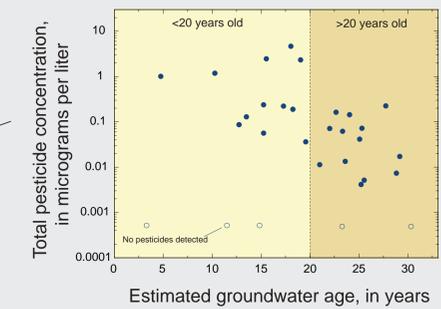
# Water Quality of the Mississippi embayment-Texas coastal uplands aquifer system and Mississippi River Valley alluvial aquifer

By James A. Kingsbury, Jeannie R.B. Barlow, and Brian G. Katz

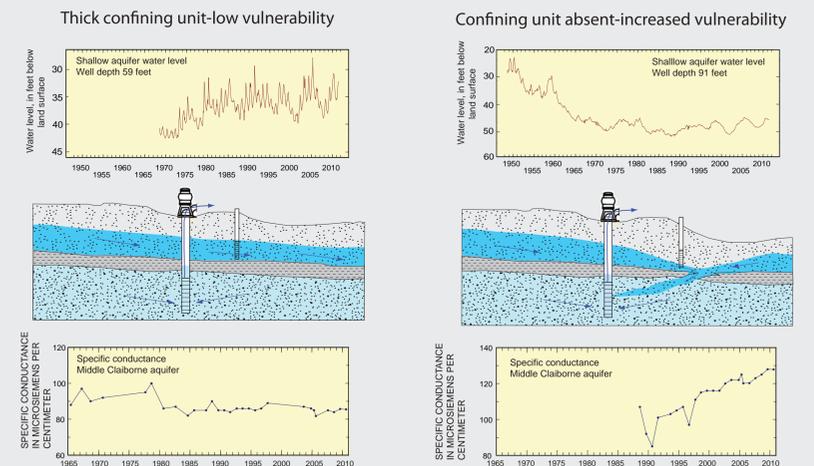
*About 8 million people rely on groundwater from the Mississippi embayment-Texas coastal uplands aquifer system for drinking water. The Mississippi River Valley alluvial aquifer also provides drinking water for domestic use in rural areas, but is of primary importance to the region as a source of water for irrigation. Irrigation withdrawals from this aquifer are among the largest in the Nation and play a key role in the economy of the area, where annual crop sales total over 3 billion dollars. The reliance of the region on both aquifers for drinking water and irrigation highlights the importance of long-term management to sustain the availability and quality of these resources.*



**Shallow groundwater is most vulnerable to contamination where groundwater residence times are short**—One or more pesticides or volatile organic compounds were detected in samples from 42 percent of wells that sampled shallow groundwater in the Mississippi embayment-Texas coastal uplands aquifer system and Mississippi River Valley alluvial aquifer. These contaminants were detected most commonly and at the highest concentrations where groundwater residence times were short (groundwater less than 20 years old) and the groundwater was oxic (containing dissolved oxygen).



**Vulnerability of deep aquifers may increase in areas where withdrawals are greatest**—Large water-level declines in the Mississippi embayment-Texas coastal uplands aquifer system have increased the potential for contamination from shallow groundwater. An example of this is the middle Claiborne aquifer underlying Memphis, Tennessee, in areas where the overlying confining units are thin or absent. In some other areas, increases in chloride and dissolved solids have occurred where saltwater has been drawn from lower parts of the aquifer into areas of freshwater.



**Groundwater is a potential source of phosphorus to streams in the lower Mississippi River watershed**—The median concentration of dissolved phosphorus (0.6 mg/L) in the Mississippi River Valley alluvial aquifer was more than 10 times greater than is typical for groundwater. Groundwater discharge contributes a significant portion of base flow to streams. An association between elevated concentrations of phosphorus and iron suggest that phosphorus transport is facilitated by the reducing conditions in the aquifer.

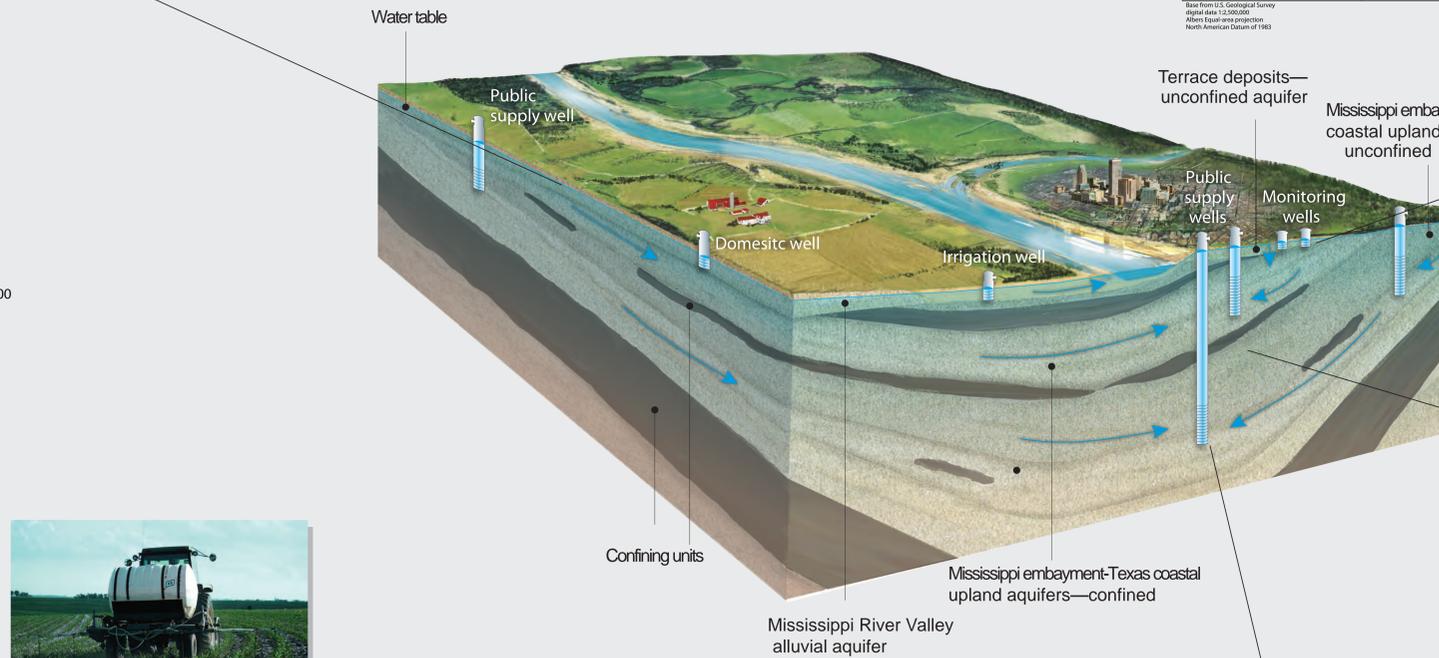
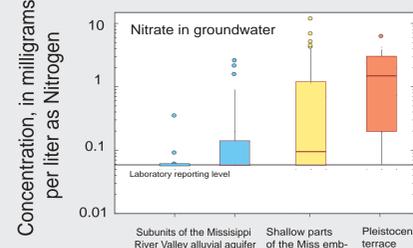
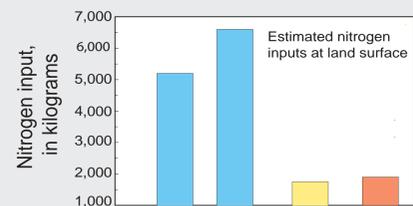
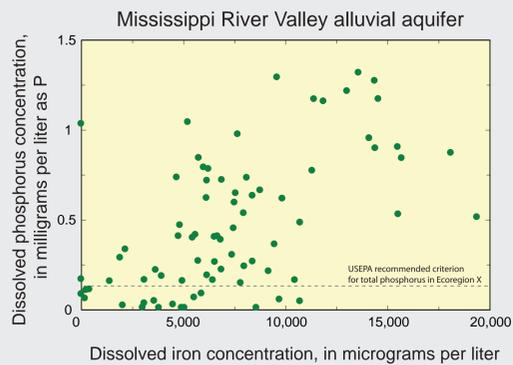


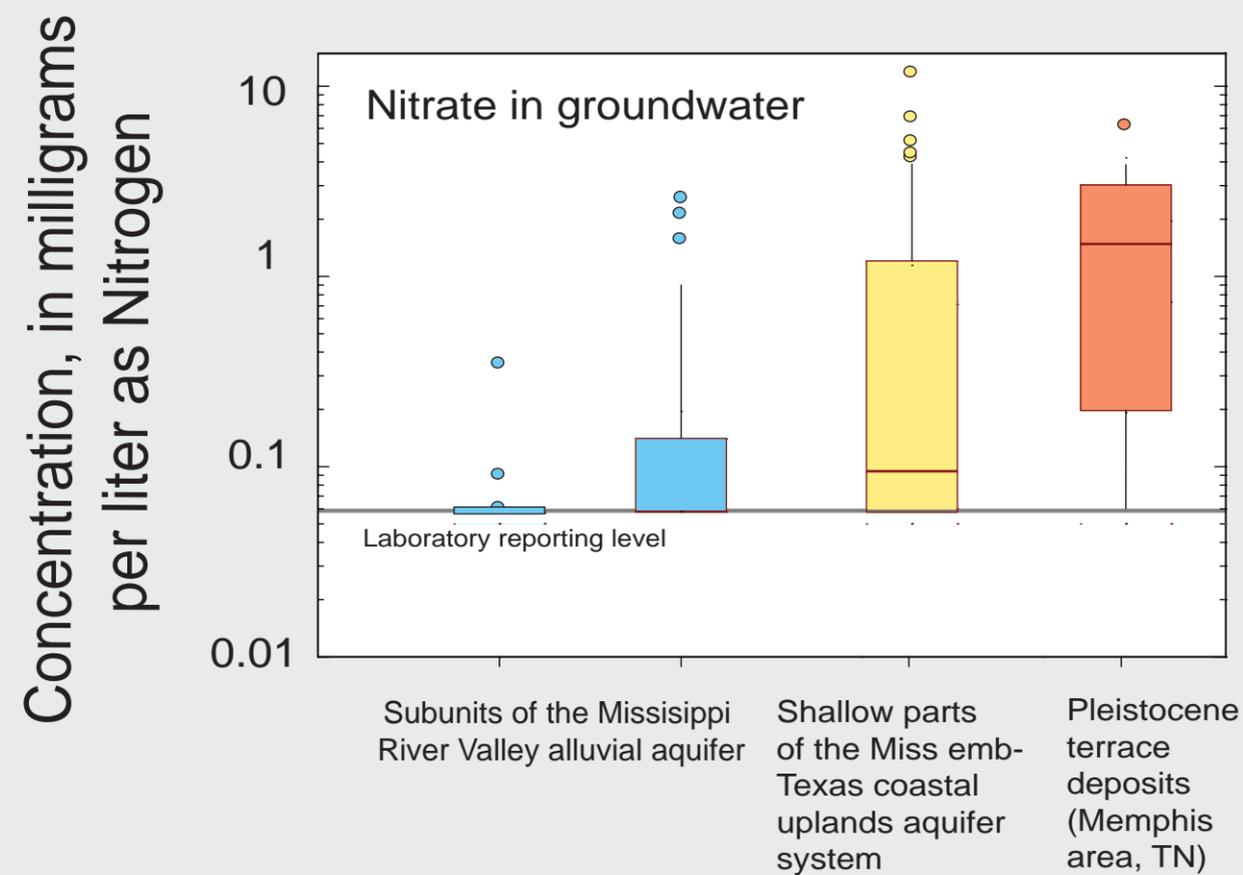
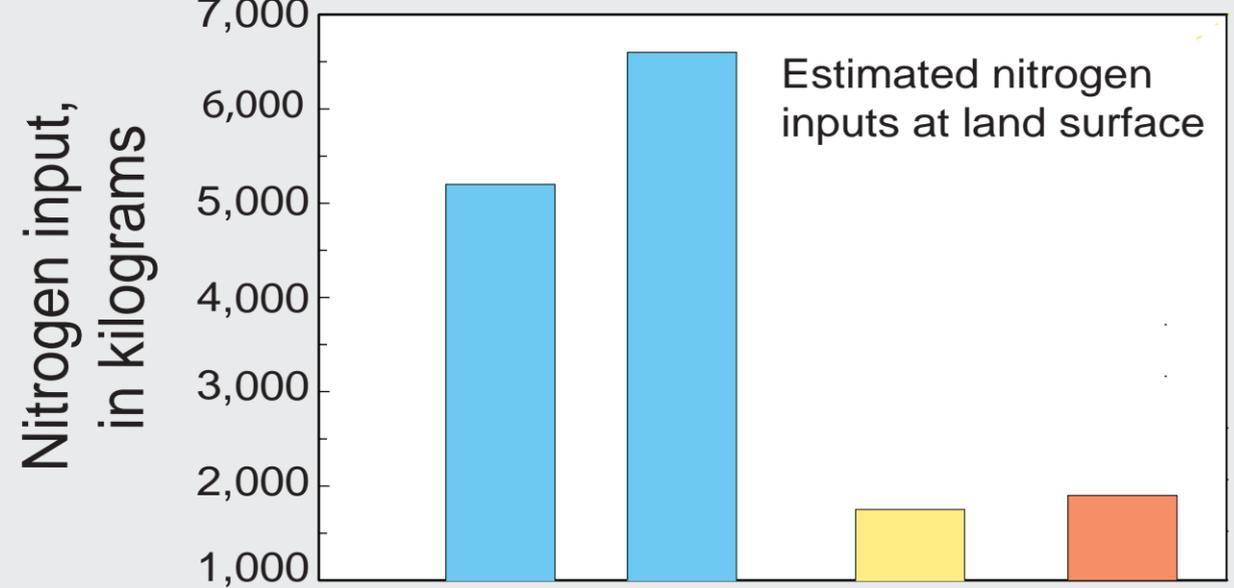
Photo courtesy of USDA NRCS

**Nitrate concentrations in shallow groundwater were low despite widespread fertilizer use**—Although agriculture is the predominant land use near the wells in the Mississippi River Valley alluvial aquifer, nitrate was detected infrequently. When nitrate was detected, concentrations were low (usually less than 1 mg/L) in large part because of the anoxic conditions throughout most of the aquifer which result in the removal of nitrate through denitrification.

**Water produced for domestic and public supply is generally of high quality**—

Few contaminants were detected at concentrations greater than human-health benchmarks. Of those that were, contaminants derived from natural sources such as radon and arsenic were more common and at higher concentrations than those derived from anthropogenic sources such as pesticides.





EXPLANATION

- Oxic
- Mixed
- Anoxic



Redox conditions



Photo courtesy of USDA NRCS

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