

# Till the wells run dry? Dealing with groundwater depletion in California and Victoria, Aust.



Source: 29 Palms Water District

Toward Sustainable Groundwater in Agriculture  
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## Overarching research question



How do state-level written laws provide for controls on groundwater depletion, and **how are these controls implemented through local rules and plans?**

- California, USA
- Victoria, Australia

## Research sub-questions

- How is groundwater depletion occurring?
- To respond to what?
- How *serious* are the problems?
- What *tools* are used? (regulatory, economic, voluntary / physical approaches)
- Is the approach:
  - Different between California and Victoria?
  - Related to the nature of the problem?
  - Related to the *gravity* of the problem?



Descriptive, univariate

Descriptive, bivariate

## Overview- legal frameworks

- California
  - Bespoke: special districts
  - Generic: water agencies adopt GW mgmt. plans  
→ *Autonomous local action; local "self-regulation"*
- Victoria
  - State declares problem areas
  - Local committees formulate GW mgmt. plans; State approves; regional agencies implement  
→ *State regulation through local bodies*



## Methodology

- Content analysis
  - Decision-making & stakeholders
  - Information
  - Management planning
  - Tools to control depletion
- Context:
  - severity & type of GW depletion problems
  - agency role
  - agency revenue

Laws/ rules/ plans	Cal. special districts	Cal. water agencies	Vict. water agencies
State-level	16	9	1
Local-level	12	45 (sample)	7

Cal.	Vict.
<ul style="list-style-type: none"> <li>• DWR Bull. 118</li> <li>• Controller's Rpt</li> </ul>	<ul style="list-style-type: none"> <li>• Vict. Monthly Water Rpt</li> <li>• Agency Ann. Rpts.</li> </ul>

## Hypotheses

Less robust: voluntary and physical

More robust: economic and mandatory



Stable or not evident	<b>1. Status of depletion</b>	Serious and worsening
No irreversible impacts	<b>2. Impacts of depletion</b>	Irreversible impacts

## Key findings: State written laws

- Very different governance structures
- Similar:
  - Information gathering (exc. metering)
  - Management planning
  - Legal tools to control depletion

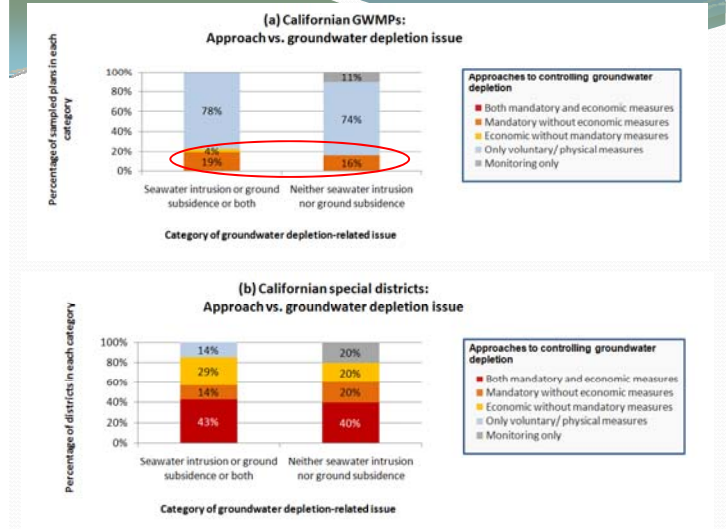
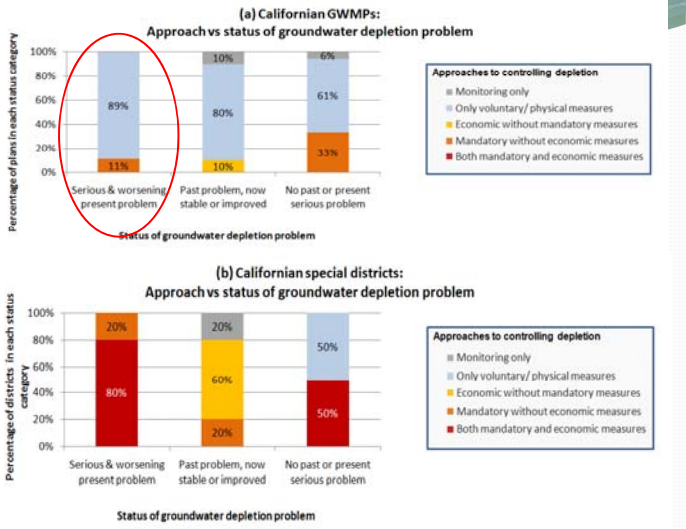
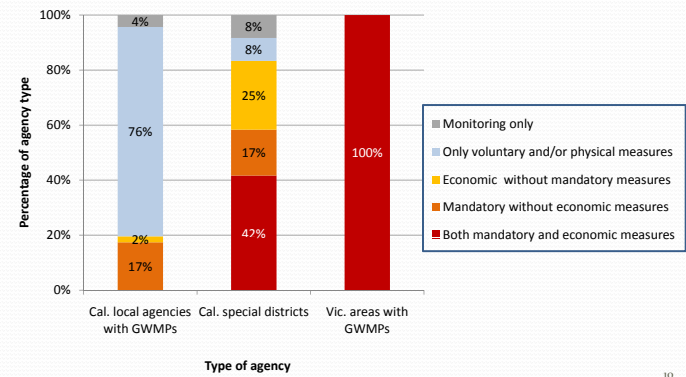
## Key findings: Local plans & rules

- Similar
  - Types of depletion problems
  - Spectrum of gravity of depletion problems
  - Range of tools (mandatory, economic, voluntary/physical)

## Key findings: Local plans & rules

- BUT tools are used to very different degrees
  - Vict.: agencies all limit extraction & charge fees
  - Cal.: rarely do so, or foresee doing so
    - Especially unlikely when depletion problems are serious & worsening
    - Apparently unrelated to type of depletion problem

## Approaches to controlling groundwater depletion used by institutions in Cal. & Vict.



## Hypotheses (Cal.)

Less robust:  
voluntary and physical

More robust:  
economic and mandatory



Stable/not evident	1. Status of depletion	Serious & worsening
No irreversible impacts	2. Impacts of depletion	Irreversible impacts

**Findings**  
→ Opposite rel'p  
→ No diff.

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## Conclusions & take-home

- Despite having strong legal powers to control depletion, few Cal. GWMP agencies use them...
  - ...especially in areas suffering serious & worsening depletion-related problems
- Cal. special districts much more likely to use more robust measures
- Compare Vict.: agencies universally use robust measures
  - Note different governance structure

19% of all GWMP agencies, 11% of those with serious depletion problems

84% of all special districts, 100% of those with serious depletion problems

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## Future research

- Case studies – focus on social/economic/political motivators for groundwater management in overdrafted areas
  - Why do some Cal. agencies choose to regulate, when they aren't forced to?
  - What effects has regulation had on the ground?

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## Questions

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## Focus and context

- Focus:
  - GW quantity
  - in-basin
  - self-supplied by users



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## California – GWMP framework

- Funding requirement
- Local water agency:
  - May not **limit or suspend** extractions unless “groundwater replenishment programs or alternative sources of water supply have proved insufficient or infeasible...”
  - **May charge for extraction or replenishment** if voter majority approves

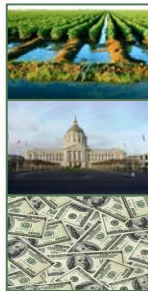


**Bottom line: significant existing legal power to control groundwater depletion**

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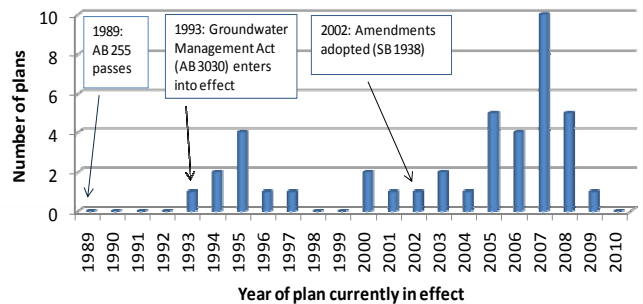
## Cautionary note

- Preliminary results: random sample of 50 plans
- Variation
  - Physical situation
  - Governance arrangements
  - Plans: date, implementation orientation
  - Financial resources



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## Groundwater Management Plans in California: Year of plan currently in effect



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## Method – coding plans & rules

	Category	Sub-categories
DECISION-MAKING	Lead agency type	Irrigation district, water district, reclamation district, etc.
	Advisory committee reps	Agricultural, urban/municipal, environmental, other
PLANNING	Management issues addressed by the plan	Overdraft; groundwater levels/quantity; ecosystem effects; seawater intrusion; other water quality impacts; subsidence
	Monitoring	GW level; GW quality; other; new/enhanced need
INFORMATION	Well information	Well registration, metering, reporting
	Review the plan	
	Report plan implementation	
APPROACHES TO COMBATING GW DEPLETION	Regulatory approaches	General extraction limits; restrictions on new wells; mandatory conservation; waste prohibition
	Economic approaches	Groundwater use-based fees (extraction or replenishment fees): uniform; tiered; unspecified
	Voluntary and physical approaches	Conjunctive use arrangements; replenishment activities; water recycling; voluntary conservation; education; water imports
	Date	
CONTEXT	Whether ag. water supplier	
	Gravity of groundwater problems	Serious and worsening present problem; past problem now improved or stabilized; no past or present problem

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