



Water, People, and the Future: Water Availability for Agriculture in the United States

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Four case studies

- **California**
 - Large state with large and growing population
 - Large agricultural sector
- **Arizona**
 - Rapidly growing urban population
 - Large agricultural sector
 - Water-scarce state
- **Florida**
 - State with significant water supplies and agriculture
 - Water supply challenges exist
- **High Plains Aquifer Region**
 - Sizable High Plains aquifer is being depleted
 - Population growth not the factor it is in the other three regions

Part of Colorado River Watershed

Federal nexus throughout Case Studies

- **Federally funded/constructed projects**
- **Endangered Species Act**
- **Clean Water Act and**
- **Safe Drinking Water Act**
 - New constituents
 - Changing standards for naturally occurring constituents, e.g. arsenic
- **Shared borders**

California



California Snapshot

- **Population expected to increase from approximately 35 to 59 million by 2050**
- **The additional demand will be met largely by conservation, reuse, and retirement of agricultural water uses (land conversion)**
- **The water landscape is driven by the temporal and spatial disconnect between the major source of water and the water users**
 - Insufficient storage for long-term droughts
- **Major agricultural activity, including dairies (15% of nation's milk and cheese supply)**
 - Approximately 1/3 of applied agricultural water percolates back to groundwater or returns to streams as tailwater



State policies



- State funding for water projects requires Integrated Water Resources Management Plans
 - Water quality across jurisdictional boundaries
 - Surface water and groundwater rights
 - State and federal laws
- Another factor driving regional water management: Water supply assessments for new subdivisions of 500 or more units prior to getting land development permit from local land use agencies. Complete basin analysis is required.

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Meeting water demands in CA will require

- Expansion of groundwater banking, possibly combined with expansion of surface water storage
- Improved conveyance through or around the Bay-Delta region
- Decrease in consumptive use of water, particularly by urban sector, which will continue to expand into CA ag lands
- Water conservation and reuse
- Desalination
- Continued improvement to irrigation efficiency and agricultural productivity

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California Case Study Conclusion

“At the regional and statewide levels, permanent, long-term decreases in water supply to agriculture translate directly into decreased agricultural production, even if irrigation efficiency is increased. Hence, the political leadership and the people of California ultimately need to determine the degree to which the state wants to support food and fiber production in light of the trade-offs associated with urban and environmental water needs.” (p.8)

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Arizona

- Two major Reclamation Projects
 - Salt River Project (SRP)
 - Central Arizona Project (CAP)
- Since 1980, Groundwater management in the Active Management Areas (AMAs)
- Agriculture expansion limited in AMAs and irrigation Nonexpansion Areas
- Non-Indian agricultural water use is diminishing as lands are urbanized in central Arizona
- Agricultural activity is increasing on non-AMA areas of the state



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Arizona Snapshot

- Population of 6.5 million people expected to almost double by 2050. Typically at or near the top of the list for population growth
- Water use estimated to be between 7 and 8 Million Acre Feet (MAF)
 - Approx. 40% of total use is groundwater
 - Approx. 3% is recycled or reclaimed water
 - Of the remaining use, which is surface water, 2.8 MAF is from the Colorado River
 - 1.5 MAF of that is delivered through the CAP
- Approx. 70% of water diverted or extracted by agriculture

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AZ Water Management Policy

- AMA Assured water supply program requires demonstration of 100 years of legally, physically, and continually available water for new residential development
- Significant use of recharge and recovery programs in AMAs. Agriculture partners with cities to use surface water in lieu of groundwater. But this does not necessarily imply sustainable groundwater use.
- Conservation regulations in the AMAs for all large water users, including ag
 - Best Management Practices
- Drought planning requirements
- No statewide water plan required
- Environmental water use recognized in state reports in very limited way, by state law even less
- Groundwater overdraft continues in many areas

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Arizona Conclusion

“...in addition to remaining challenges within the AMAs, there is a need to understand the growing – and often competing – demands for water....Rapid population growth, continuing drought, and impacts of climate change are additional factors making water management in Arizona challenging and careful water planning imperative.” (p. 12)

Update: State budget problems are affecting significantly Arizona Department of Water Resources personnel and programs

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Florida



- Population of approx. 18 million is largely urban and expected to increase to 26.5 mil by 2030
- Agriculture uses more than half of freshwater
 - About half of this is groundwater
- Agribusiness in FL is 9th largest in U.S. (\$7.8 billion in 2005)
- Abundant groundwater
- More than 7,800 lakes

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Florida Water Management

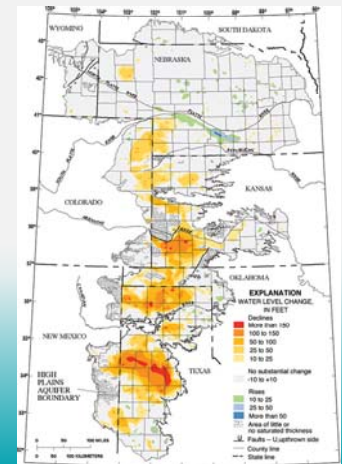
- 1972 Water Resources Act delegated water management to five regional districts covering entire state.
 - District boundaries follow surface hydrologic boundaries and cut political boundaries, including cities
- Districts permit consumptive use for a maximum of 20 years but usually much less
- Effect of water withdrawals on natural ecosystems is a consideration
 - “Criteria for the limit of acceptable environmental impacts caused by water withdrawals are established based on minimum flows and levels in surface waters and aquifers...”

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High Plains Aquifer

“Lying in a semiarid environment and geologically cut off from replenishment by sources outside the region, natural recharge of the High Plains Aquifer is meager.” (p. 14)

“Beneath the eight-state region, the volume of water...is nine times the volume of Lake Erie.” (p.15)



State Policy Example: Nebraska

- 2004 legislation directed the NE Dept. of Natural Resources (DNR) to complete regional hydrological examinations to determine if river basins or streams were fully or overappropriated
- Director declared several areas fully appropriated. In those locations, stream flow diversions, reservoir impoundments, and construction of additional large-capacity wells are prohibited until Integrated Management Plans prepared by DNR are completed

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Conclusions related to High Plains overdraft

- It is expected that overdraft will continue in many parts of the High Plains Aquifer
- High Plains section of the paper concludes that in most High Plains locations “...no utility would be gained from leaving water in the ground. Pumping the ground water has and will continue to create wealth...” (p.17)

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Differences and similarities abound across the case studies

- **There is wide diversity in availability, distribution, consumption, and regulation of surface water, groundwater and treated water**
 - Reflective of decentralized approach to water management in United States
- **Each state or region increasingly is concerned with the ability to meet future demand of diverse users**
- **Although the proportion of available freshwater used in agriculture varies widely among the case studies, it is a major proportion of total water use in every area**

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Changing agricultural water use

- **Increasingly, regulatory considerations related to water quality and the environment are affecting agricultural water use**
- **Agricultural lands are being urbanized, resulting in decreased water use by ag**
- **Other voluntary transactions are likely to decrease ag water use, such as dry-year options to address drought or other, longer-term transactions, such as those in California**
- **Competition for water supplies**
- **Conservation practices**

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Key to addressing current policy & decision making challenges: analysis of impacts of changes and water management actions needed...and collaborative approaches

- **Reversible or not**
- **U.S. trade balance**
- **Food security**
- **Irrigation and urban water use efficiency**
- **Water reuse practices**
- **Expansion of surface water or groundwater storage**
- **Identification and analysis of tradeoffs needed**

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Questions/Discussion

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