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Innovative Responses to Water Supply Variability



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The Aspen Global Change Institute

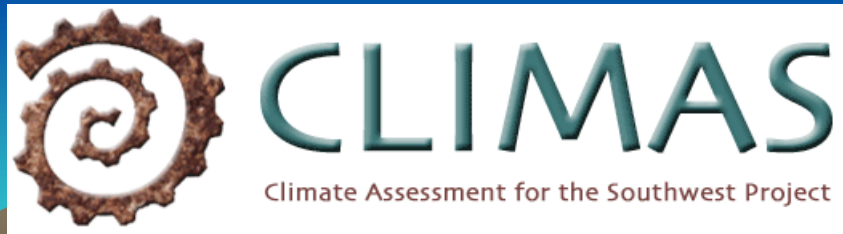
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“Learning from Regions: A Comparative Appraisal of
Climate, Water, and Human Interactions in the Colorado and
Columbia River Systems”

Innovative Responses to Water Supply Variability

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Climate and Water Supply Variability

- precipitation, snowmelt, runoff
- streamflows and groundwater levels
- reservoir yields
- environmental constraints on water use
- fire effects on runoff, water quality



Risk: Water Supply Variability

- difficult to deliver customary water quantities
- difficult to comply with environmental regulations
 - surface water quality standards
 - instream flow requirements



Risk: Variability in Water Costs

- acquiring dry year supplies
- addressing conflicts
- regional coordination efforts
- changes in power costs
- changes in water treatment costs



Risk: Conflict Management Costs

- inter-jurisdictional coordination
- litigation and negotiations
- agreements in advance of crisis
- prevention less costly than damage control



Drought

- twelve U.S. droughts since 1980 each have caused damages exceeding \$1B
- drought damages accumulate slowly are larger than hurricanes and tornadoes
- damages greatly reduced if water-reallocation agreements already in place



Typical Responses to Drought

- lobby (successfully) for disaster relief
- lobby for infrastructure funding
- restrict urban outdoor watering
- argue over who gets how much and when
- argue about raising water rates



Drought Response

- repeated cycles of short-run panic and long run inertia
- the “hydro-illogical” cycle (National Drought Mitigation Center)



Drought Preparedness

- fine-tune reservoir operations
- groundwater recharge and recovery
- increasing block rate water pricing
- authorize dry-year surcharges
urban and ag
- improved effluent reuse
- negotiate to firm up dry year supplies



Strategies to Improve Supply Reliability

- firm up dry year reliability
- increase long-run, annual supplies
- decrease short-run demand in times of shortage
- decrease long run water demand



Arrangements To Firm Up Dry Year Supplies

- mitigate costs of water supply variability
- preserves local ag base if farmers adequately compensated



Dry year option contracts

- ownership of water right remains with original water user
- compensation for lost crop revenues AND
 - disruption of farm planning and land use patterns
 - production and marketing expenses
- terms and timing for notification to cease irrigation
- increased payments to irrigators when option exercised later in growing season



Example of Dry Year Option

MWD S. California and Sacramento Valley irrigators

- district-to-district arrangements
- \$10/af to district to secure option
- \$90/af to farmer to exercise option



Example of Dry Year Option

MWD S. California and Sacramento Valley irrigators

- \$5 million paid in 2003 for 50,000 af
- farmers shift from rice to less water intensive crops
- shift from surface water to groundwater



Regional Water Bank

legally authorized arrangement for:

- storing water to be used in the future
- temporary water transfers
- need flexibility in river operations and reservoir or aquifer storage



Regional Water Bank

functions:

- coordinate negotiations
- standardize units of water traded
- standardize trading procedures
- reduce transaction costs
- match buyers and sellers



Water Banks Around the West

Several established banks:

- Idaho, Snake River
- Arizona, interstate
- Texas
- California, many regions



Water Banks Around the West

newly emerging:

- Oregon – Klamath Basin
- New Mexico – Pecos Basin only (so far)
- Nevada – proposed
- Colorado



Klamath Basin Water Bank

- accumulated 50,000 af for 2003
- water acquired will be released for fishery needs
- high prices in 2002, approx \$300/acre
- in 2003, approx \$188/acre (still exceeds farm land rental rate)



Deschutes Water Exchange

- NGO founded in 2001
- actively promotes water leases from farmers to maintain stream flows
- restored flows to key spawning streams that had been de-watered



“Leasing water allows farmers to see how markets can work without obliging them to make permanent transactions. Leasing is a great way to test different approaches to streamflow restoration.”

- spokesperson for Deschutes Water Exchange



Spot Markets for Water

- one-time lease of specific quantity
- low (and relatively certain) transaction costs
 - easy to contact potential lessors/lessees
 - minimal administrative requirements
 - little or no brokerage fees
- price negotiated between lessor/lessee
- no change in ownership of water right



Spot Markets: Examples

Texas Lower Rio Grande Valley

- well-defined surface water rights
- complete monitoring/enforcement
- 10-20% of water rights in spot market
“normal” years
- 30-40% in dry years
- ag-to-ag, ag-to-urban, ag-to-mining



Spot Market: Snake River Basin, 2001

- 400 farmers agreed to fallow 150,000 acres so the electric power and water could be re-directed.
- Payments averaged \$485/acre (better than crop returns even in good years).



Acquiring Agricultural Water

The infamous American bank robber, Willie Sutton, was once asked why he robbed banks. Sutton replied, somewhat perplexed by the question:

“Banks are where the money is.”



Irrigation Consumptive Use in Selected Major Western States, 1995

	Irrigation's Consumptive Use (MAF/year)	Irrigation's Share of State Consumptive Use (%)
Columbia River Basin		
Oregon	2.7	96
Washington	2.5	91
Idaho	3.8	99
Montana	1.6	93
Colorado River Basin		
Wyoming	2.4	95
Colorado	4.4	94
Utah	1.7	88
New Mexico	1.5	85
Arizona	2.8	83
Nevada	0.9	79



Examples of Land Fallowing Agreement

- MWD S. California – Palo Verde Irrigation District, 2003
- 7-29% of district land fallowed annually (max 26,500 acres)
- 25K to 111K water for urban needs
- one-time sign up payment: \$3,170/acre
- annual payment: \$550/acre fallowed



Example: California Drought Emergency Water Bank

- 1991, offered farmers \$125 per acre-foot
- acquired 820,000 acre-feet
- only wanted 655,000 acre feet
- BUT rapidly acquired water for drought needs
- 1992, offered \$50 per acre foot
- acquired 154,000 acre feet



Arizona-Nevada Interstate Water Banking

- small pilot program in place for several years
- new agreement provides up to 200,000 afy storage for Nevada in Arizona aquifers
- cumulative storage for Nevada may not exceed 1.2 maf



Arizona-Nevada Interstate Water Banking

- storage gives Nevada “credits” to take equivalent quantity of Arizona’s share of Colorado River water from Lake Mead
- max 100,000 af credits can be used by Nevada in any one year
- long, complex federal-state negotiations



New Federal Initiative

- recognize “crisis management not an effective solution”
- target federal resources to assist state/local efforts
- emphasis on voluntary, collaborative approaches
- water banking, temporary transfers



“Most young salmon are gathered up and put into barges and released past the dams. River flows do not affect them.”

- Columbia River Basin Water Manager



Although California growers are highly productive, other countries can produce crops much more cheaply. Despite transport costs and a 376% import tariff, garlic grown in China is cheaper at Oakland wholesalers than garlic grown an hour away

- The Economist, January 11, 2003



The ski industry has woken up to global climate change with the launch of a “Keep Winter Cool” campaign.

The campaign will work for more regulation of auto and power plant emissions and promote using renewable energy to run ski lifts and snow making operations.

- High Country News



Coastal, northern Californians laughed when they first heard of a plan to pump river water into colossal bags and tow it down the coast to southern California.

Then, they organized community opposition. The “bag” is 100 feet wide and three football fields long.

- U.S. Water News, 2003



Arizona's Central Arizona Project Board
voted to reduce the cost of CAP water to
cities, lowering the 2002 capital charge from
\$43/af to \$37/af and then to \$32 in 2004.

A 25% cut in water rates, during severe
drought.



On the edge of the pueblo were corrals, orchards,
and little gardens of corn, chili, melons and squash
... and all about an intricate network of irrigation
ditches...

Water is a holy thing in the pueblos; you
understand there how the heart yearns for it...
when the rain comes, you hold your face and
hands up to it.

- N. Scott Momaday, reflecting on his childhood in
Jemez Pueblo



Klamath River - Oregon



San Pedro River - Arizona



Preparation

