Water Transfers in the West

The California experience: the reality, the potential, and the missing pieces

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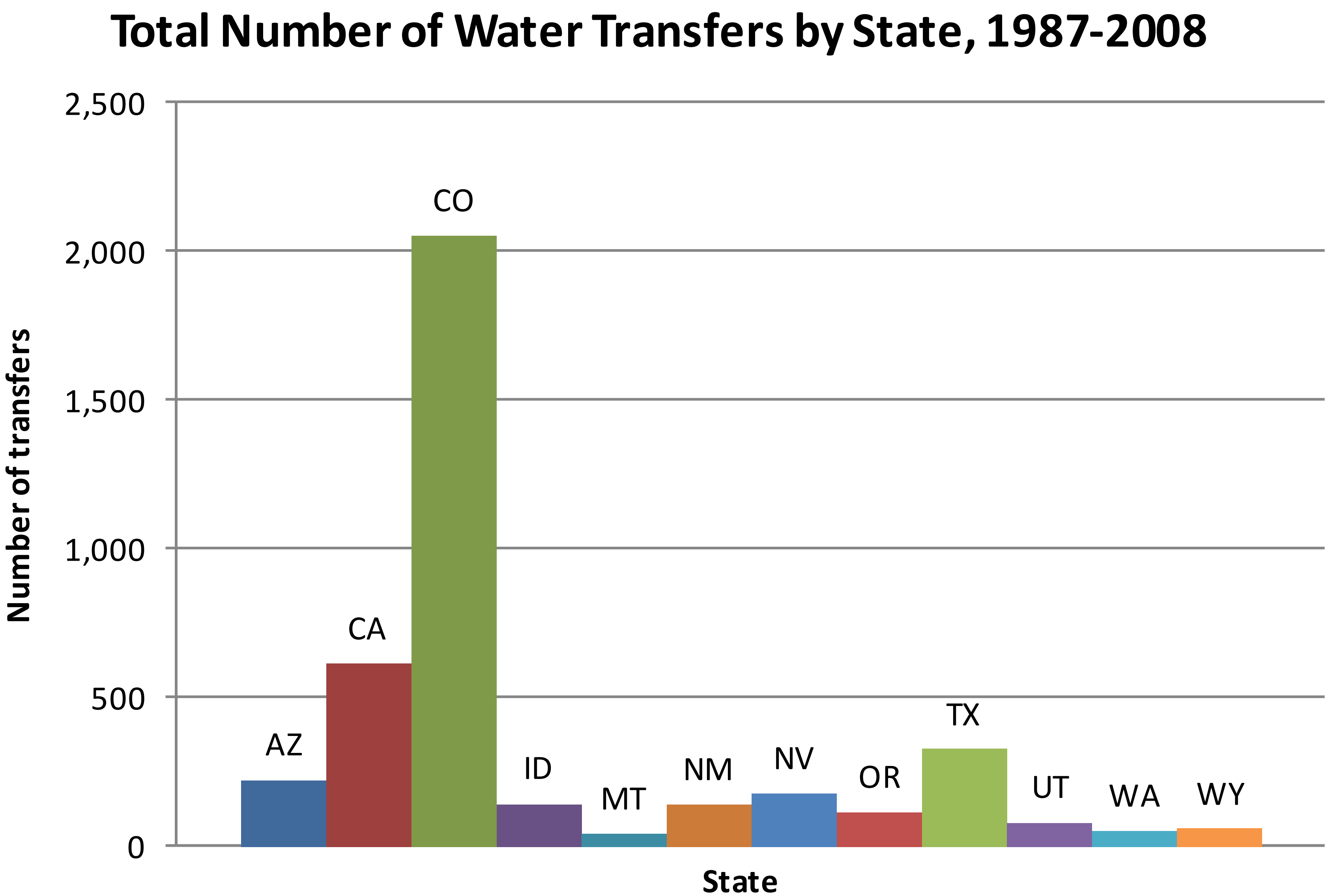
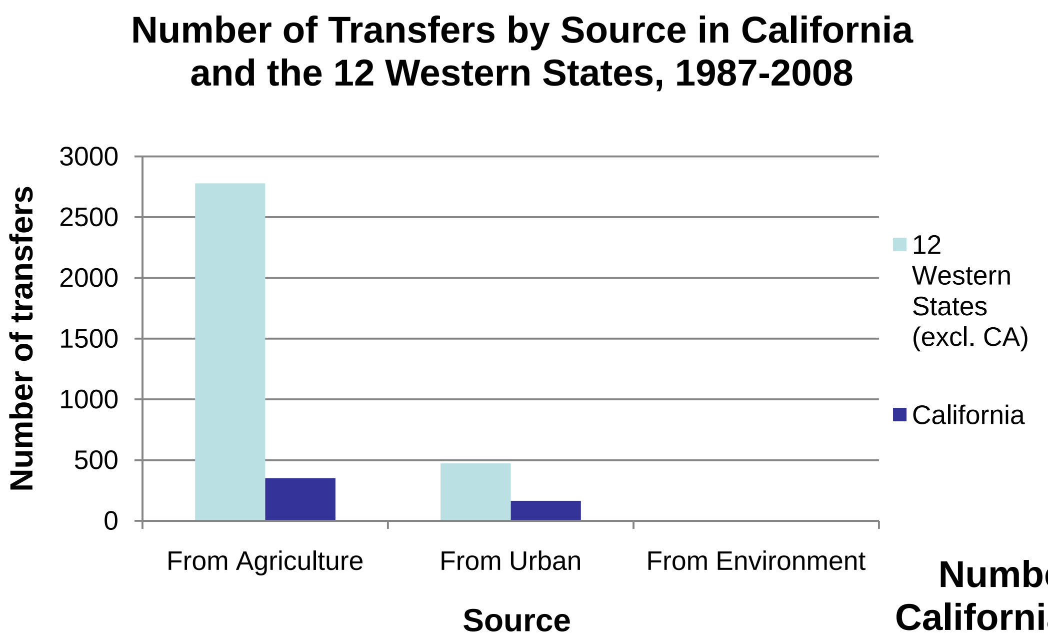
WATER: How Can Alberta Do More with Less?

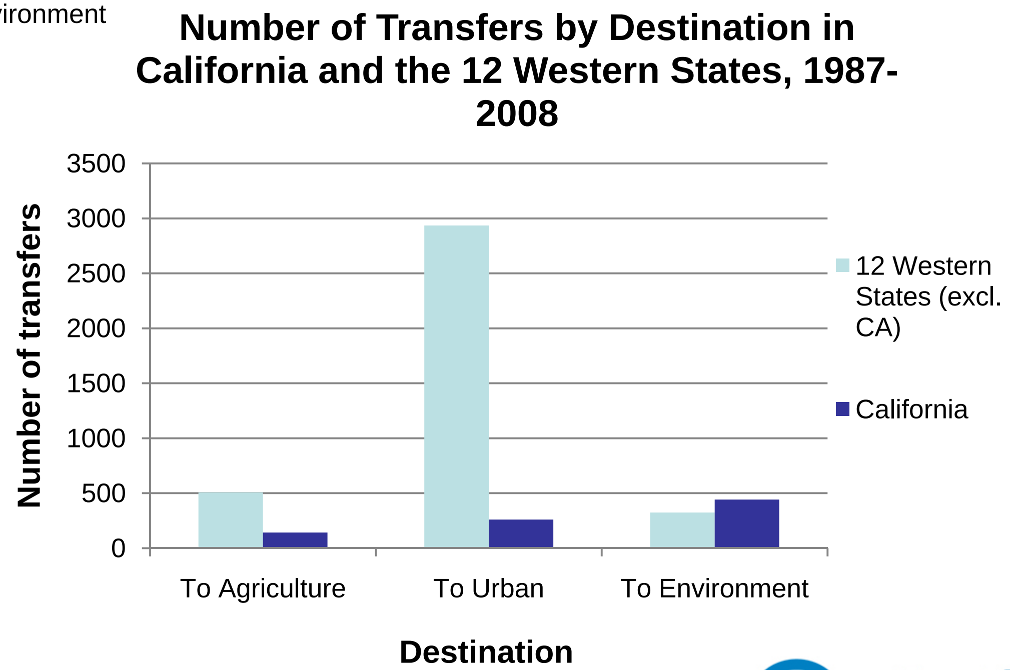
March 4, 2009

Pacific Institute


Total Number of Water Transfers by State, 1987-2008
2,500
2,000
1,500
1,000
500
0
Number of transfers
CO
CA
AZ
ID
MT
NM
NV
OR
TX
UT
WA
WY
State

The reality





The reality

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Agricultural Water Transfers in the West

		Ag-to-Ag	Ag-to-Urban	Ag-to-Envt	Total
		Number of Transfers			
Sales		266	1,706	94	**2,066**
Leases	1-year	286	200	215	**701**
	Multi-year	33	106	52	**191**
		Total Quantities: Average Annual Flow (AF)			**GL**
Sales		434,027	1,688,631	515,609	**326**
Leases	1-year	6,721,507	3,370,591	6,140,827	**1,998**
	Multi-year	115,646	742,000	563,644	**175**

Water Transactions in the Western United States, 1987-2008
(*Water Strategist*)

The reality

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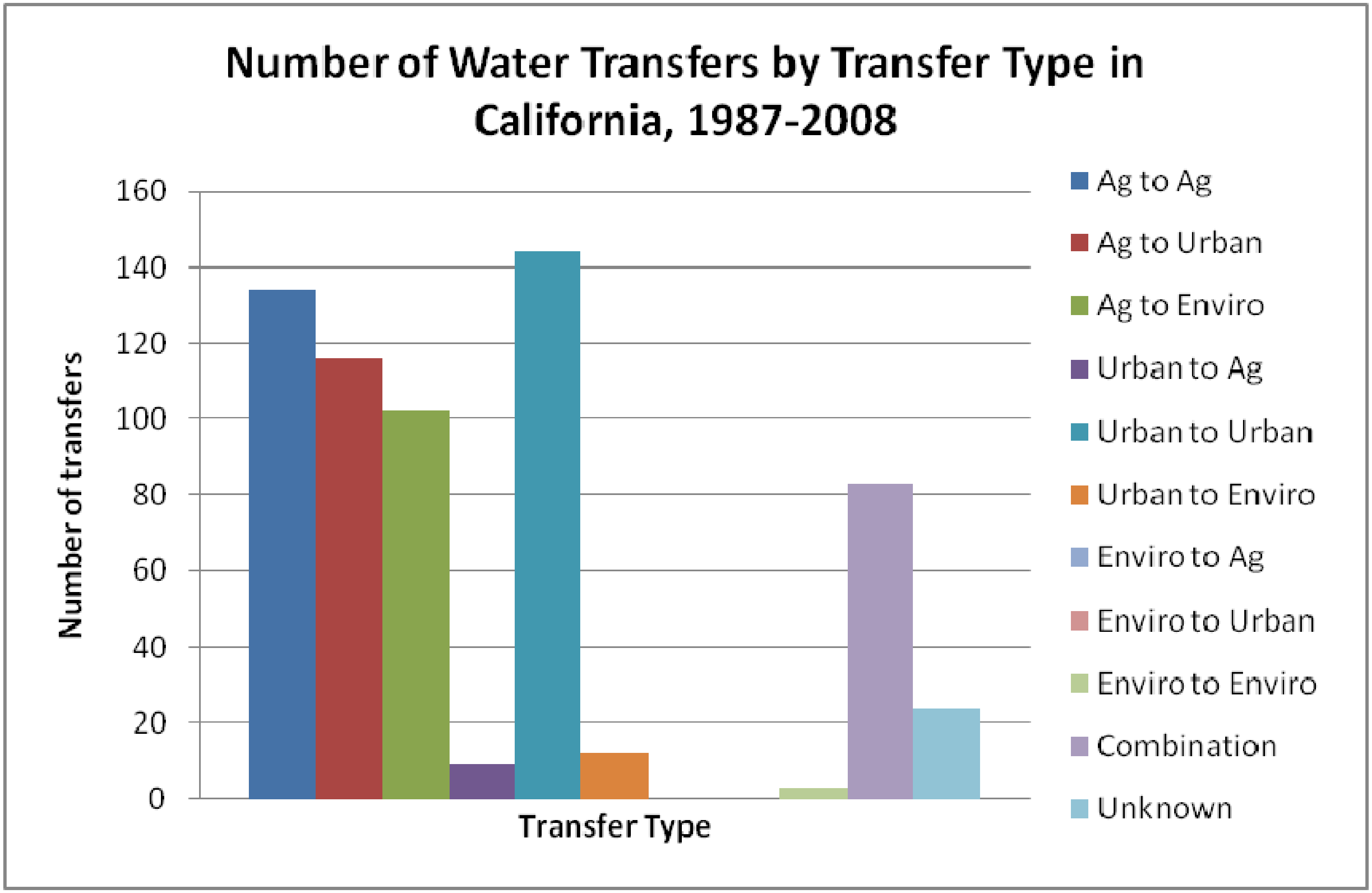

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The reality

Agricultural Water Transfers in California

		Ag-to-Ag	Ag-to-Urban	Ag-to-Envt	Total
		Number of Transfers			
Sales		6	24	4	**34**
	1-year	114	59	81	**254**
Leases	Multi-year	2	23	15	**40**
		Total Quantities: Average Annual Flow (AF)			**GL**
Sales		127,768	257,907	27,057	**51**
	1-year	1,384,820	1,374,658	2,975,775	**706**
Leases	Multi-year	5,150	375,432	394,788	**95**

Water Transactions in California, 1987-2008 (*Water Strategist*)

Sources of Water for Transfers

- Water conservation and efficiency
- Crop shifting
- Fallowing
- Storage withdrawals (surface or groundwater)

Where do these water savings come from?

- Consumptive uses
  - Crop evapotranspiration
  - Evaporation from soils
  - Evaporation from reservoirs and canals
- Non-consumptive uses
  - Return flows
  - Deep percolation
- Examples
  - Crop shifting, irrigation technology, canal lining

- Beneficial
  - Crop evapotranspiration
  - Return flows?
  - Percolation to groundwater?
- Non-beneficial
  - Evaporation from soils
  - Evaporation from reservoirs and canals
  - Return flow?
  - Percolation to groundwater?

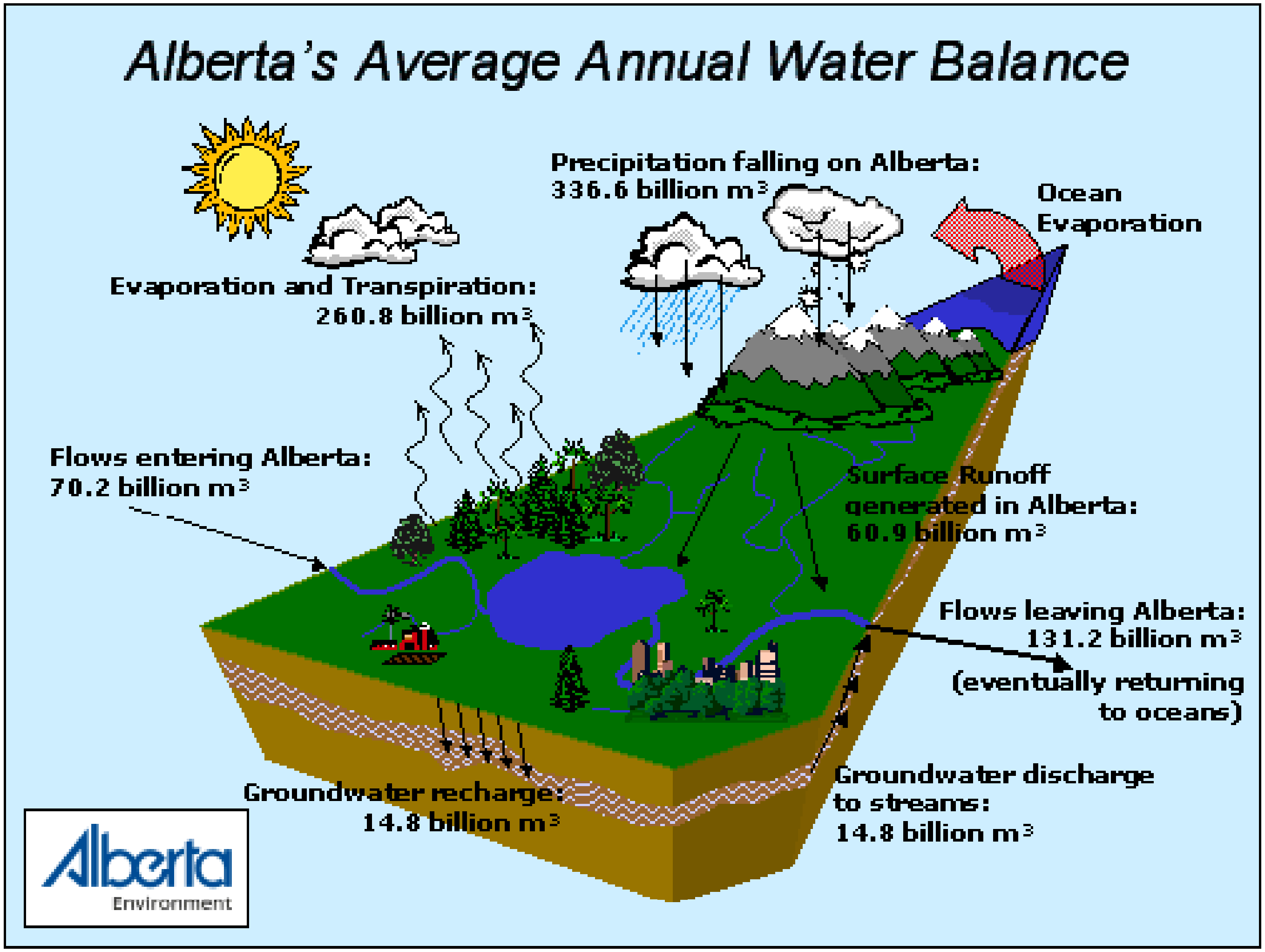
Missing pieces

IID-San Diego County Water Authority & the Salton Sea

JEFF T. ALU

Missing pieces

Water Balance



Missing pieces

Water Saving Opportunities Differ

	Bhakra	**Chishtian**	**Huruluwewa**	**Kirindi Oya**
Consumed fraction *(consumed water/available water)*	0.88	1.00	0.84	1.00
Beneficial use *(beneficial use/available water)*	0.86	0.89	0.52	0.65
Crop productivity *(ET/available agricultural water)*	0.85	0.88	0.39	0.39

Water balance indicators based on a water balance of four case studies in South Asia (Molden et al. 2001).

Missing pieces

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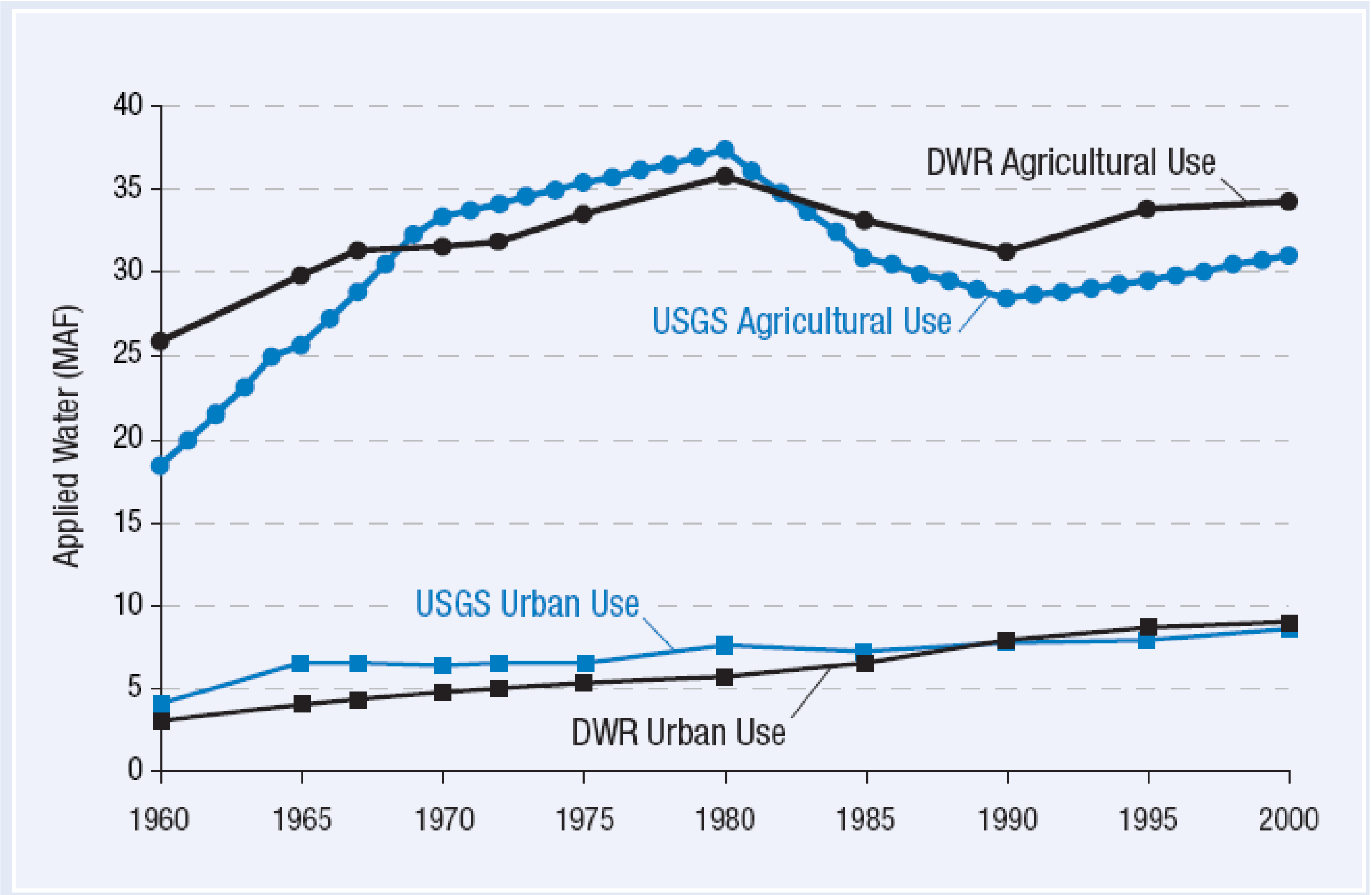
Data & Monitoring Needs

- One of the many challenges to studying water issues in California is the lack of a consistent, comprehensive, and accurate estimate of actual water use, by sector or region.

- Different institutions and groups track, record, and report water use in different ways, and no single accepted historical record exists.



Gleick, Cooley, and Groves (2005). California Water 2030: An Efficient Future.

Missing pieces

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Water Use	Level	Procedure
Surface water	Basic	Track delivery duration and use flow estimate to calculate volume
	High	Measure flow rates, on average, three times per structure use
	Highest Technical Potential	Install flow totaling devices, data loggers, and telemetry**
Groundwater	Basic	Closure factor after estimating crop water consumption, surface water delivery, and return flow
	High	Sub-basin water hydrologic balance and water table method
	Highest Technical Potential	Totalizing flow meters or pump testing coupled with estimate of runoff and deep percolation of pumped water*
Crop water consumption	Basic	Based on inventory of crop acreage and existing crop coefficients
	High	Remote sensing (LANDSAT 7) based on a 32-day time step with 30m resolution during growing season*
	Highest Technical Potential	Remote sensing (LANDSAT 7) based on 16-day time step and 30m resolution throughout irrigation season**

Missing pieces

Water Use	Level	Procedure
Return flows	Basic	Track delivery duration and use flow estimate to calculate volume
	High	Measure flow rates, on average, three times per structure use
	Highest Technical Potential	Install flow totaling devices, data loggers, and telemetry**
Instream flows	Basic	Water level measurement of a cross section surveyed annually
	High	Water level measurement of a cross section surveyed monthly*
	Highest Technical Potential	Water level measurement of a rated control section consistent with USGS criteria**
Farm-gate delivery	Basic	Track delivery duration and use flow estimate to calculate volume
	High	Measure flow rates, on average, three times per structure use
	Highest Technical Potential	Install flow totaling devices, data loggers, and telemetry**

Missing pieces

FIGURE 2.1. SUMMARY OF STATEWIDE BASELINE CONDITIONS BY MEASUREMENT LOCATION

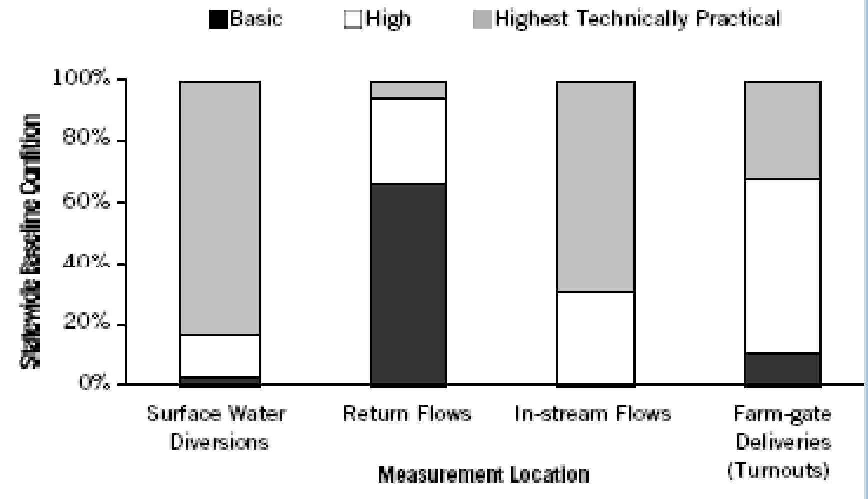

TABLE 4.4. SUMMARY OF INCREMENTAL MEASUREMENT COSTS ($/YR)

	Measurement Improvement Level	
Measurement Location	**High**	**HTP***
Surface Water Diversions	< $250,000	< $550,000
Groundwater Use	$2–2.5 million	$20–25 million
Crop Water Consumption	< $1 million	< $1.5 million
Farm Gate Delivery	$25–30 million	$175–200 million

* HTP = Highest Technically Practical

Missing pieces

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PVID-Metropolitan Transfer

- Two year test fallowing program
- Farmers paid $2,480 per fallowed acre per year
- PVID received $250,000 at the beginning of each year
- A measurement committee, composed of one representative from each party,
  - reviewed the status of the fallowed acres, with a local “water master” and satellite images
  - determined realistic quantities (and sources) of water savings.

Missing pieces

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Conclusions

- Water transfers are happening in the Western U.S. but often without important data
- Critical to understand the nature of the water you are transferring (consumptive?, beneficial?) to avoid unintended consequences and third-party impacts
- Best place to start: create detailed sub-basin water balances that monitor flows