

# Water Linkages Beyond the Farm Gate: Implications for Agriculture

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Agriculture's Water Economy

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*The organizations indicated below provide support for work summarized in this presentation*



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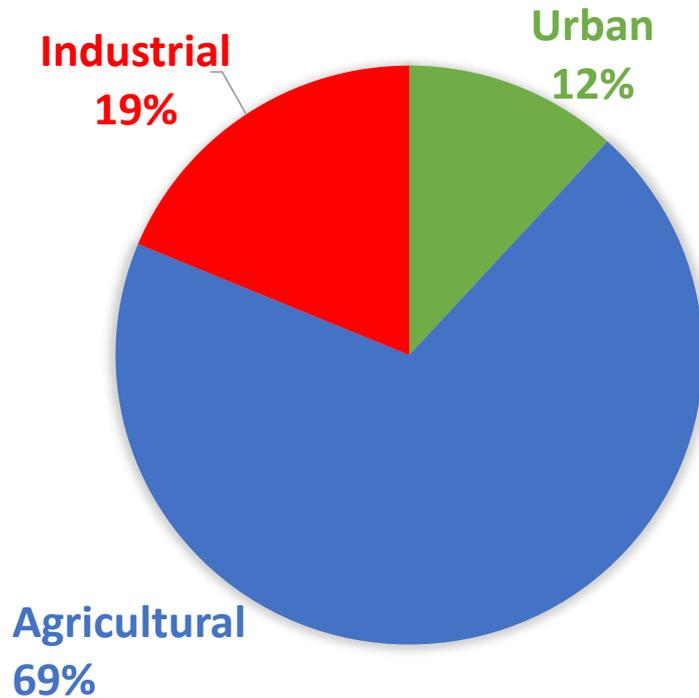


# Outline

- Key non-ag sectors: urban, energy, industry and environmental
- Adaptations to scarcity
- Water trading as adaptation mechanism
- Navigating a changing water future

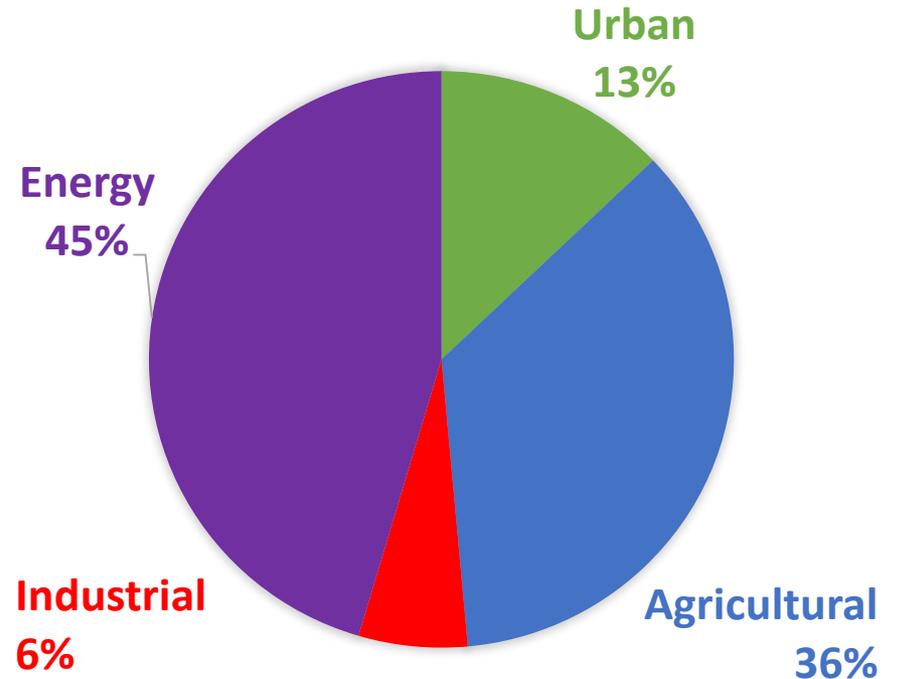
# Water Withdrawals By Category

## World (2007)



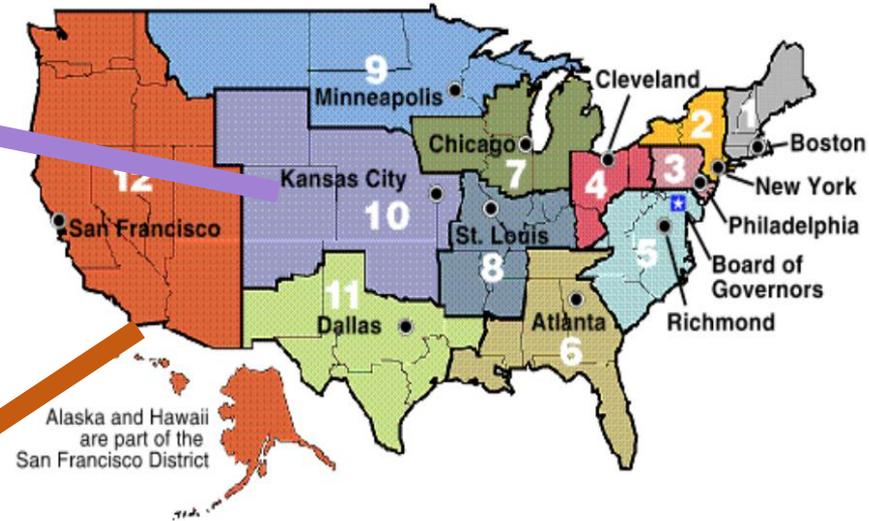
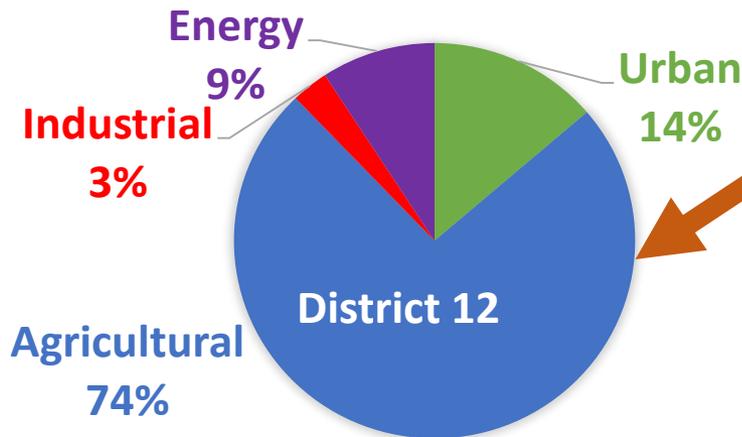
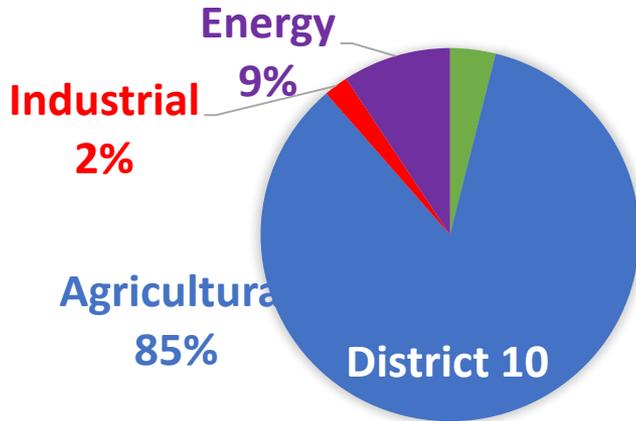
Data: "Water Withdrawal by Sector, around 2007." AQUASTAT. FAO, Sept. 2014. Web. 21 June 2016.

## US (2010)



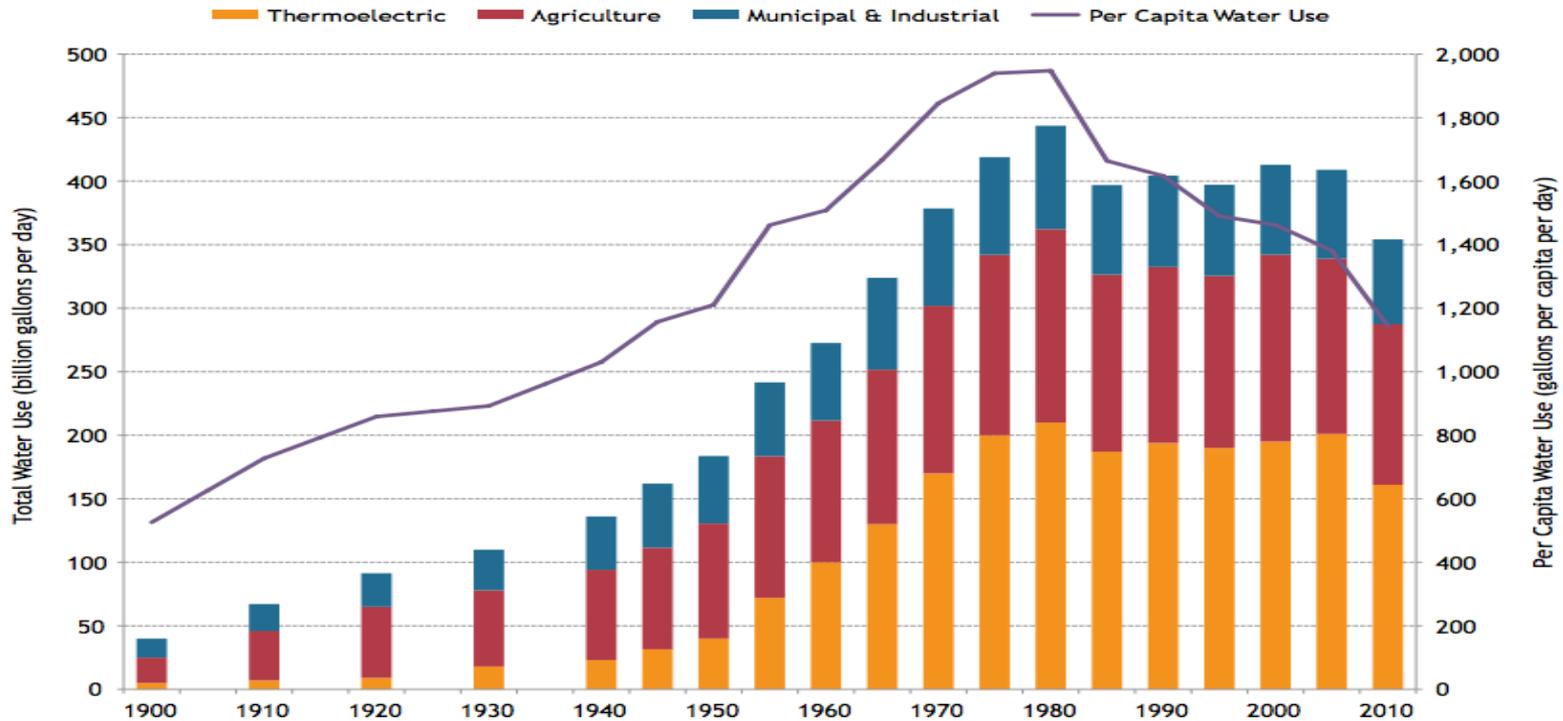
Data: Maupin et al. Estimated Use of Water in the United States in 2010. 1-56. Web. U.S. Geological Survey Circular 1405.

# Withdrawals By Category, FRB Districts 10 & 12, 2010



Data: Maupin et al. Estimated Use of Water in the United States in 2010. 1-56. Web. U.S. Geological Survey Circular 1405, Map: "The Twelve Federal Reserve Districts." FRB: Federal Reserve Districts and Banks. The Federal Reserve Board, 13 Dec. 2005. Web. 20 May 2016.

# US Water Use By Sector (1900-2010, freshwater and saline water)

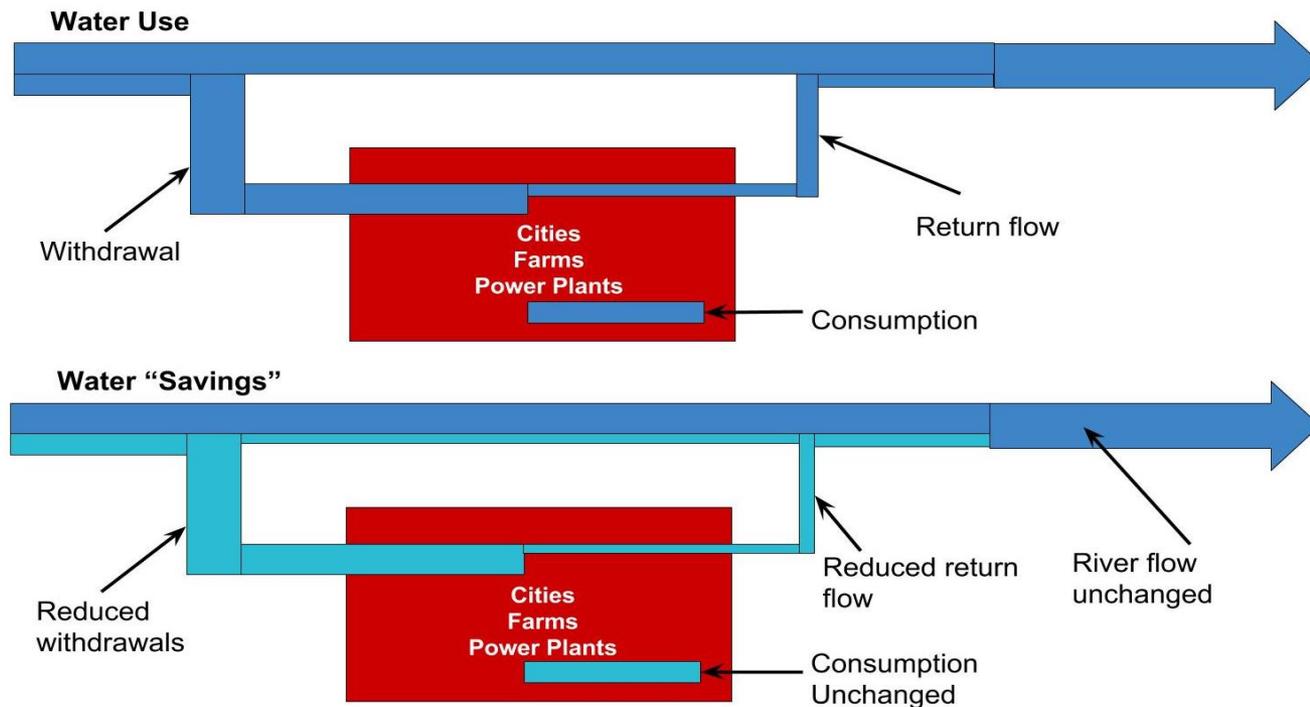


Notes: Municipal and industrial (M&I) includes public supply, self-supplied residential, self-supplied industrial, mining, and self-supplied commercial (self-supplied commercial was not calculated in 200–2010). Agriculture includes aquaculture (1985-2010 only), livestock, and irrigation. Between 1900 and 1945, the M&I category includes water for livestock and dairy.

Sources: Data for 1900-1945 from Council on Environmental Quality (1991). Data for 1950 from USGS (2014a). Population data from Williamson (2015).

## Water “savings” may not free up water for other purposes

Water-saving devices/practices (drip irrigation, recycling cooling water) reduce amount of water withdrawn and applied on site, but amount consumed may remain the same. Evaluate carefully ...

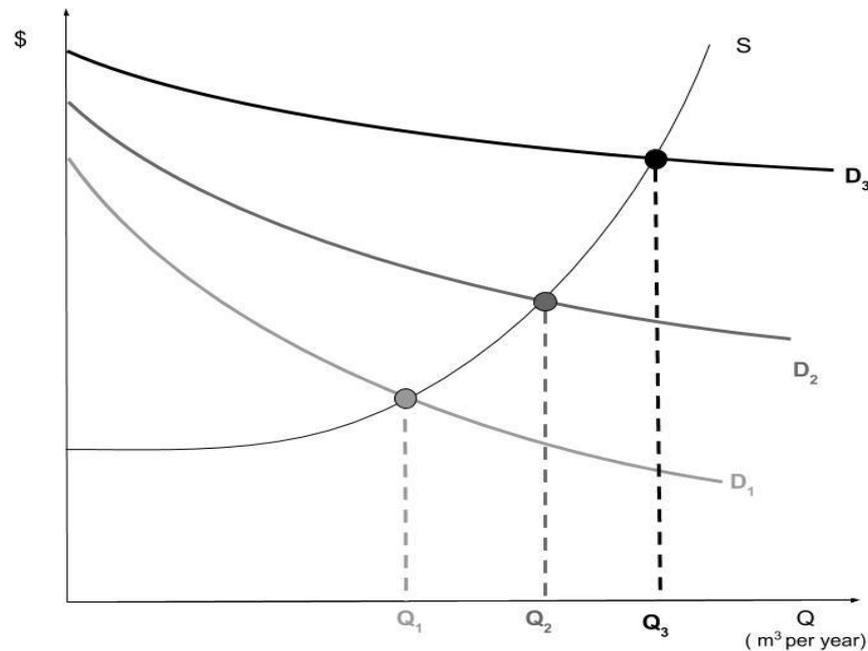


# Adaptation to Scarcity

Water conserving practices & technologies: numerous and evolving

INCENTIVES are the key

If water costs/prices don't reflect scarcity – other incentives arise



# Incentives That Signal Water Scarcity

Water costs paid by users – often difficult to alter as a policy instrument

Prices generated by water trading – useful in regions with active trading

New regulations, litigation, administrative proceedings, political maneuvering, civil unrest ...

In Lima, “Wall of Shame” separates vast neighborhoods of shacks without plumbing from affluent area with hundreds of private swimming pools. ...



# Ebro River Pipeline Conflict, Spain



“The lands of the Ebro are the enchantment of Catalan”

# Water Trading as Scarcity Adaptation

Improve regional economic resilience by trading capital, water and risk

Regional economic interdependence – thriving farm & non-farm sectors

Long-term trading agreements stabilize off-farm water supplies & costs

Payments to farmers can be structured to stabilize farm income, land values

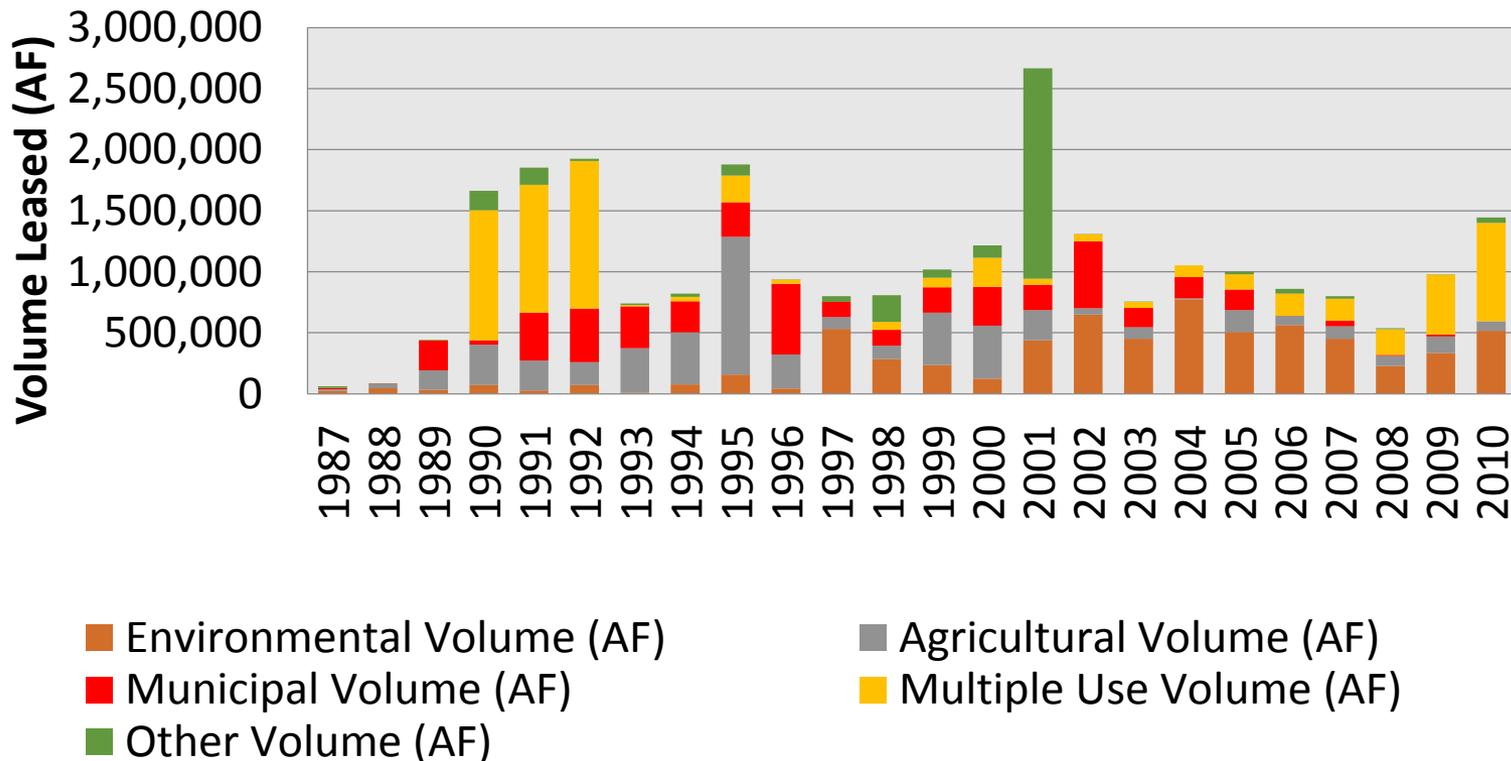
Regional “pressure relief valve”  
in face of water scarcity



Photo: Todd Sargent, 1988, San Luis Valley, Colorado

# Transactions by new use: annual volume of leases, Colorado River Basin States, 1987-2010

(CA, AZ, NM, UT, COLO, WY, NV)



"Other" = primarily industrial uses. Transaction data from Water Strategist and other sources, Professor Bonnie Colby, University of Arizona bcolby@email.arizona.edu

# Water trading in western U.S.

- a few dozen active areas spurred by urban growth, high value ag, environmental needs, interstate compacts, tribal settlements ...
- trading for environ. more active over time
- pricing and volume patterns rational
  - more volume & higher prices in dry periods
  - trading prices reflect real estate markets, population & income trends, farm profits
- outside active areas: sporadic trading, irregular pricing patterns

# Navigating a changing water future

- Improve existing trading institutions
- Innovations to address water-based threats to regional economies
  - custom-crafted regional “water banks”
  - provide alternatives to farmland “buy and dry”
  - streamlined procedures for temporary, intermittent water trades
- Optimistic -- tremendous ongoing change in water policy, technology and economics

# Innovative trading of capital, risk, water .... resilient regional economies



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**Thank you**

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