

American Agriculture and Water



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Introduction

- Over the past 200 years, American agriculture has developed as a leading export sector and component of overall economic growth.
- Assisted by relatively low-cost capital, land, and water.
- In the past 20 years, land and water have become more costly, and water especially so.
- Agriculture uses 80 percent of fresh water in the U.S.
- Water supplies are static—no new dams or reservoirs--or possibly declining and becoming more variable with climate change.
- New demands in urban consumption, recreational activities, and environmental concerns.

Introduction

- This presentation is on the use of markets for water management and allocation within and from agriculture.

Water Rights

- Riparian Surface Water Rights.
 - Ownership of land appurtenant to water flows is the basis for riparian rights.
 - Common Law.
 - Dominant in the Eastern U.S.
 - Right to access water adjacent to or passing through properties for reasonable use so long as doing so does not harm other riparian claimants down stream.
 - In cases of drought, all parties share in the reduced water flow.
 - Riparian rights are not lost through disuse.
 - Can only be transferred with riparian lands.

Water Rights

- Appropriative Surface Water Rights.
 - Rights owners can withdraw a certain amount of water from its natural course for private beneficial purposes on land remote from the point of diversion.
 - Separable from the land.
 - Western U.S.
 - Required aqueducts, ditches or canals to move the water.
 - Ownership of water was allocated through the rule of first possession or priority of claim.
 - Ownership maintained by placing water in beneficial use.

Water Rights

- Earliest claims have highest priority.
- A ladder of rights on a stream, ranging from lowest in priority to highest.
- Ex ante ranking of competing claimants in assigning rights and in rationing water during times of drought.
- Highest priority receives full allocation before any water is made available to lower priority claimants.
- The relative security granted senior rights holders encouraged investment in both water infrastructure and in irrigated agriculture.
- With trading high-valued water users with low-priority rights can lease or purchase water from those with lower-valued uses but higher-priority rights.

Water Rights

- If trading is restricted, however, water use may be locked into traditional uses by the priority system.
- Because appropriative rights can be separated from the land and sold or leased, they can be the basis for private water transfers in response to changing economic conditions.
- Prior to late 1980s little formal trading across sectors.
- Conservation and instream flows not considered beneficial use until recently.
- Incentive to use water intensively and in low-value crops.

Water Rights

- Groundwater Rights.
 - Much less well defined.
 - Prior appropriation and reasonable use are the dominant allocative mechanisms.
 - Common pools.
 - Excessive withdrawal.

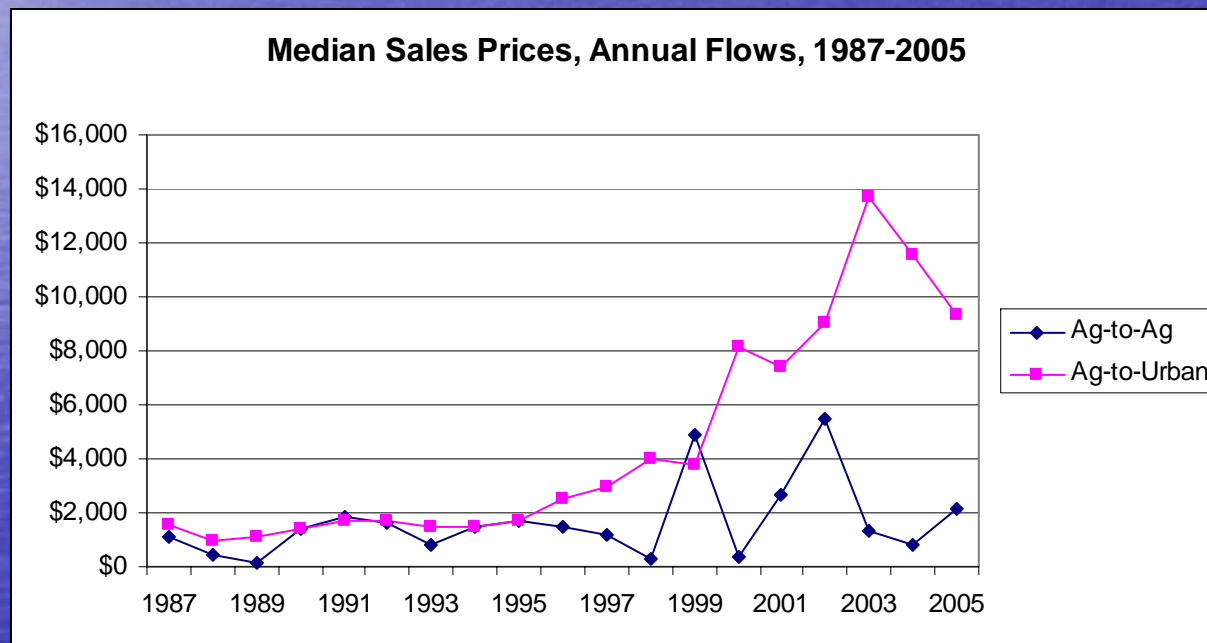
Infrastructure

- Irrigated agriculture receives most water through an elaborate system of storage dams, reservoirs, aqueducts, and transmission canals operated by the Federal Bureau of Reclamation, created in 1902. Subsidized.
- Water for 140,000 farms covering 10,000,000 acres in 17 western states.
- Over 55,000,000 acres of irrigated agriculture in the US, 2/3 in the Great Plains and Western States.
- Over 600 dams and reservoirs.
- Service contracts.
- Pressure for reallocation.

Price Differentials

- 1992 Texas data show value of water in agriculture at \$300 to \$2,300/a.f., whereas in urban uses, \$6,500 to \$21,000/a.f.
 - The mean estimated gains from transfer in Texas (1992), \$10,000/a.f.
- Farmers pay pumping charges, \$15-25/acre foot.
 - Urban areas offer \$500+
 - Same groundwater in Arizona diverted for farming at \$27/acre foot and for urban users at \$479 to \$3,267 per acre-foot.

Price Differentials



Price Differentials

Water Transfer Prices (per acre foot) by Sector

	Agriculture-to-Urban Leases	Agriculture-to-Agriculture Leases	Agriculture-to-Urban Sales	Agriculture-to-Agriculture Sales
Mean Price	\$114	\$29	\$4,366	\$1,747
Median Price	\$40	\$10	\$2,643	\$1,235
Number of Observations	189	178	1,013	169

Water Markets

- Water trading can have broad benefits.
 - Farmers receive more for their water than they could earn in agriculture.
 - Cities secure additional water at a lower cost than available alternatives, such as desalination.
 - Water trading also produces prices that give indication of the value of water in different uses—in agriculture, in urban, in recreational, and in environmental.
 - This information is critical for determining how much water should be reallocated.

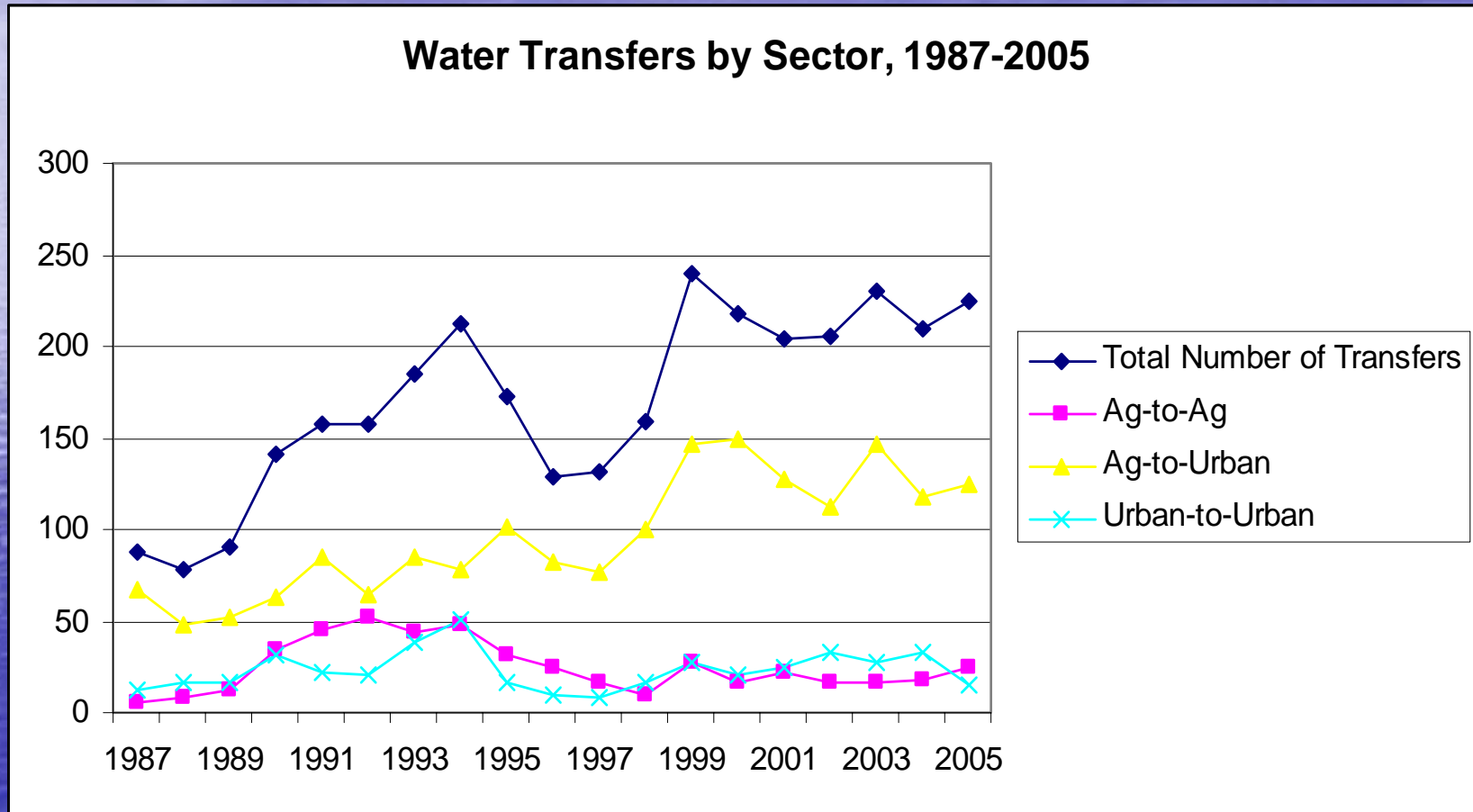
Difficulties in Reallocating Water

- Water rights are imprecise.
- Usufruct rights, subject to state regulation.
- Third party claims.
- Multiple decision makers—Irrigation Districts, Bureau of Reclamation, State Agencies, Indian Tribes.

- Interdependencies—physical externalities from trades that change the location, timing, or nature of use.
- Pecuniary externalities if there are impacts on local economy.
- Both involve measurement problems, but latter include also issue of legitimacy and bounding. Rent seeking. Can't be ignored. Political reaction.
- Mark Twain: "Whiskey is for drinkin and water is for fightin over."

Water Markets

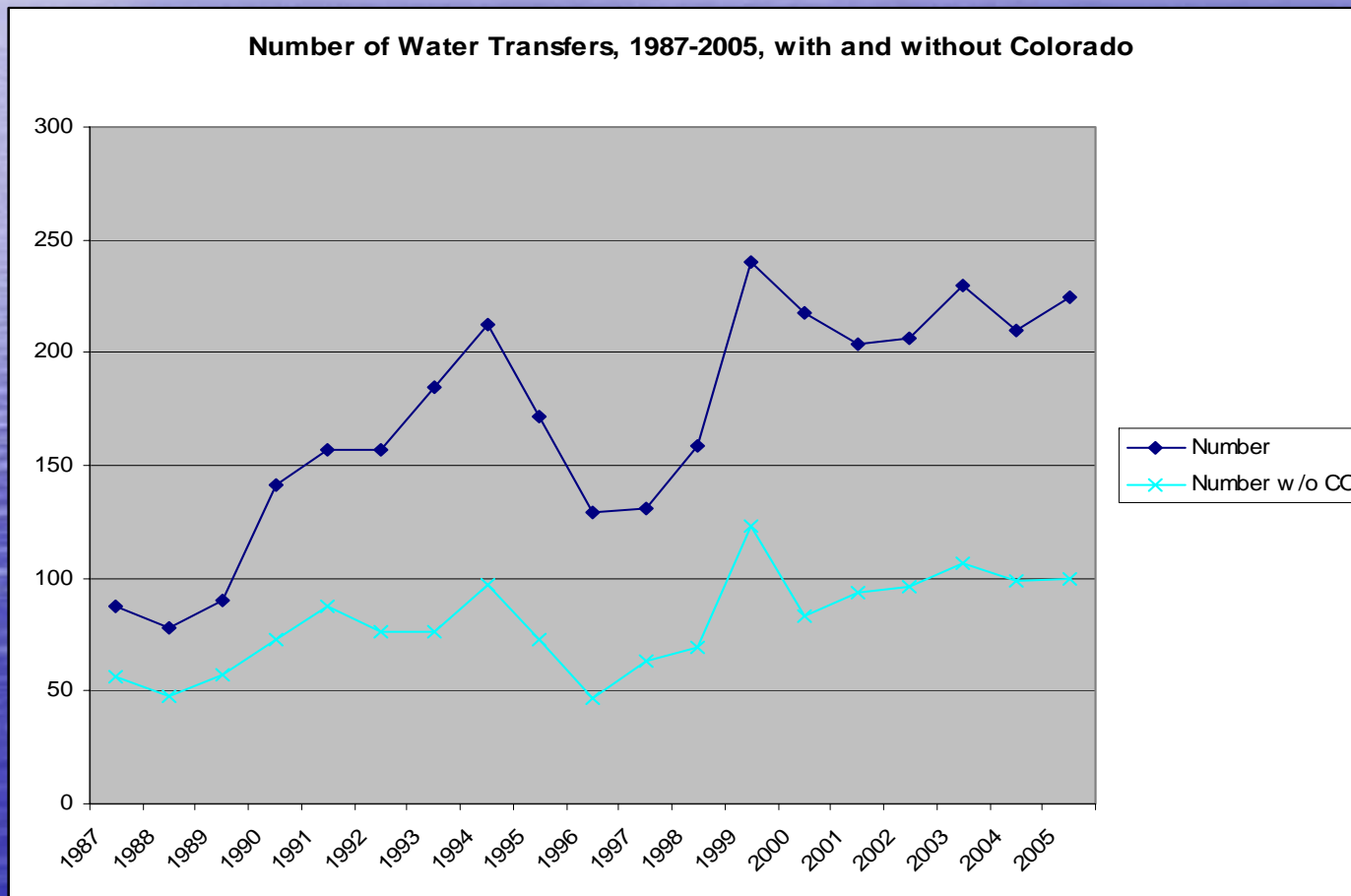
Water Transfers by Sector, 1987-2005



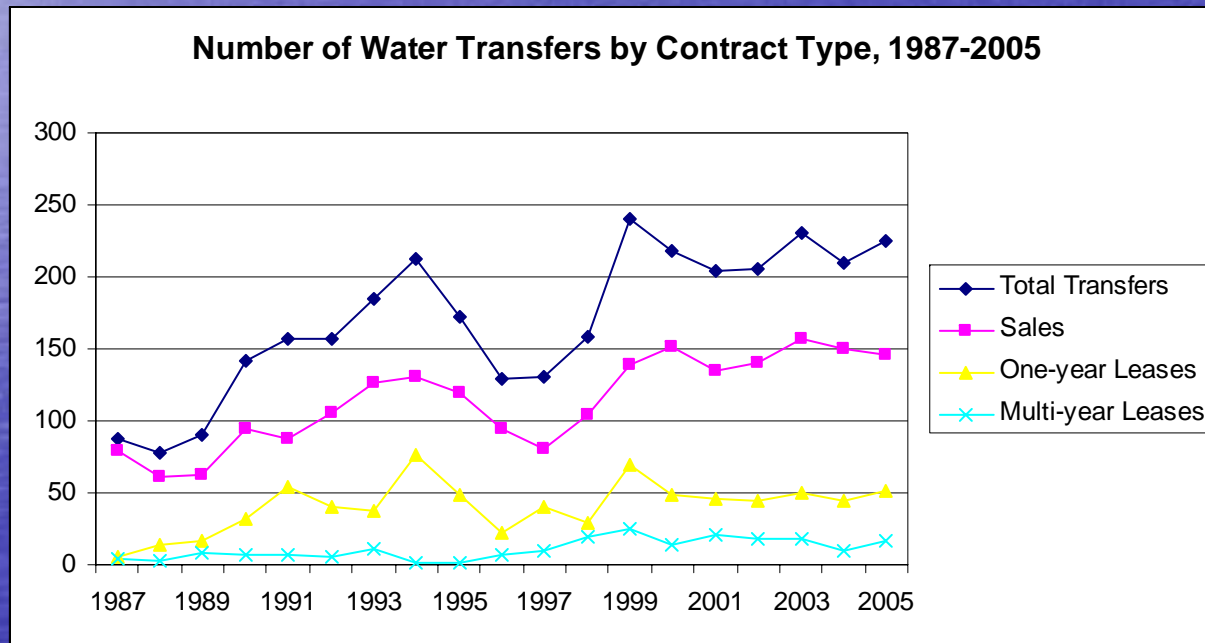
Water Markets

- Agriculture is the source of most transferred water. 77 % of all exchanges and 60 % of all water originates in agriculture.
- Agriculture-to-urban exchanges are the most numerous, 56 % of transfers and 18 % of all water transferred.
- There is considerable activity within sectors. Agriculture-to-agriculture exchanges account for 15 % of transactions and 23 % of water transferred.
- Environmental transactions (agriculture to environmental and urban to environmental) involve significant amounts of water, 6,014,228 acre-feet and 1,054,031 acre-feet respectively.

Water Markets



Water Markets



Water Markets

- An increase in total transactions.
- A significant upward trend in sales transactions and multi-year leases.
- No significant trend in one-year leases.

Conclusion: Agriculture and Water

- Pressures to reallocate and wiser use of water that uses information on relative values—prices and markets.
- Appropriative rights doctrine allows for water trades.
- Increase movement of water out of agriculture.
- Adoption of drip irrigation and drought resistant crops—except where there are subsidies—ethanol, rice, cotton.
- Active within sector exchanges, short-term leases.
- Across sector trades rely on sales and multi-year leases.