Water and the Future of the San Joaquin Valley

February 22, 2019

Supported with funding from the S. D. Bechtel, Jr. Foundation, the TomKat Foundation, the US Department of Agriculture, the US Environmental Protection Agency, and the Water Foundation
An interdisciplinary research team

Ellen Hanak
PPIC
Economics

Alvar Escriva-Bou
PPIC
Engineering

Brian Gray
PPIC
Law

Sarge Green
CSU Fresno
Engineering

Thomas Harter
UC Davis
Hydrology/Climate

Jelena Jezdimirovic
PPIC
Economics

Jay Lund
UC Davis
Engineering

Nat Seavy
Point Blue
Conservation
Ecology/Biology

Josué Medellín-Azuara
UC Merced
Economics

Peter Moyle
UC Davis
Biology
…with important direction from many valley experts

<table>
<thead>
<tr>
<th>Chuck Ahlem</th>
<th>Daniel Cozad</th>
<th>J. Paul Hendrix</th>
<th>Brian Pacheco</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eric Averett</td>
<td>Pamela Creedon</td>
<td>Trevor Joseph</td>
<td>Stephen Patricio</td>
</tr>
<tr>
<td>Ashley Boren</td>
<td>Vernon Crowder</td>
<td>Jonathan Kaplan</td>
<td>Jeff Payne</td>
</tr>
<tr>
<td>Paul Boyer</td>
<td>Terry Erlewine</td>
<td>Adam Livingston</td>
<td>Bill Phillimore</td>
</tr>
<tr>
<td>Kimberly Brown</td>
<td>Tommy Esqueda</td>
<td>Karl Longley</td>
<td>Katie Pranek</td>
</tr>
<tr>
<td>Karen Buhr</td>
<td>Melissa Frank</td>
<td>Joe Macllvaine</td>
<td>Jon Reiter</td>
</tr>
<tr>
<td>Peter Carey</td>
<td>Michael Frantz</td>
<td>Cannon Michael</td>
<td>Jesse Roseman</td>
</tr>
<tr>
<td>Michael Carbajal</td>
<td>Noel Gollehon</td>
<td>Sarah Moffatt</td>
<td>Jonathan Vaughn</td>
</tr>
<tr>
<td>Emmy Cattani</td>
<td>Abby Hart</td>
<td>Daniel Mountjoy</td>
<td>Josh Viers</td>
</tr>
<tr>
<td>David Cehrs</td>
<td>Ann Hayden</td>
<td>Soapy Mulholland</td>
<td>Walter Ward</td>
</tr>
<tr>
<td>Vito Chiesa</td>
<td>Maria Herrera</td>
<td>Mike Olmos</td>
<td>Kathy Wood-McLaughlin</td>
</tr>
<tr>
<td>Joe Choperena</td>
<td>Matt Hurley</td>
<td>Dave Orth</td>
<td>Stuart Woolf</td>
</tr>
<tr>
<td>Greg Coleman</td>
<td>Michael Hurley</td>
<td>Lorelei Oviatt</td>
<td></td>
</tr>
</tbody>
</table>

PPIC WATER POLICY CENTER
The San Joaquin Valley is at a pivotal moment

- California’s largest farming region faces unprecedented challenges and inevitable change
- Much at stake for region’s economy, public health, environment
- Most promising approaches
  - Increase flexibility
  - Provide incentives
  - Leverage multiple benefits
- Increased cooperation, coordination will be key
- State, federal governments can provide vital assistance
The valley relies on groundwater overdraft to deal with its long-term water imbalance


1988–2002 average overdraft: 1.3 maf/year
2003–2017 average overdraft: 2.4 maf/year
The valley is ground zero for implementing the Sustainable Groundwater Management Act

- Most of the valley’s groundwater basins are critically overdrafted
- Consequences are dry wells, sinking lands, reduced supplies for droughts
- Most basins must adopt plans by 2020, achieve sustainability by 2040
- Attaining balance means more recharge, less water use, or both
- Impacts will vary across the region
Valley agriculture faces linked challenges on water, air, and habitat quality

- Nitrate in groundwater
  - Risks to drinking water

- Salinity in west-side soils and groundwater
  - Limits crop productivity

- Poor air quality
  - Could increase with more land falling under SGMA
  - Dairy industry will need to tackle methane emissions

- Highly altered natural environment
  - Conflicts over land, water management
Balancing water supplies and demands
Addressing groundwater quality challenges
Fostering beneficial water and land use transitions
Many approaches to reduce overdraft

Supply management options
- Capture and store more local runoff
- Increase local runoff
- Increase Delta imports
- Reduce exports to other regions
- Reuse and repurpose local supplies

Demand management options
- Reduce net farm water use
- Reduce net urban water use
- Reduce net water use for open space, wetlands
- Reduce losses from water infrastructure
- Increase flexibility

Average annual net water use (1988–2017)
- Local supplies: 70%
- Delta imports: 19%
- Groundwater overdraft: 11%

Total average annual net water use: 16.7 maf
Many approaches to reduce overdraft

Supply management options
- Capture and store more local runoff
- Increase local runoff
- Increase Delta imports
- Reduce exports to other regions
- Reuse and repurpose local supplies

Demand management options
- Reduce net farm water use
- Reduce net urban water use
- Reduce net water use for open space, wetlands
- Reduce losses from water infrastructure
- Increase flexibility

We examined approaches shown in red
Supply options vary greatly in potential yield...

- Capture & store more local runoff
- Increase local runoff
- Increase Delta imports
- Reduce exports to other regions
- Reuse & repurpose local supplies
- Reduce non-farm water use

Groundwater overdraft (thousands of acre-feet per year)
...and in affordability for valley farming

New supplies can affordably fill about 25% of overdraft

- Capture & store more local runoff: 21%
- Increase local runoff: 4%
- Increase Delta imports: Water that might be physically available
- Reduce exports to other regions: Water that farmers are most likely to afford
- Reuse & repurpose local supplies
- Reduce non-farm water use

Groundwater overdraft (thousands of acre-feet per year)
Flexibility is key to managing farm water demand

- Inflexible water use is very costly
- Local water trading slashes costs
Inflexible water use is very costly
Local water trading slashes costs
Valley-wide surface water trading cuts costs further
Flexibility is key to managing farm water demand

- Inflexible water use is very costly
- Local water trading slashes costs
- Valley-wide surface water trading cuts costs further
- Trading + new supplies also cuts land fallowing
A portfolio approach can minimize regional economic losses

- Gradually ending overdraft ("glide path") can also help
Priorities for action

1. Assess infrastructure needs, modernize operations
2. Incentivize recharge on farmland
3. Develop local water trading rules
4. Clarify how much water is available for recharge
5. Facilitate approvals for trading and banking projects
6. Coordinate to maximize benefits
Outline

- Balancing water supplies and demands
- Addressing groundwater quality challenges
- Fostering beneficial water and land use transitions
Groundwater quality must be addressed while implementing SGMA

- Three new areas of focus
  - Providing safe drinking water
  - Managing nitrogen loading
  - Managing salt balance

- Potential synergies, but also trade-offs, in tackling these issues alongside SGMA
The valley is a hot spot for California’s safe drinking water crisis
Dairies face special challenges in managing manure
Better approaches are needed to manage salts
Tools to balance groundwater supplies and demands can affect groundwater quality

Crops on moderately good to excellent recharge soils (2014)

- **Clean recharge crops (low N)**
- **Other suitable recharge crops (but higher N)**
- **Less suitable for recharge (crop suitability or very high N)**
- **Unknown**
Priorities for action

1. Provide safe and reliable drinking water
   • Consolidate, aggregate systems
   • Provide technical support
   • Mitigate dry wells
   • Ensure funding

2. Coordinate water quality and quantity management

3. Implement new technologies to manage pollutants, especially for dairies

4. Provide regulatory flexibility to manage nitrogen, salt loading
Outline

- Balancing water supplies and demands
- Addressing groundwater quality challenges
- Fostering beneficial water and land use transitions
Changes to water and land present new challenges, opportunities

- Ecosystems under stress
- Water becoming scarcer
- More land available, but with less revenue
- Threats of land retirement: dust, pest, weeds
- Potential for multi-benefit approaches: healthy soils, habitat, solar, recharge, flood protection, recreation
Current planning efforts only account for 1/3 of land likely to be fallowed.

- The goal should be to steward all idled lands.

**Potential uses of formerly irrigated lands**

- **68%** | Other idled land
- **15%** | San Joaquin desert
- **9%** | Solar
- **4%** | Riparian corridors/floodplains
- **4%** | Intermittent wetlands

**535,000 acres**
Priorities for action: Planning

- Involve many local parties, including county and city planners
- Regional scope would enable more synergies

Source: Huber et al. (2010)
Priorities for action: Flexible regulatory approaches

- Large landscape, multi-species permitting
- Simplified, streamlined permitting
- Protect landowners from regulatory risk
  - Safe harbor
  - Relax prime farmland retirement restrictions
Priorities for action: Funding and incentives

- Redirecting, pooling funding sources will be key
  - Water, land, energy use fees
  - State, federal grants and credits
- Many farmers will also need other incentives (e.g., keep rights to water from fallowed lands for use on other lands)

Atwell Island Land Retirement Program  Source: Jezdimirovic
Cost-effective approaches are essential for stewarding lands on a large scale

River Partners’ San Joaquin River restoration project

Source: River Partners
Priorities for action: Technical support, R&D

- Much experimentation will be needed
- RCDs are ideal partners, but too limited in coverage, underfunded
- Other key “honest brokers”: NGOs, UC extension, USDA technical assistance
Effective and equitable solutions will require cooperative approaches

- Problems can’t be solved farm-by-farm
- Many opportunities to tackle multiple problems at once and get multiple benefits
- Broad-based partnerships will be key
- State, federal agencies can play vital roles
Thank you
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:

Ellen Hanak (hanak@ppic.org; (415) 291-4433)

Thank you for your interest in this work.
Water and the Future of the San Joaquin Valley
February 22, 2019

Supported with funding from the S. D. Bechtel, Jr. Foundation, the TomKat Foundation, the US Department of Agriculture, the US Environmental Protection Agency, and the Water Foundation