Water Banking: Added Drought Resilience for New Mexico's Economy

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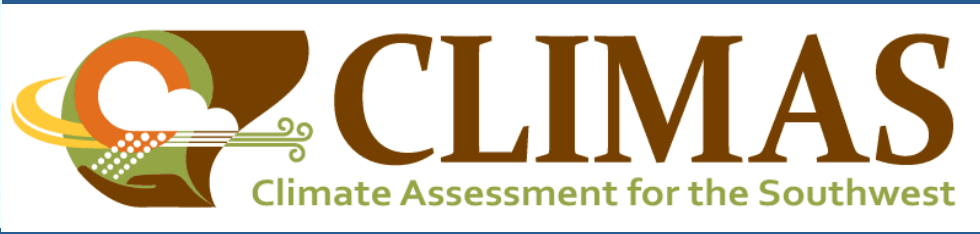
March, 2015

The organizations indicated below provided support for work summarized in this presentation.



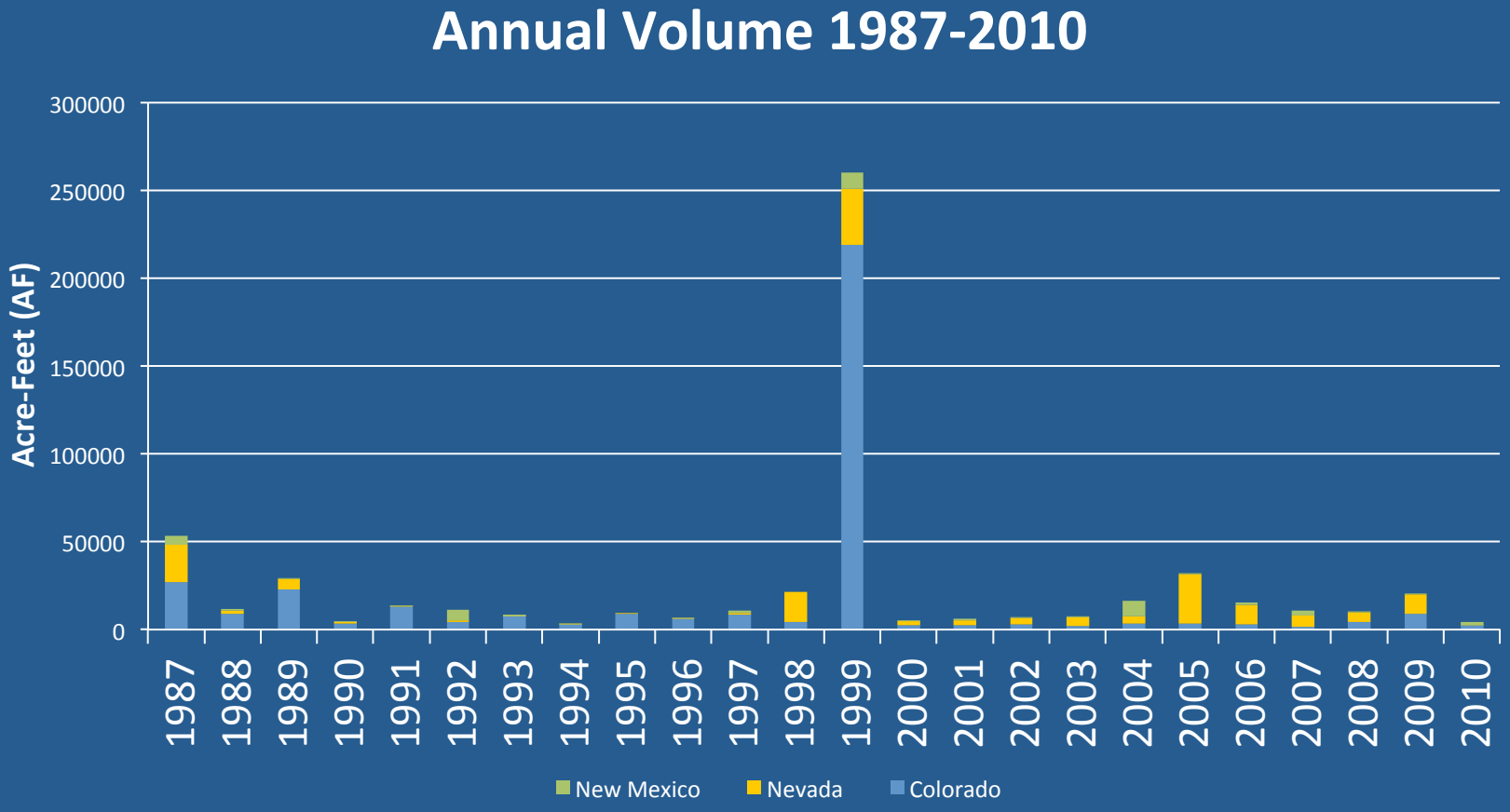
Disclaimer

- Consult for various NM clients on water matters
- Currently under contract to ISC in Pecos and LRG Basins
- Presentation represents general perspective as a university professor. Not intended as advice to clients, or to represent perspective of clients.

New Mexico Water Resource Economics

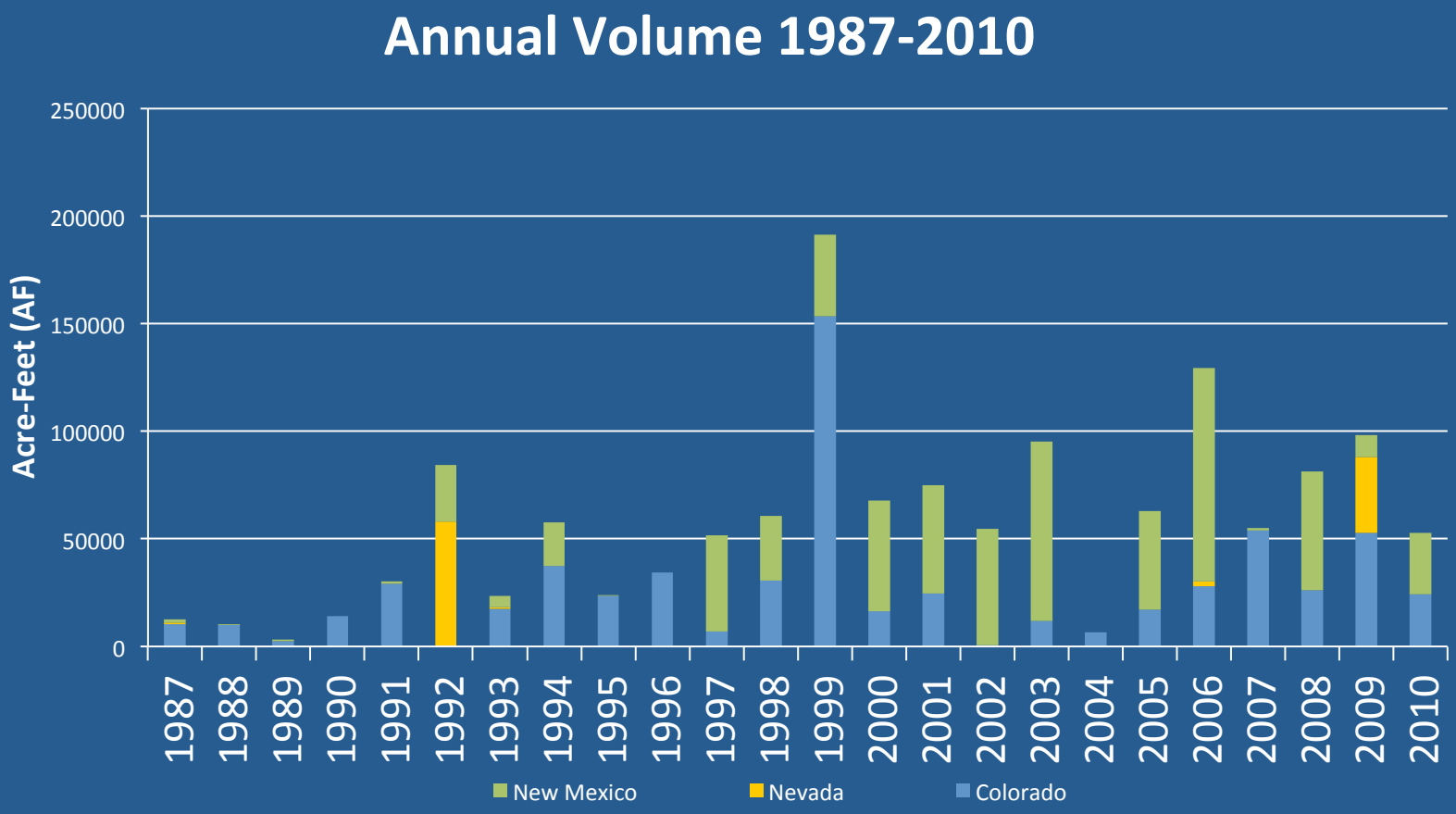
- UNM pioneering work over 5 decades and continuing – Econ Department, BBER
- NMSU - detailed models of ag water use profitability, contributions to state economy, recreation and instream flow values

Water Right Sales: New Mexico, Nevada, Colorado



Sources: Basta and Colby, 2010, Jones and Colby, 2010a

Water Leases: New Mexico, Nevada, Colorado



Sources: Basta and Colby, 2010, Jones and Colby, 2010a

Water Banking – Why?

- Reduce economic losses when juniors curtailed
- Improve supply reliability for M&I, high value crops, environ. and recreation flows
- Interstate compact compliance
- Funds to upgrade ag water infrastructure

Water bank:

- legally authorized to conduct temporary & intermittent changes in place/purpose of use
- offers an alternative to “buy and dry”
- offers streamlined procedures, “pre-approved” menu of transfers
- can be managed by state, federal or local agency, special district or private firm

Terminology

- Priority administration, curtailment of juniors
- Making “replacement water” available through reduced use
- Acquiring replacement water
- “Irrigation water entitlement” – use this term to include state water rights and Reclamation project water

Examples: how water bank generates economic benefits

- Pecan grower and field crop farmer

  Pecans ~ $260/afcu net farm income

  cotton/alfalfa ~ $135/afcu

- Irrig district and instream flows

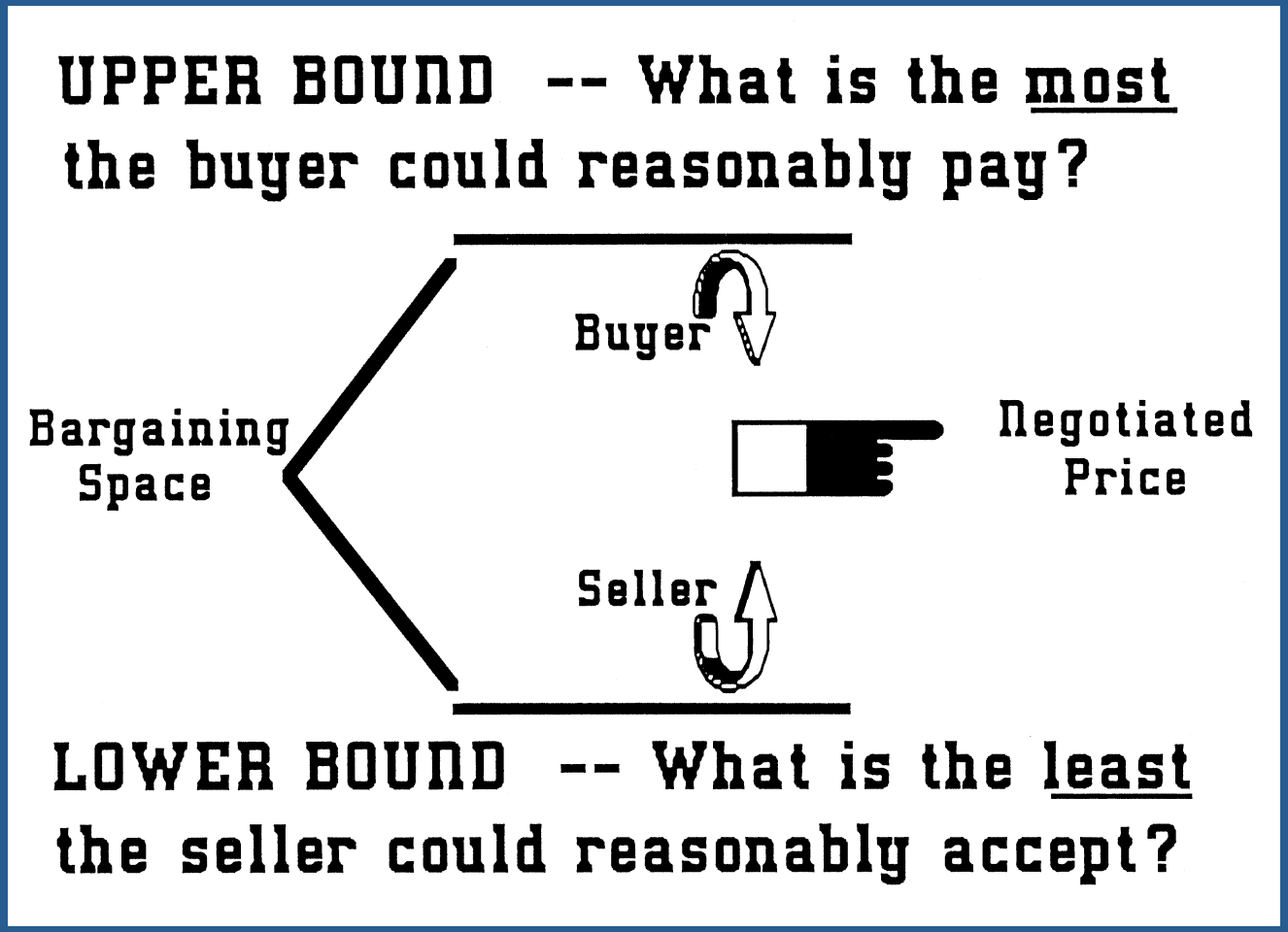
- Irrig district and municipal water provider

(Sources: NMSU 2013; Dagnino and Ward, 2012; Macarena, Dagnino and Frank A. Ward, 2012)

To Succeed A Water Bank Must

- serve a region containing diversity of water uses with varying WTP to reduce risk of curtailment
- cost-effectively provide seasonal, temporary "replacement water" in response to curtailment
- provide timely response – lead time for initiating curtailment?

water values and the “bargaining space”



Transaction Costs

- costs of finding trading partners, negotiating price, obtaining approval, implementing
- erode impetus for offering and acquiring replacement water
- high TC make seasonal and temporary trading impractical

Purchase of 500 af @ $14,000/af = $7M deal

Lease of 500 af @ $100/af = $50K deal

Water Bank Pitfalls to Avoid

- Water bank increases depletions – key issue: defining transferrable quantity & acceptable methods of producing replacement water
- Unacceptable third party impacts
- Inadequate diversity of participants
- Water bank fails to offer rapid response, low transaction costs

Third Party Impacts?

- reduced irrigated acreage => decreased business activity, earnings, employment
- BUT when replacement water used in same region as fallowing, positive impacts of using replacement water balance out reduced economic activity linked to fallowing
- consider alternatives to full season fallowing

Examples: Water Bank Arrangements

- Contingent contract to provide replacement water if curtailment occurs
- Spot market – one time provision of replacement water
- Seasonal leases, mid-season irrigation suspension

Contingent Contracts: Adapting to Curtailment Risk

- Multi-year contracts negotiated in advance of need
- Rapid response when replacement water needed
- Motivated by differences in cost of being curtailed
- Provider of replacement water temporarily reduces use to free up water

Contingent Contracts (cont)

- Triggered by a pre-specified indicator – stream flow or reservoir level
- Contracting provider of replacement water can be ID and/or farmers
- Added layer of negotiation when ID involved: payments to ID and to farmers

Contingent contracts (cont)

- Include notification deadline so farmers can adapt farm planning
- Cap set on frequency for exercising option
- Rotate farm participation – a farm only fallows for 1-2 years at a time, keeps farms active and spreads benefits of participating (Source: Jones and Colby, 2010b)

Contingent Contracts (cont)

- enrollment payment offered upfront to attract farmers to enroll
- when option exercised, payments set at levels to cover net crop revenues foregone
- payment to ID to cover district-level costs of accommodating fallowing
- magnitude and timing of payments, split of payments between IDs and farmers all determined by negotiations

Contingent contract examples

- 4 summer weeks, cease mountain pasture irrigation, triggered by low flows, high temperatures for fish

- Field crop irrigation forbearance to sustain orchards, triggered by curtailment for juniors

- Compact compliance, triggered by low reservoir levels

Potential methods for creating replacement water

- full season of cropland fallowing
  - easiest to monitor
- change in crop mix to alter crop CU
- change in irrig technology & practices
- regulated deficit irrigation

Colo State Univ Study – Alfalfa Deficit Irrigation

- State of art linear irrigation system, near Fort Collins
- 2.5 acres of established alfalfa
- cost-effective means to produce conserved water
- compared net income/acre
  - Full irrigation: $245/acre
  - Stop w 2nd cutting: $177/acre
  - Sacrifice $68/acre net farm income

Source: Lindenmayer et al, 2010

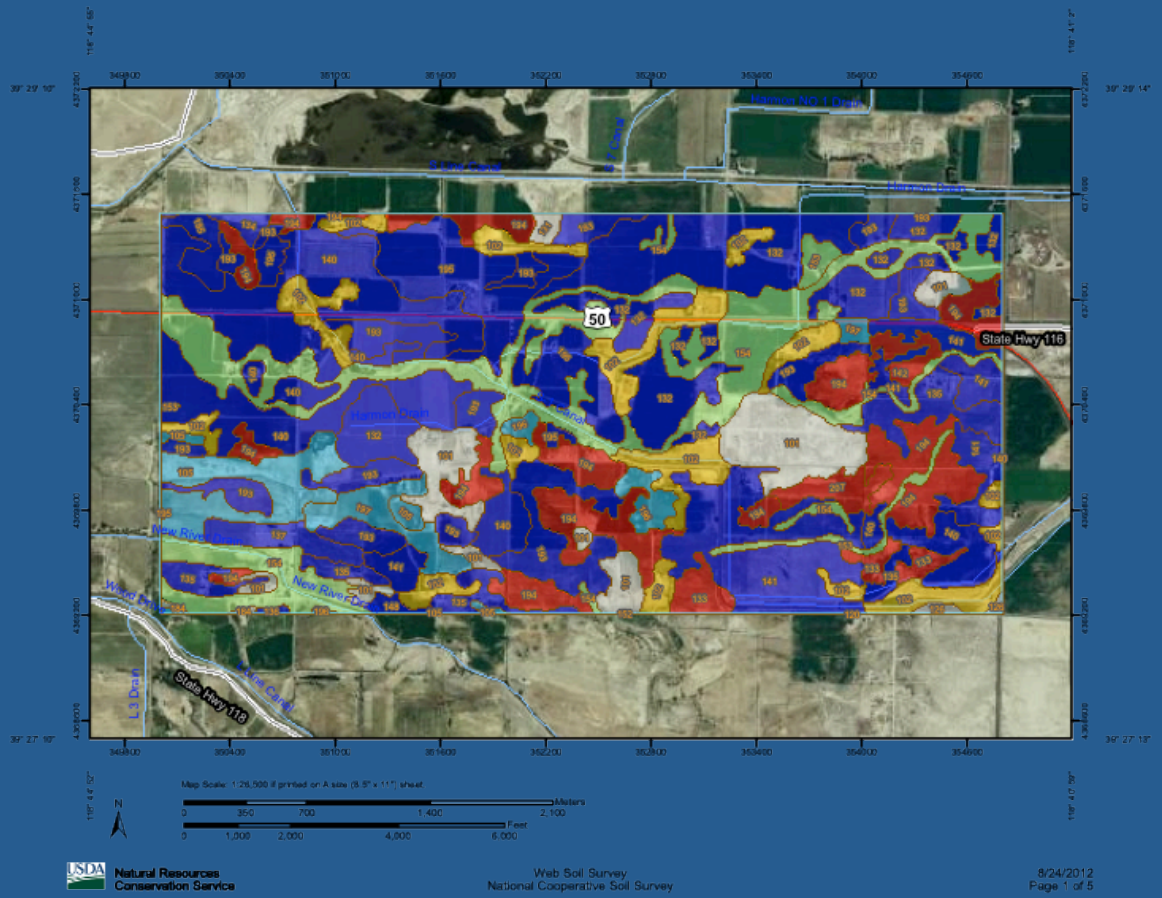
Part season irrigation suspension

- On-the-ground field-checking costly – not “worth it”
- Not consistent with how water rights administered
  FDRs, water applied vs consumed
- Can remote sensing make monitoring these arrangements practical?

Web Soil Survey yield map for alfalfa, Lahontan Valley, NV

Yields of Alfalfa hay (tons), February 2012

Soil Data Mart, NRCS http://soildatamart.nrcs.usda.gov



<= 0.22 > 0.22 and <= 0.4 > 0.4 and <= 3.39

> 3.39 and <= 4.93 > 4.93 and 5.68 not available

Cost Effective Monitoring with RS

Idaho DWR - Landsat thermal data, METRIC ET model

Costs to monitor 3,830 irrigation wells
using power consumption coefficients = $120 per well

Using Landsat thermal data, cost = $30 per well

RS data significantly higher accuracy, as well as less expensive.

Cost Comparison For Monitoring Irrigation Water Use:
Landsat Thermal Data Versus Power Consumption Data
Anthony Morse, William J. Kramber Idaho Department of Water Resources

GIS and Remote Sensing Capacity

Water bank needs access to highly trained professional staff

Benefits:

- lower cost to accomplish monitoring and water accounting tasks
- improved timeliness and precision in tracking CU
- transparency, reduced conflict

Partner with universities

– capacity building
- outreach on RS

VALUE: one Landsat scene can include $500M in water assets

track crop CU
- field, sub-field scale
- 2+ observations per month

Mesilla Valley, New Mexico. Landsat-7, pecan orchards (white polygons).

From New Mexico WRRI Technical Completion Report No. 357 ESTIMATING WATER USE THROUGH SATELLITE REMOTE SENSING

Establishing water bank prices

- one-time trades “matched” online
- fixed offer price
- auctions and bidding,
- case-by-case negotiations between those offering and seeking repayment water
- can offer bonuses to enroll lands at ends of ditches, other spatial distinctions

Water bank admin fees

Base admin fee on price paid for water

Example: half of one percent admin fee

500 af for 10 years, $2K per afcu
Payment = $1M

Admin fee = $5,000

Advantages of fee based on price paid:

- funding for water bank admin
- public info on water prices develops market

Western U.S. Water Bank Examples

Nebraska Platte Basin NRDs

- NRDs must meet flow targets: compacts, ESA
- Farmers paid per acre-foot reduced depletion to river (calculated using basin models)
- Twin Platte NRD: Online trading platform calculates transferrable quantities, matches buyers and sellers
- Central Platte NRD: paying $8,000 per acre-foot depletion in 2014, up from $3,750

Nebraska Platte Basin Natural NRDs

- online water trading system accounts for spatial difference in impacts on river flows.
- provision of replacement water ("offset") motivated by water users who need an offset paying to decrease current use
- water users well aware that broad regulatory reduction in water use likely if trading system proves ineffective.

Idaho Snake River Basin – 60 years of water banking

- motivated by salmon recovery, hydropower
- Use remote sensing to facilitate and monitor changes in ag CU
- LARGE benefits to ag from water bank
  - drought impacts on farm profits reduced 80%
  - most water bank trades are ag-to-ag

Klamath River Basin

- Pilot Water Bank managed by Reclamation in midst of intense acrimony and litigation over water for endangered fish versus farming
- Many phases of Klamath water banking illustrate adaptive management approach
- use of guiding principles to develop fallowing programs that accommodates environ needs while protecting ag economy and infrastructure

Colorado: Upper Rio Grande

- 2012, new CREP program for conserving irrigation water, reducing groundwater program provides funding for activities of the type water banks often implement, though this program is not referred to as a water bank
- Farm Service Agency administers, partnering with NRCS, Colorado DWR, Rio Grande Water Conservation District

Upper Rio Grande CREP

- USDA pays up to 50 percent of the cost of installing the conservation practices
- program notable for combination of incentives funded by federal, state and local sources
- specifically targets reduced agricultural use in where it is most spatially advantageous for water management objectives (bonus zones)

Guidebooks: Innovative Water Trading

- **Prioritizing Water Acquisitions for Cost-Effectiveness, 2013**
- **Measurement, Monitoring and Enforcement of Irrigation Forbearance Agreements, 2012**
- Entendiendo el Valor del Agua en la Agricultura: Herramientas para Negociar Intercambios de Agua, 2012
- **Understanding the Value of Water in Agriculture, 2011**
- **Water Banks: A Tool for Enhancing Water Supply Reliability, 2010**
- **Dry-Year Water Supply Reliability Contracts: A Tool for Water Managers, 2009**

Mo O'Donnell (now at UNM), Bonnie Colby and various co-authors, University of Arizona, Department of Agricultural and Resource Economics.

Google: Colby water guidebooks

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