

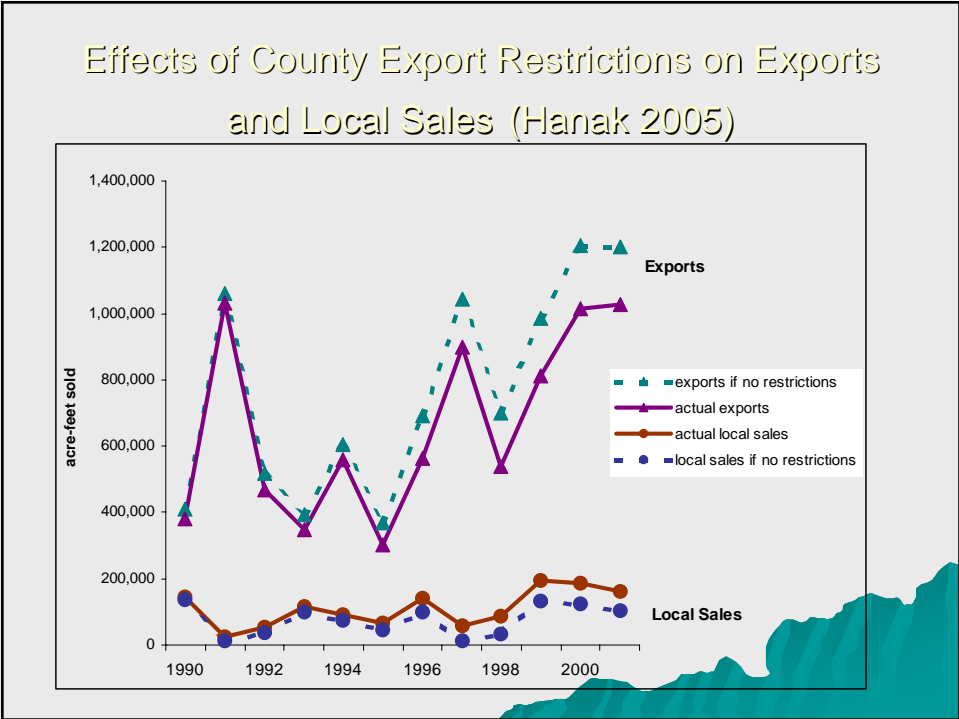
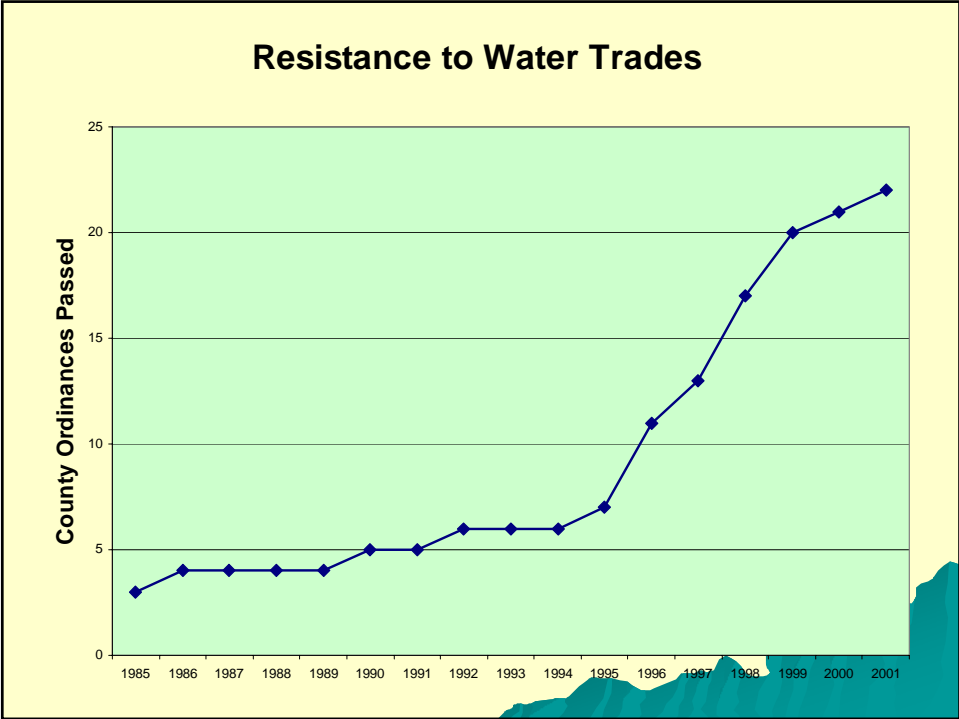
Three Worries for California Water Management

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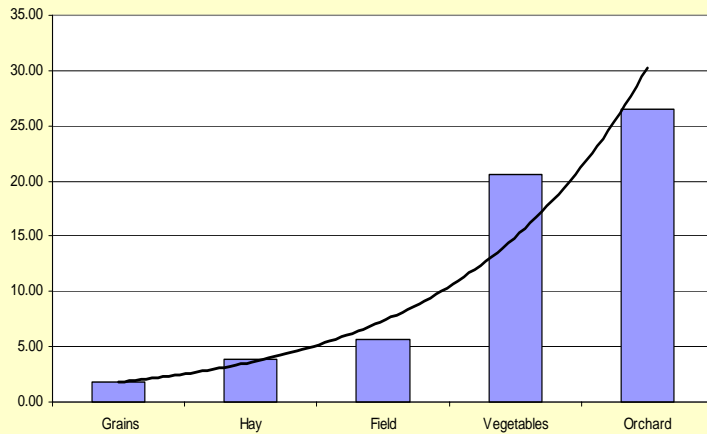
- ◆ How can Water Markets, Risk, and Third Parties be Reconciled ?
- ◆ Should we Focus more on Groundwater Quality management versus Groundwater Quantity ?
- ◆ How can the Environmental Water Account be Financed on a Permanent Basis ?

Water Markets and Risk

- ◆ Water markets are growing more important for California water management
- ◆ Third party resistance to water exports is widespread.
- ◆ Long term or permanent sales cause much higher third party costs per acre foot.
- ◆ Sporadic spot markets transfers the risk to the water buyer



Sacramento Valley County Jobs Lost per Acre Foot



Future Water Markets

- ◆ Need a trade off between third party impacts and supply risk
- ◆ Option markets can spread the risk by paying the seller to be flexible in their water use.
- ◆ Option markets need both bilateral agency contracts and a DWR drought option market.

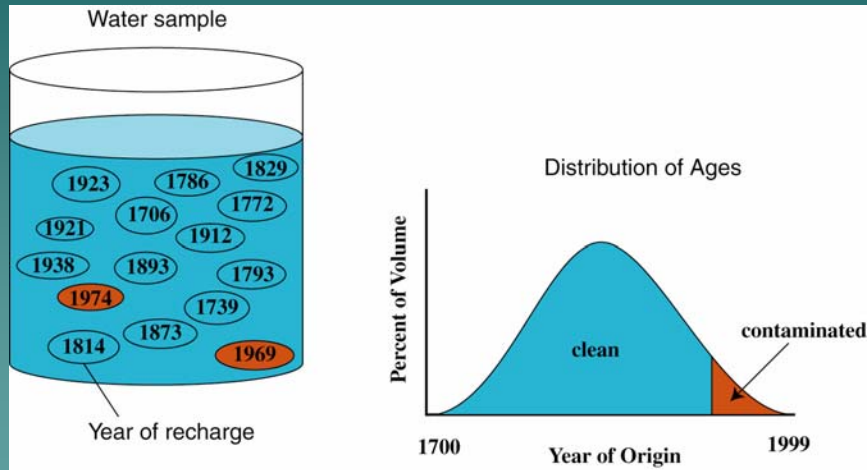
Groundwater Quality vs Quantity Management

- ◆ Groundwater quantity depletion generates more concern than quality degradation
- ◆ Quantity depletion happens faster and is more immediately observed than quality degradation
- ◆ Increased pumping costs and well failure provide a natural economic control on pumpers

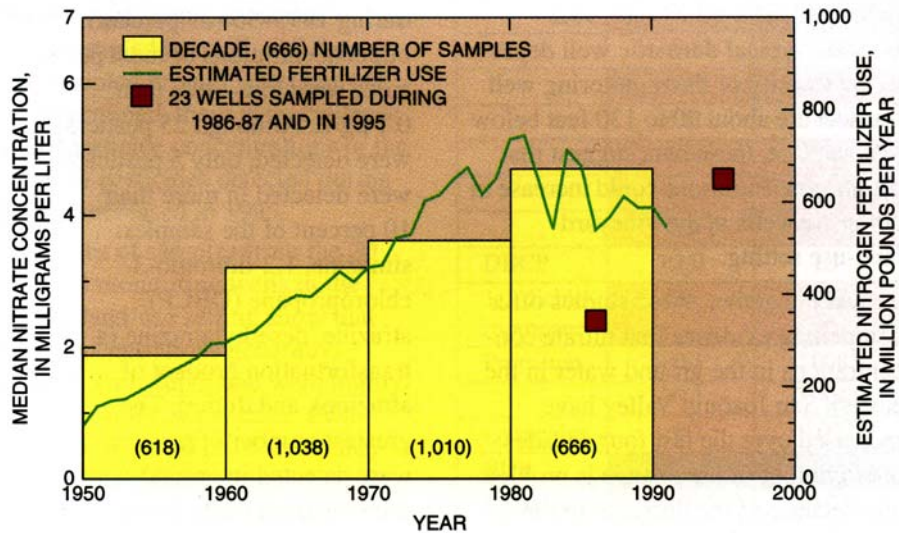
Past Studies of Economic Gains from Groundwater Management

Groundwater	Management	% Gain In Benefit
	Bredehoeft & Young	14-16%
	Gisser & Sanchez	0-1%
	Feinerman & Knapp	12- 14%
	Allen & Gisser	0-1%
	Worthington et al	30-34%
	Nieswiadomy	0.2- 6.5%
	Reichard	11.50%
Conjunctive	Management	
	Noel et al	18-20%
	Knapp & Olsen	2.60%
	Knapp et al	5-11%
	Average % Gain	10.535

Essence of an Age Distribution (Fogg 2003)



Long-Term Measurements Show Degradation



Fertilizer use and median nitrate concentration in ground water have generally increased over the past four decades. From Dubrovsky, et al. (1998) - USGS NAWQA

Quality and Quantity Management

- ◆ The economic benefits from optimal versus individual pumping seem small.
- ◆ Quality degradation effects are much slower and harder to reverse. Quality and quantity are often linked.
- ◆ Common pool nature of contamination makes economic incentives hard to employ without standards and monitoring.

Financing the Environmental Water Account.

- ◆ The Environmental Water Account has reduced supply risk to agricultural and urban contractors
- ◆ Currently the EWA is financed by Federal and State allocations.
- ◆ Joint Financing by water contractors can be viewed as an environmental insurance policy.
- ◆ Consistent with insurance, premium levels should be lower for senior water rights.
- ◆ To Control "Moral Hazard" environmental managers should be responsible for the first "deductable" water quantities.

The California Environmental Water Account 2001-2003

Year	Number of Actions	Water Use / Action (KAF)	Total Water Use (KAF)
2001	10	8.8 – 82.4	311.0
2002	8	5.0 – 75.9	422.0
2003	8	5.5 – 59.5	195.0

A “Ball park” Estimate of Environmental Insurance Cost

EWA 2001	311	
EWA 2002	422	
EWA 2003	185	
Average EWA Use	306	
EWA Purchase Price	131	
Average Expected Cost (2001-2003)		40086
Add Drought Premium (0.166 * 150%)	0.25	50107.5
Bulletin 160-98 1995 Surface Supplies		
Sacramento	11881	
San Joaquin	8562	
Tulare	7888	
SWP South	610.6	
Total taf		28941.6
Average cost/ acre foot (50% match)	\$0.87	
Average cost/ acre foot (75% match)	\$1.30	

A Permanent EWA Scheme

- ◆ Environmental Regulation is a permanent factor for California water.
- ◆ Reducing the environmental supply uncertainty by water banks works
- ◆ Permanent financing on the basis of a broad based environmental insurance results in manageable premiums.

Conclusions

- ◆ California Water is slowly moving from a Politically allocated commodity to an economic commodity.
- ◆ The cost of water supply is influenced by risk
- ◆ Options and Insurance are widespread methods of reducing and selling risk
- ◆ We should investigate the application of these tools to some water problems
- ◆ Not all California water problems are amenable to financial tools- namely Groundwater quality.