California’s Water Market

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Our Focus: Water Marketing and Groundwater Banking

- **Water marketing**: temporary, long-term or permanent trades of water-use rights
- **Groundwater banking**: storage of surface water in aquifers in wet years for use in dry years

Why these tools matter for California:
- Reducing costs of drought
- Accommodating shifts in demand
- Adapting to a changing climate
Water Marketing Has Requirements and Constraints...

- Infrastructure is needed to connect source/destination
- Only “wet” water can be sold/leased
- State protections for groundwater are incomplete
- Local economic impacts of land fallowing are a concern
...So Does Groundwater Banking

- Infrastructure is needed to get/store/retrieve water
- Rules are needed to prevent harm to bankers/locals
- Water quality can be an issue
Outline

- Water Market Trends
- Groundwater Banking Trends
- Policy Recommendations
Three Phases in Water Market Development

- Drought-related growth (1987–94)
- LT trade growth & overall deceleration (2003–11)

Contracts:
- Yellow: Short-term
- Black: Long-term
- Green: Permanent
- Orange: Water committed but not transferred

Dry and critically dry years
Direct Government Purchases
Spurred Early Development

Water traded (million acre-feet/year committed)

Direct government purchases (taf)
Other purchases (taf)
Direct government purchases (%)

Direct government purchase share

Environmental Concerns Drove Shifts in mid-1990s

Average annual purchases by end-user

Share of purchases by end-user

Water trades (million acre-feet/year committed)

<table>
<thead>
<tr>
<th>Year</th>
<th>Mixed purpose</th>
<th>Other farmers</th>
<th>San Joaquin Valley farmers</th>
<th>Environment</th>
<th>Cities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987-1994</td>
<td>0.0%</td>
<td>0.0%</td>
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<td>0.0%</td>
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<tr>
<td>1995-2002</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
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<tr>
<td>2003-2011</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>100%</td>
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</tbody>
</table>
Long-term and Permanent Trades Now Dominate the Market

- Mostly for cities
- But also for high-value farms
- And some environmental uses
But Slowing Market Was Unable to Provide Much Drought Relief

- Infrastructure constraints: Delta
- Institutional constraints: complex, frequently changing approval process
- In all, 500,000–600,000 acre-feet dry-year supplies from 2007–2010
Trades Are Becoming More Local

Share of non-environmental trades

- Same County
- Same Region
- Different Region (Direct Sales)
- Unspecified (Bank/Pool)

Acre-feet committed

1987-94
1995-02
2003-11
North-South Trades Are Down; San Joaquin Valley Is Now Net Exporter
Purchases of Water for the Environment Are Now Falling

- Can lessen conflicts and raise efficiency
- But cash running out (~50% was from state bonds)

![Graph showing environmental water traded over time]

- Salton Sea mitigation
- Delta flows (EWA)
- Other instream flows (§1707)
- San Joaquin/eastside flows (WAP)
- Wildlife refuges (DFG & WAP)
Outline

- Water Market Trends
- **Groundwater Banking Trends**
- Policy Recommendations
Several Types of Groundwater Management and Storage

- **Formal**: adjudicated basins and special districts with accounting for pumping/recharge (So Cal, Silicon Valley)
- **Informal**: voluntary, price incentives but no accounting (most common)
- **Semi-formal**: accounting for bank members, not for other local pumpers (Kern County)

- Our focus: banking for offsite parties in Kern, So Cal
Diverse Users Are Storing Water in Kern County Banks

- Shares of balances:
  - Urban: 47%
  - Agriculture: 45%
  - Mixed: 8%
Metropolitan Water District Has Also Been Storing in So Cal Banks

- Exchange agreements with outside partners
- Infrastructure investments for partners within service area

Thousands of acre-feet

- Withdrawals (1995-2011)
- Balances (2011)

Coachella Basin
Mojave Basin
Met Service Area
New Groundwater Banks Were Very Useful During Recent Drought

- Total withdrawals 2007–10: 1.9 maf (3x more than water market)
- Rapid recharge thanks to post-drought rains
- But some conflicts in Kern County over falling groundwater tables
Outline

- Water Market Trends
- Groundwater Banking Trends
- Policy Recommendations
How Can We Work Out the Kinks in These Important Tools?

- Address infrastructure gaps
- Make institutional review process more consistent, transparent, predictable
- Strengthen local groundwater management
- Develop models to mitigate local economic impacts
- Pursue more environmental transfers
- Engage high-level leaders who can take needed risks and break through barriers
Notes on the use of these slides

These slides were created to accompany a presentation. They do not include full documentation of sources, data samples, methods, and interpretations. To avoid misinterpretations, please contact:

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Thank you for your interest in this work.