



As dry as a bone: How do banks cope with droughts?

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Climate Change and Agriculture Vulnerability

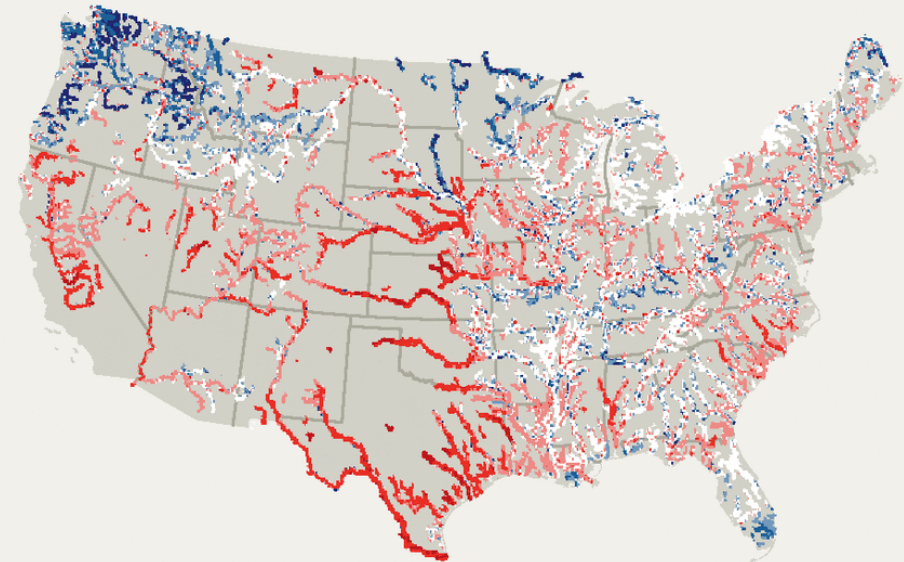
Recent years have seen increased focus on drought, with intense heat waves lowering river levels significantly.

Agriculture is highly vulnerable to climate shifts due to its direct reliance on temperature and precipitation.

United States, river-discharge anomaly, Jun to Aug 2022

↑ Above
average

↓ Below
average





Bank Finance in Agricultural Sectors

- Rajan and Ramcharan (2023) show that access to bank finance boosts agricultural investment and productivity in drought-affected areas, leading to long-term advantages.
- They also observe a sharp decline in bank lending, net immigration, and population growth in drought-exposed areas with limited initial access to banking.
- Scott et al. (2022) document high demand for agricultural loans during periods of low real farm income, but weak demand when real farm income is strong.
- Government assistance and insurance coverage in drought-affected areas must also be considered (Brei, Mohan, and Strobl, 2019 vs. Steidl and Weinrobe, 1982).





Data on banks

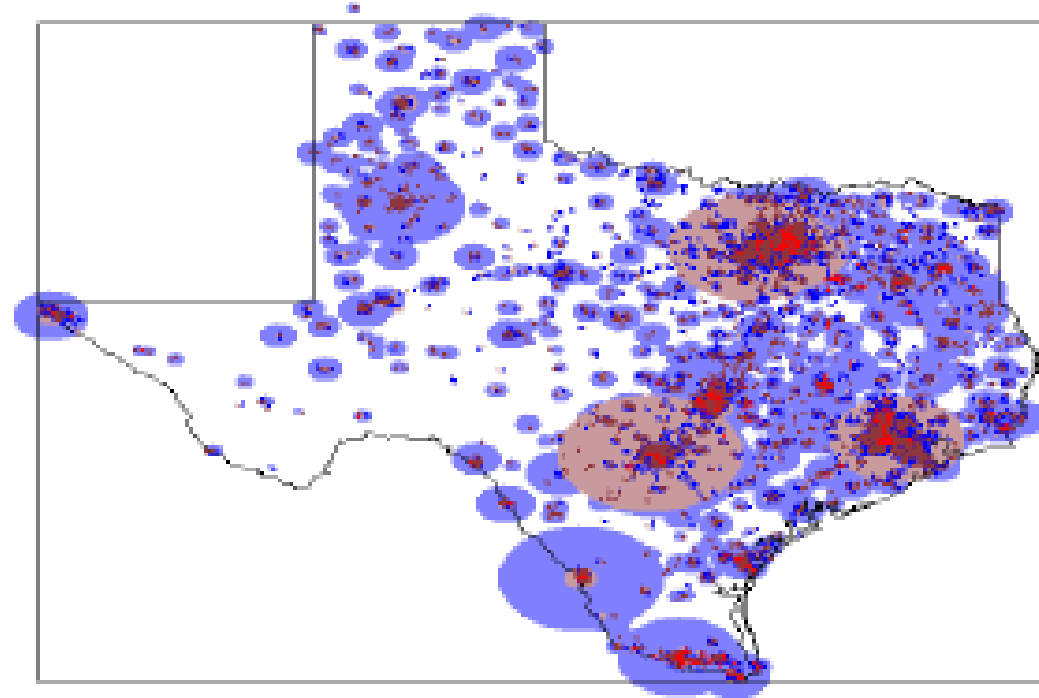
- Bank level - call reports - Consolidated Reports of Condition and Income
 - quarterly Information on financial statements of headquarter
- Bank-county level - Community Reinvestment Act
 - annual information on small business and farm lending by county
- Branch level - summary of deposits and Rate Watch
 - weekly rates on deposit products: INTCK2.5K, MM25K, 03CD10K-60MCD10K
 - focus on rate setters only (10% of branches)





Distribution of Bank Branches in Texas (SOD Database)

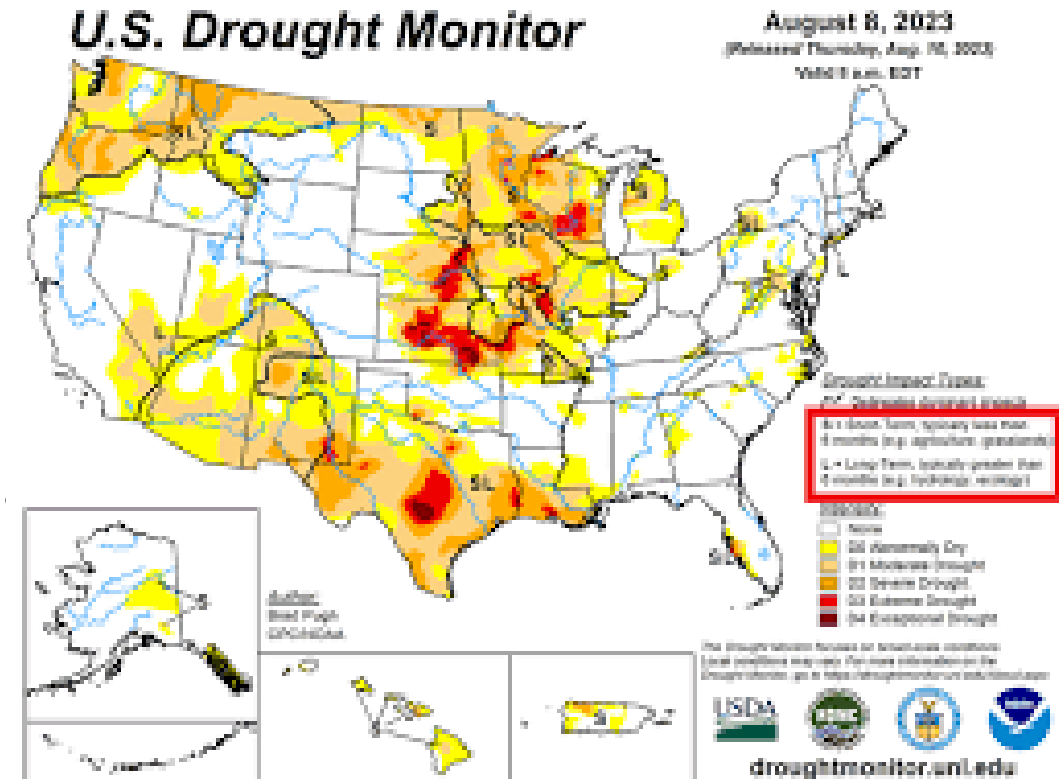
- Blue markers: National banks
- Maroon markers: State banks
- Red markers: Banks that failed in 2007-08
- Transparent circles: Proportional to branch deposit amounts





Measuring Drought Impact

- Designation based on U.S. Drought Monitor (USDM) used in disaster declarations.
- Weekly maps by National Drought Mitigation Center, NOAA, U.S. Department of Agriculture
- Classifications use five quantitative indicators and local expert reports D0-D4.
- Our 5km grid cell drought index: Sum of weeks reaching D2 level in growing season (May-Oct).

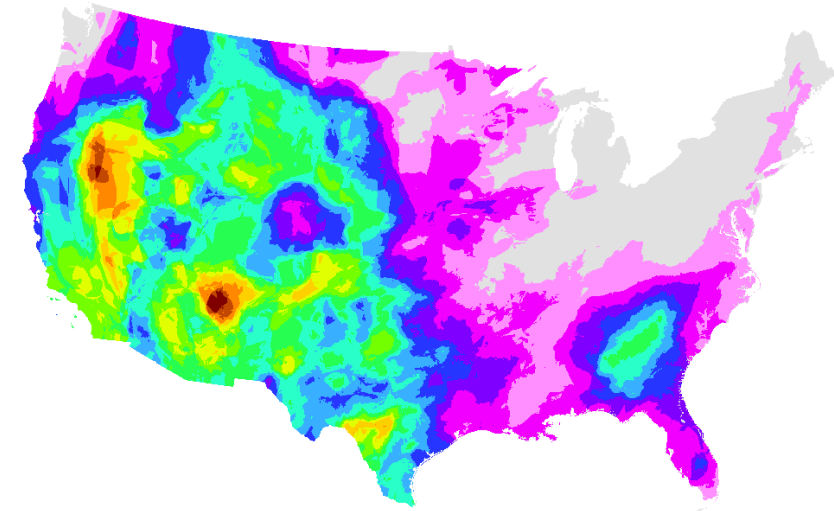


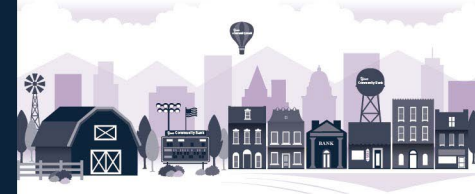


Average Annual Weeks of Drought 2000-2020

- Measures D2 and greater drought levels.
- Growing season: May to November.
- Main impact: South-West U.S.

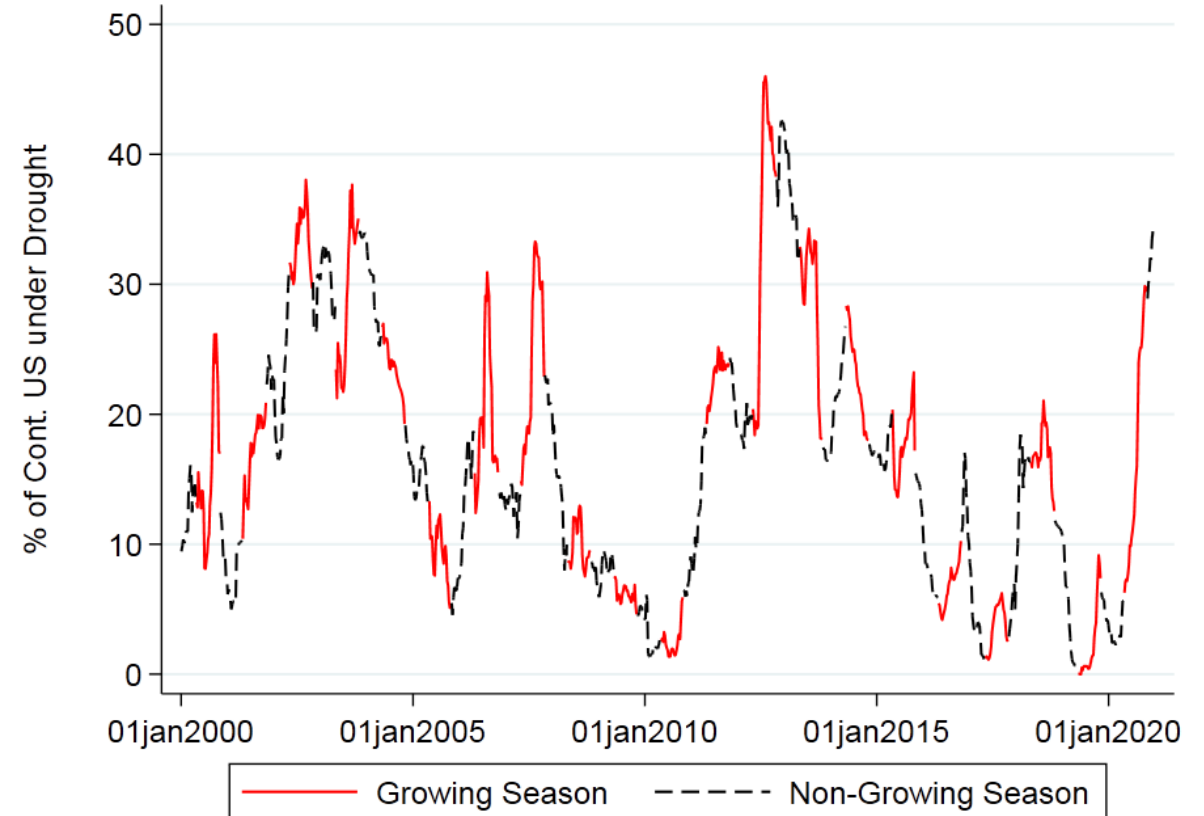
Weeks Drought During Growing Season





Drought Trends and Notable Events

- Droughts are cyclical and peak during growing seasons.
- August 2012: 1,692 counties in 36 U.S. states declared primary natural disaster areas.
- Indications of a new long-term drought cycle.





Linking Branch Data with Drought Index

- Used geographic coordinates of branches to map to USDM's 5km grid cells.
- Gives annual count of weeks a branch was in a D2 or higher drought area.
- Assumption: Farming clients use closest branches (Rajan and Ramcharan, 2023).
- Bank-county level drought indices are weighted by branch deposit shares from the previous year. Aggregation varies at branch and bank levels.





Key Findings on Bank Behavior During Droughts

- No evidence of reduced lending during drought periods.
- Banks alter lending structures, varying by bank type.
- Distinct patterns between local (county and state) banks and geographically diversified banks.
- Federal programs mitigate negative impacts observed during drought periods.





Agriculture lending during drought periods

- Decline in new loans to small farms.
- Reduced share of agricultural loans in portfolios of local and agricultural banks.
- Decline persists even after 2012 aid programs.





Lending to Enterprises During Droughts

- Decline in new loans to small firms.
- Negative impact on small firms reversed after 2012 aid programs.
- No effect on commercial and industrial loans.





Consumer Lending During Droughts

- Increase in consumer lending by local banks.
- Decline observed after the introduction of 2012 aid programs.





Mortgage Lending During Droughts

- No overall effect on mortgage lending.
- Increase in loans secured by farmland and construction land.
- Decrease in residential property loans.
- Trends reverse after 2012 aid programs.





Bank Performance During Droughts

- Changes not driven by banks' financial health.
- Decrease in nonperforming loans, including those secured by farmland.
- Increase in local bank deposits, likely due to higher interest rates on term deposits.





Conclusion:

The study explores U.S. banks' adaptation to droughts from 2000 to 2019.

- Local banks show significant adjustments:
 - Contraction in small business and agricultural lending.
 - Expansion in consumer loans.
 - Build-up of liquidity reserves, possibly for precaution.
- No corresponding increase in non-performing loans.
- Larger banks exhibit fewer changes compared to local entities.
- Government aid mitigates negative impacts on lending and deposits.

