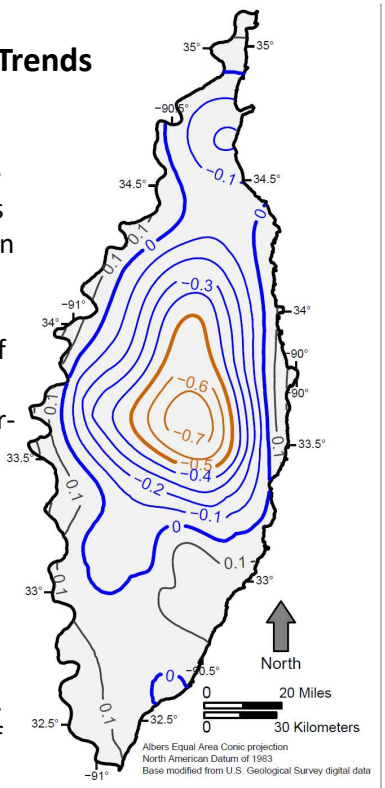
STATUS and TRENDS

Mississippi River Valley Alluvial Aquifer in the Mississippi Delta, Spring 2023

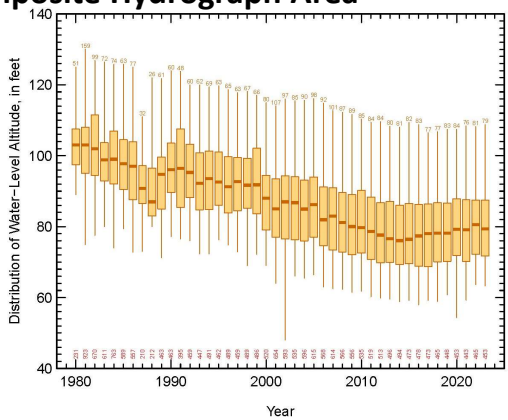
Introduction: The USGS Mississippi Alluvial Plain project is developing tools to support groundwater management across the Delta including assessing recent and long-term trends in groundwater levels. This presentation handout summarizes groundwater level and precipitation data in the Delta from 1981 to 2023 and recent spring-to-spring changes in water surface elevations and related hydrologic variables (see back panel). These analyses are based on 42 years of semi-annual water level data collection by the Yazoo Mississippi Delta Joint Water Management District across 450 to 500 stations.

Long-term Water Level Trends

This map shows contours of long-term water level trends in ft/yr across the Delta. The bold blue contour represents the spatial boundary between long-term positive/negative trends. All points within that contour, representing 65% of the Delta, have experienced an average decrease in water-level altitudes for the period 1981-2023. The bold orange contour represents the area experiencing average decreases in water level of greater than or equal to 0.5 ft/yr (defined as the composite hydrograph area). This contour encloses 10% of the Delta.

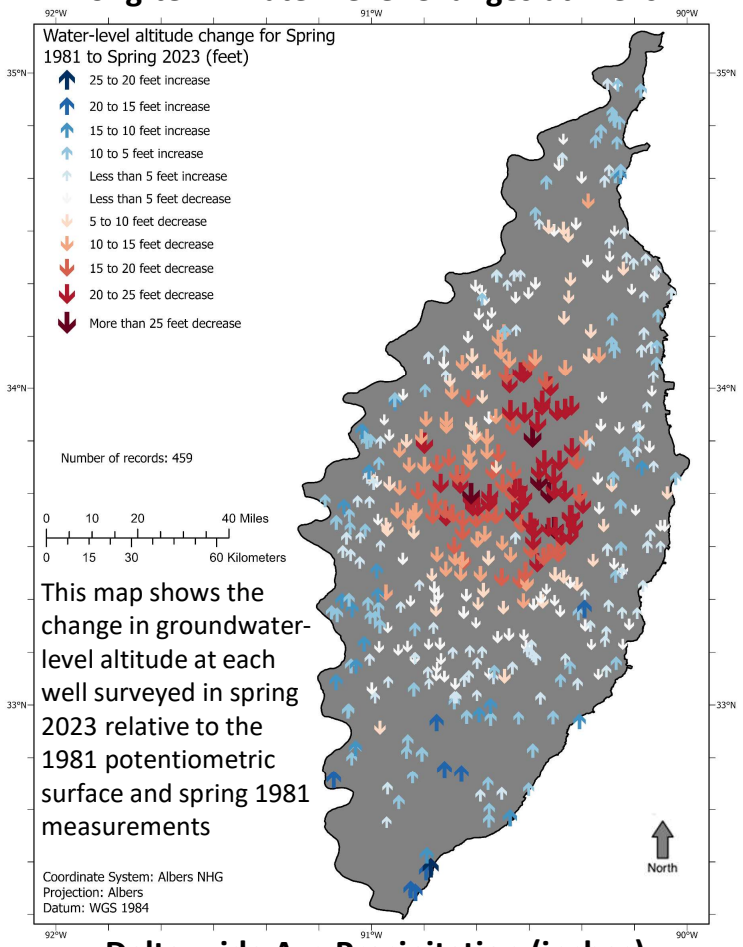


Composite Hydrograph Area



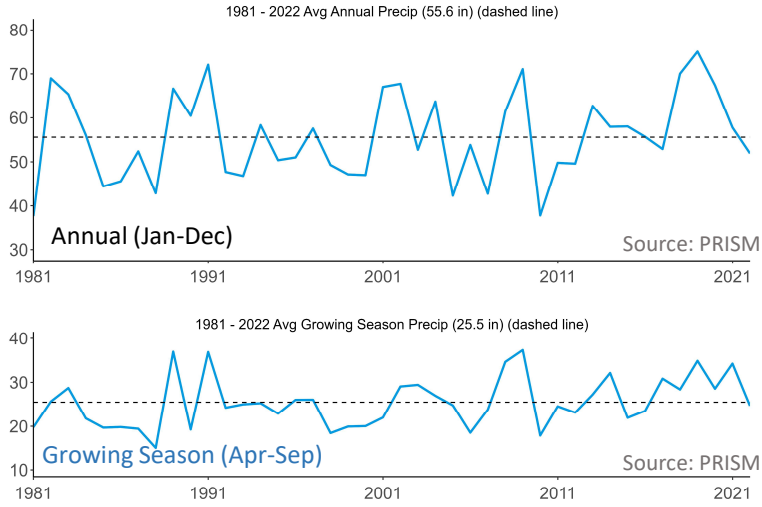
The hydrograph above shows annual spring maximum water levels from all wells measured within the composite hydrograph region. Horizontal bar shows the mean of all wells for each year (1980-2023). Maximum, minimum, and mean values show long term decline. Stabilization in recent years coincides with multiple years of above-average growing season precipitation.

Long-term Water Level Changes at Wells



This map shows the change in groundwater-level altitude at each well surveyed in spring 2023 relative to the 1981 potentiometric surface and spring 1981 measurements

Delta-wide Avg Precipitation (inches)

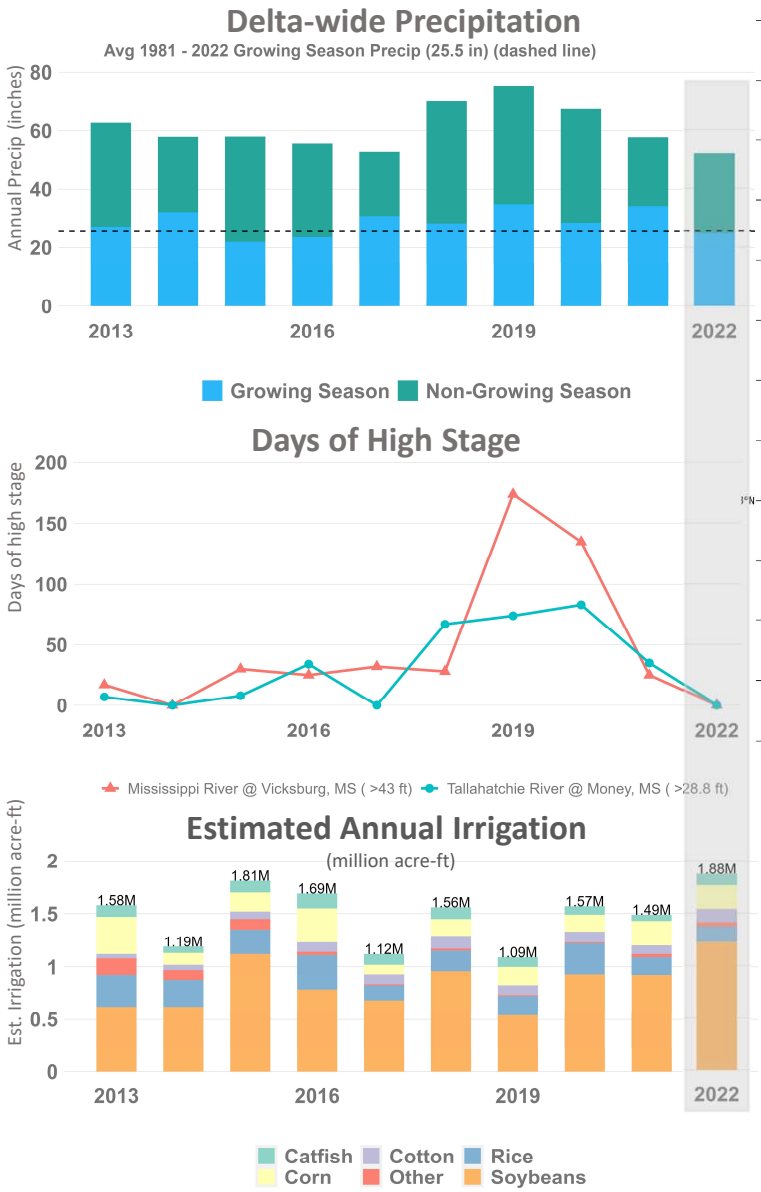


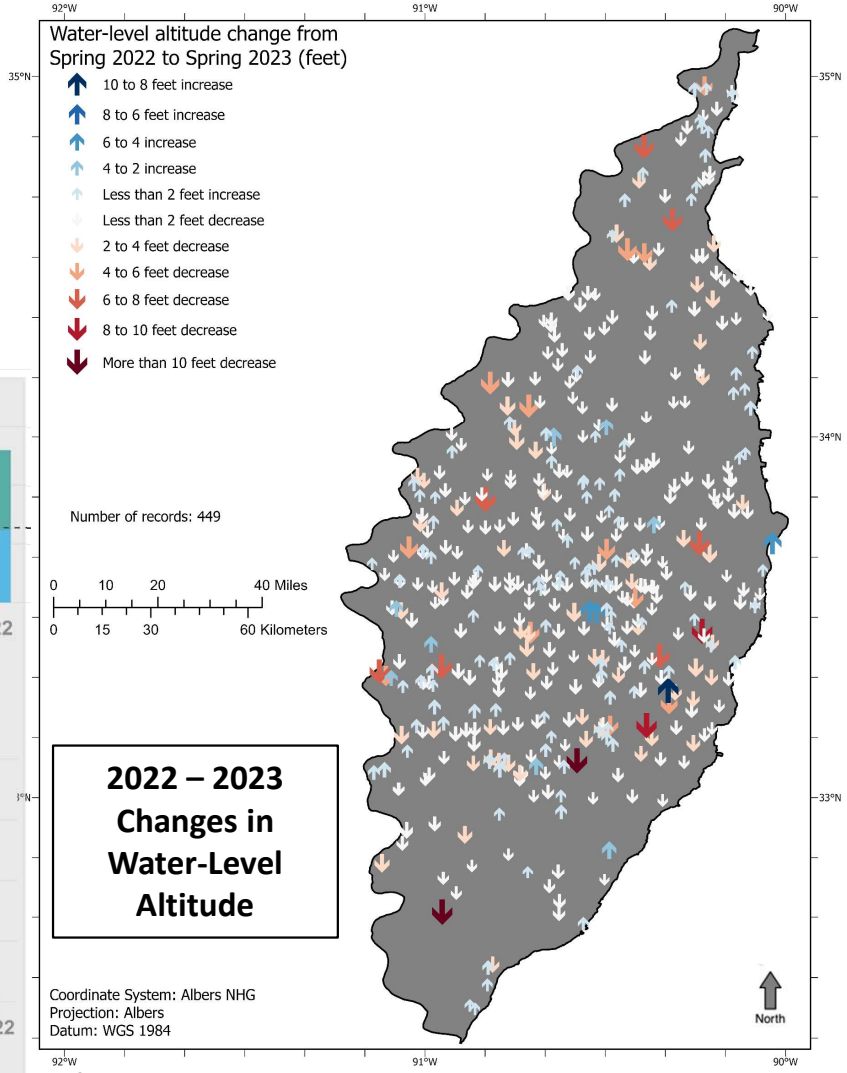
Recent Water-Level Altitude Changes and Hydrologic Drivers

Annual water-level altitude changes (spring-to-spring) are shown below for 2022-2023. The map panel shows an arrow for each well that was measured in both years with the size and direction of the arrow indicating the degree and direction of water-level altitude changes at that observation point. Annual changes over much of the central and western Delta have been positive, though some areas of the Delta have had a negative annual change.

Drivers

Aquifer levels are driven generally by water use and recharge. Estimated irrigation is shown here by crop as the primary water use. Water use is expected to correlate with growing season precipitation. Non-growing season precipitation and high river stages are expected to contribute to annual recharge.





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References

Daly, C., Neilson, R.P., and Phillips, D.L., 1994, A statistical topographic model for mapping climatological precipitation over mountainous terrain: Journal of Applied Meteorology, v. 33, no. 2, p. 140–158, accessed March 30, 2020, at https://doi.org/10.1175/1520-0450(1994)033%3C0140:ASTMFM%3E2.0.CO;2.

U.S. Geological Survey, 2019a, USGS Water Data for the Nation: U.S. Geological Survey National Water Information System database, accessed October 31, 2022, at http://doi.org/10.5066/F7P55KJN.

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Coordinate system: Albers Equal Area, WGS 1984, NAVD88