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### SLIDES: Managing Risks Associated With Climate-Related Water Supply Variability

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## **Managing Risks Associated With Climate-Related Water Supply Variability**

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**Outline prepared for: Water, Climate and Uncertainty** Natural Resources Law Center  
University of Colorado, June 11-13, 2003

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### **Overview of Topics:**

- what climate-related water supply risks need to be managed?
- firming up dry year supplies
- water acquisition strategies – advantages, disadvantages and examples
- tools for implementing acquisition programs
- acquiring agricultural water supplies
- effective methods to reduce ag consumptive use
- pervasive effects of the federal farm bill on western water use

#### **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
- regional coordination efforts
- changes in power costs
- changes in water treatment costs
- addressing conflicts

### **Typical Responses to Drought**

- lobby for infrastructure funding
- restrict urban outdoor watering

- argue about raising water rates
- lobby (successfully) for disaster relief
- repeated cycles of short-run panic and long run inertia

### **“Common Sense” Drought Preparedness**

- fine-tune reservoir operations
- groundwater recharge and recovery
- authorize dry-year surcharges: urban *and* ag
- negotiate to firm up dry year supplies

### **Arrangements To Firm Up Dry Year Supplies**

#### **Dry year Option Contracts**

- ownership of water right remains with original water user
- compensation for lost crop revenues, disruption of farm planning
- terms and timing for notification to cease irrigation
- cost of options must be weighed against increased reliability provided
- dry-year options *much* more expensive (per af/year) than buying water rights
- useful way to introduce water trading

#### **Regional Water Banks**

- legally authorized arrangement for storing water to be used in the future
- functions:
  - coordinate negotiations
  - standardize units of water traded
  - standardize trading procedures
  - reduce transaction costs
  - match buyers and sellers
- requires state-of-the-art website, professional staff
- develop clear acquisition guidelines
- develop compensation mechanisms (if needed)
- temporary water transfers
- requires flexibility in river operations and reservoir or aquifer storage

#### **Spot Markets for Water**

- one-time lease of specific quantity
- low (and relatively certain) transfer costs
- price negotiated between lessor/lessee
- no change in ownership of water right

#### **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).
- All agreements finalized in 2 weeks

## **Water Acquisition Costs**

five variables determine acquisition costs:

1. prices paid for water (mix of water acquired)
2. annual increase in water prices
3. how quickly acquisitions get underway
4. time to complete acquisitions
5. transaction costs incurred

## **Transaction Costs**

- in addition to the actual price paid to water sellers: transaction costs must be budgeted
- transaction costs include:
  - administrative fees
  - attorney fees for water acquisitions
  - expert fees paid to undertake negotiations, investigate water rights, accomplish administrative processes
- estimated range to plan budget: 15-25% of the price paid for the water right
- based on studies in New Mexico, Colorado, Utah and Nevada

## **Acquiring Agricultural Water**

- new federal Farm Bill in May, 2002
- tens of billions of dollars in programs for U.S. agriculture
- \$\$ for water conservation and environmentally beneficial changes in water management
- role of agricultural subsidies in responding to climate variability

## **Effects of the 2002 Farm Bill**

### **On the one hand:**

- enhances profitability of irrigated crops
- contributes to larger irrigated acreage and water use
- alfalfa acreage *much* higher due to Farm Bill

### **On the other hand:**

- earmarks funds for ag water conservation
- earmarks funds for wetland/stream flow protection

## **Reducing Agricultural Consumptive Use**

- fallowing irrigated acreage
- “deficit” irrigation
- improved delivery systems and irrigation technologies
- “precision farming” irrigation management
- changes in crop mix

### **Example 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: \$750/acre fallowed

### **Acquiring Irrigation District Water:**

- make offer to district as a whole
- offer bonus for early response, build momentum
  - avoid “divide and conquer” approach
  - open public process
  - each member receives something of value
  - spreads revenues from water acquisition program
  - can help build acceptance of the program

### **Mechanisms for Establishing Price**

#### **Case-by-Case Negotiated Acquisitions**

- tailor to meet specific needs
- transaction costs
- examples:

#### **Standing Offers**

- widely-used mechanism
- publicize a fixed offer price
- examples:

#### **Auctions and Bidding Mechanisms**

- public, transparent process
- reflect current market conditions
- examples:

#### **Bargaining With a Sellers’ Consortium**

- negotiate with an organization rather than on a one-by-one basis
- useful where transfers out of local agriculture controversial
- examples:

### **Summary: firming up dry year supplies**

- *No* simple or cheap options – but lots of innovative examples around West
- establishing a water acquisition program:
  - open process, community outreach
  - confidential negotiations with individual sellers
  - BUT secretive acquisition plans = high levels of objections and costs

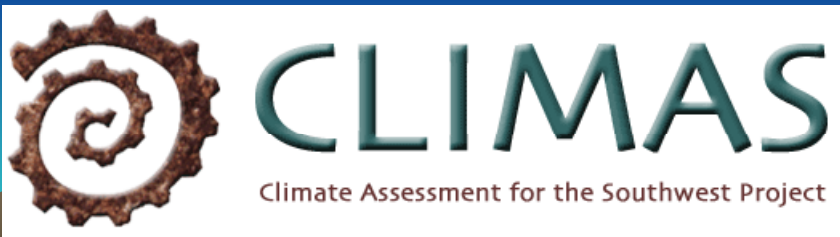
“And it never failed that during the dry years the people forgot about the rich years, and during the wet years they lost all memory of the dry years. It was always that way.”

*East of Eden*, John Steinbeck

# Managing Risks and Costs of Water Supply Variability

**Dr. Bonnie G Colby**  
**University of Arizona**

**Natural Resources Law Center Conference**  
**June 2003**



# 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
- regional coordination efforts
- changes in power costs
- changes in water treatment costs
- addressing conflicts



...the lower the water in the river, the drier the season, the more people came to be involved in distributing the water through the valley

...when it gets as bad as this, every time someone opened a ditch gate, a thousand people would be watching and listening.

- Stanley Crawford, *Mayordomo*



# Drought

- twelve U.S. droughts since 1980 with damages exceeding \$1B each
- drought damages accumulate slowly, are larger than hurricanes and tornadoes
- costs greatly reduced if dry-year water arrangements made “in advance of need”





**He made  
arrange-  
ments in  
advance of  
need!**

**Why is this man grinning?**

# Typical Responses to Drought

- lobby (successfully) for disaster relief
- lobby for infrastructure funding
- restrict urban outdoor watering
- argue about raising water rates
- repeated cycles of short-run panic and long run inertia



# Federal Drought Mitigation Funding

- billions spent in 2002
- 2003:
  - over \$3 billion for ag losses
  - \$53 million for irrigation improvements
  - \$750 million for ranchers
  - plus funds for specific basins



# Drought Preparedness

- fine-tune reservoir operations
- groundwater recharge and recovery
- authorize dry-year surcharges:  
urban and ag
  - triggered by forecasts?
  - If no meters: per acre, per hookup
- negotiate to firm up dry year supplies



# Arrangements To Firm Up Supplies: Dry-year Option Contracts

- ownership of water right remains with original water user
- compensation for lost crop revenues, disruption of farm planning
- terms and timing for notification to cease irrigation





# 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 to groundwater

(???)



# Tribal involvement: providing dry year reliability

- dry-year lease, Wyoming's Wind River
- fish flow assurances, Truckee River
- Arizona settlements, "senior" CAP water
- high potential for tribal participation if senior quantified rights
- or as part of settlement negotiations



# Dry Year Option Contracts

- cost of options must be weighed against increased reliability provided
- dry-year options much more expensive (per af/year) than buying water rights
- useful way to introduce water trading



# Arrangements To Firm Up Supplies: Regional Water Bank

legally authorized arrangement for:

- storing water to be used in the future
- temporary water transfers

requires flexibility in river operations and  
reservoir or aquifer storage



# Water Banks Around the West

Several established banks:

- Idaho, Snake River
- Arizona, intra- and inter-state
- 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)





# 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



# Arrangements To Firm Up Supplies: Spot Markets

- one-time lease of specific quantity
- low (and relatively certain) transfer costs
- 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).
- All agreements finalized in 2 weeks



## So, where's the flexibility in western river basins?

The infamous American bank robber, Willie Sutton, was once asked why he robbed banks.

Sutton replied, somewhat perplexed by the question:

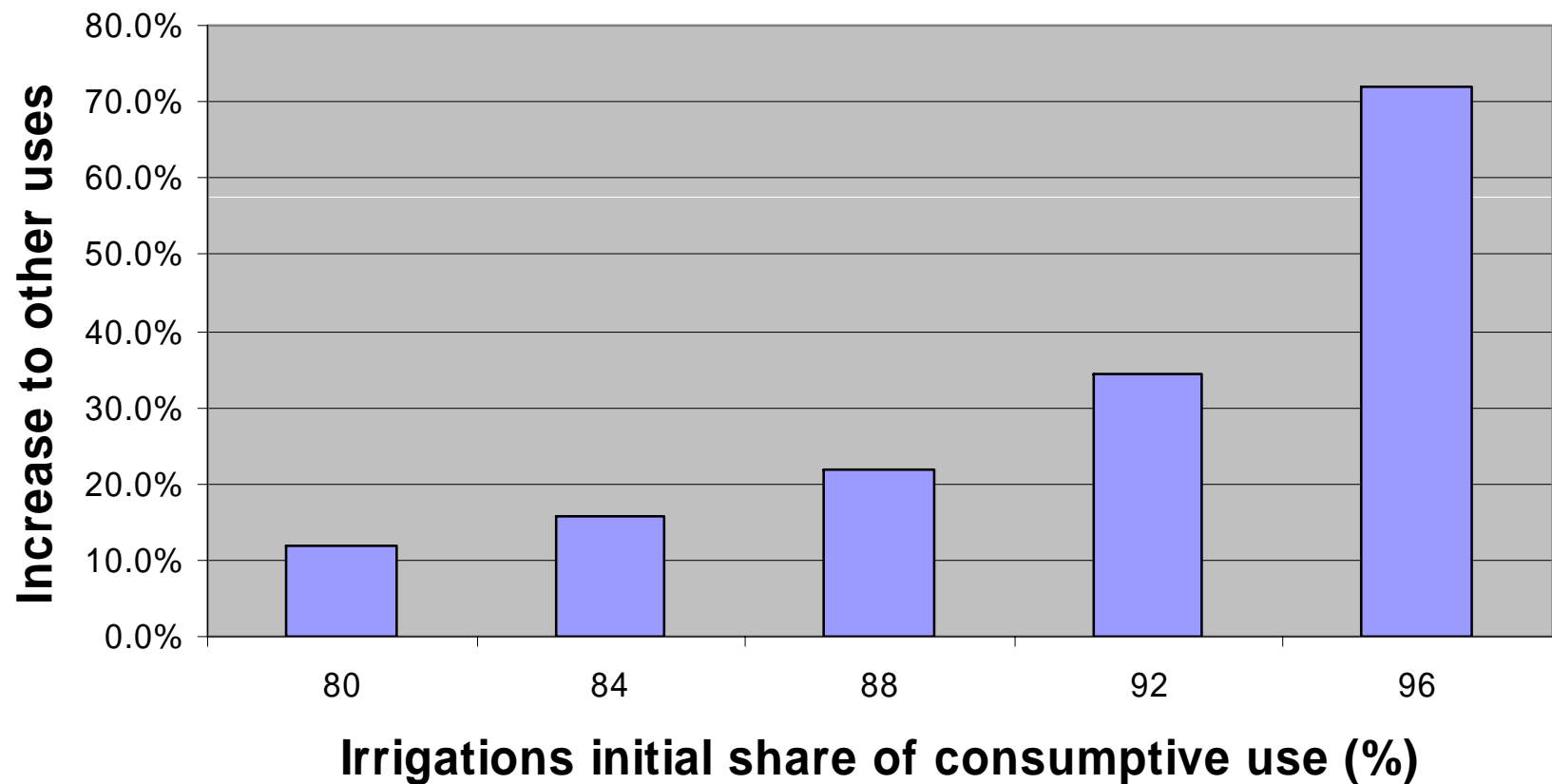
“Banks are where the money is.”



## Irrigation Consumptive Use

	Irrigation's Consumptive Use (MAF/year)	Irrigation's Share of State Consumptive Use (%)
<b>Columbia River Basin</b>		
Oregon	2.7	96
Washington	2.5	91
Idaho	3.8	99
Montana	1.6	93
<b>Colorado River Basin</b>		
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

## Increase in water for to other uses from a 3% reduction in irrigation use





# Acquiring Agricultural Water

- new federal Farm Bill in May, 2002
- tens of billions of dollars in programs for U.S. agriculture
- these payments are *in addition to* low cost water and power for many ag districts



# Effects of the 2002 Farm Bill

On the one hand:

- enhances profitability of irrigated crops
- contributes to larger irrigated acreage and water use
- alfalfa acreage much higher due to Farm Bill



# Effects of the 2002 Farm Bill

on the other hand:

- earmarks funds for ag water conservation
- earmarks funds for wetland/stream flow protection



# Example: Use of Farm Bill Funds

- Oregon's instream flow and riparian protection program
  - 100,000 irrigated acres targeted
  - fair market value payments for leasing water to state
  - \$250,000 budget, 75% federal funds



# Reducing Agricultural Water Applications

- following irrigated acreage
- “deficit” irrigation
- improved delivery systems and irrigation management
- changes in crop mix



# 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
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- annual payment: \$550/acre fallowed



# Example: suspending irrigation

San Antonio area of Texas, 1990s

- solicited offers to suspend irrigation
- irrigators submitted bid per acre
- 20,000 acre feet acquired
- half auctioned to municipal water users, remainder used for ESA needs



# Example: suspending irrigation

San Antonio area of Texas, 1990s

evaluated irrigator's bids based on:

- types of crops
- types of irrigation system
- commitment to dry land farming
- bid price per acre





# Summary: firming up dry year supplies

establishing a water acquisition program:

- open process, community outreach
  - confidential negotiations with individual sellers
  - BUT secretive acquisition plans = high levels of objections and costs
- 
- **No** simple or cheap options – but lots of innovative examples around West



# conference news flash:

- Economics has been displaced as the “dismal science”
- The title now belongs to the science of: climate modeling!



And it never failed that during the dry years  
the people forgot about the rich years, and  
during the wet years they lost all memory of  
the dry years. It was always that way.

*East of Eden*

John Steinbeck



Aridity, more than anything else, gives the western landscape its character.

It is aridity that gives the air its special dry clarity; aridity that puts brilliance in the light and polishes the stars...

- Wallace Stegner, *Thoughts in a Dry Land*

