Integrated Modeling to Test and Design Alternative Water Markets: Rio Mimbres, New Mexico

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NNSA National Nuclear Security Administration

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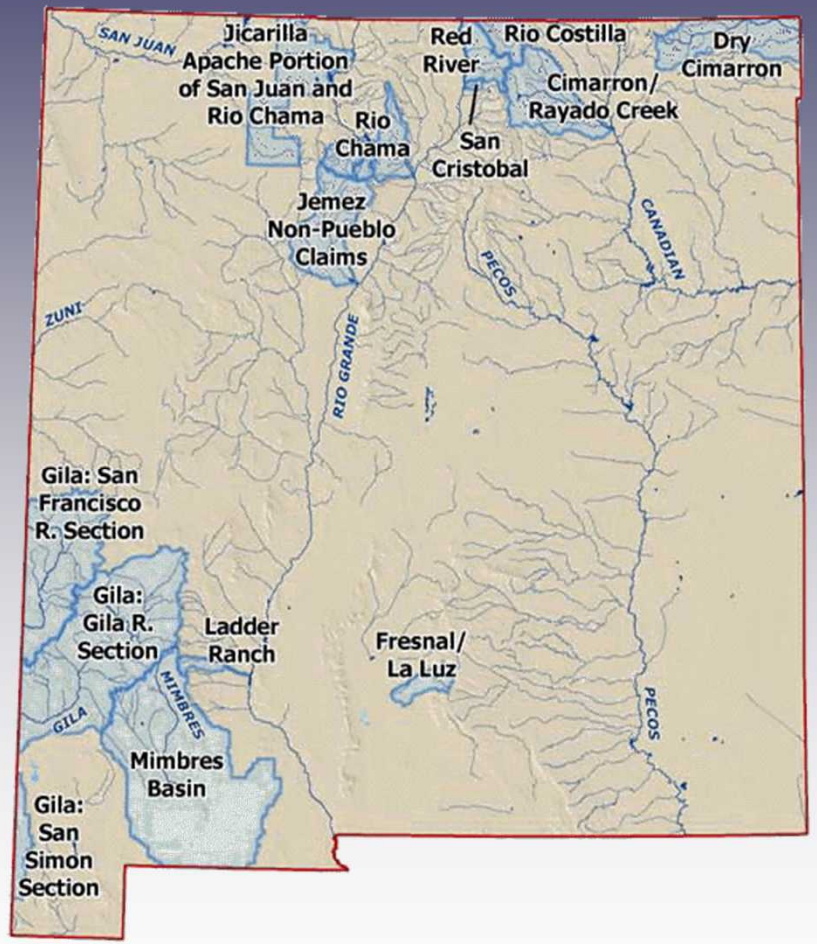
Active Water Resource Management

- Provides institution to:
  - Supervise the physical distribution of water,
  - Protect senior water rights owners,
  - Assure compliance with interstate stream compacts, and
  - Prevent waste caused by administration of water rights.
- Replacement plans provide means for curtailed junior rights holders to acquire senior rights in expedited fashion.



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Problem

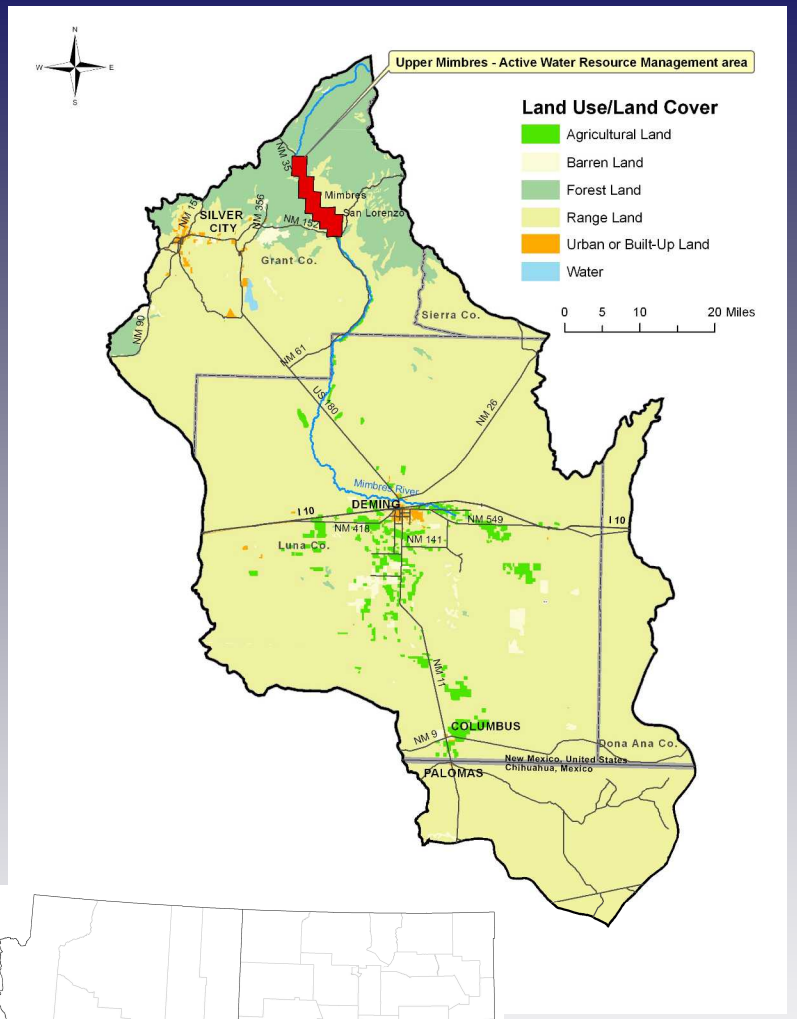
- In theory water markets are a vehicle that allows the efficient, short-term reallocation of water rights.
- But, in reality how does one establish such a market in a charged environment?

Objectives

- Requested by the New Mexico Office to the State Engineer to:
  - Develop decision support tool to vet water marketing ideas and issues within the NMOSE,
  - Use the tool to explore physical/economic consequences subject to alternative institutional controls and market systems, and
  - As a pilot project, aid in the design of a water market for the Mimbres.

Mimbres AWRM

- *Located in southwestern New Mexico*
- *AWRM area is only a small portion of basin.*
- *Approximately 800 acres of irrigated agriculture*
- *Basin has also seen rapid growth in domestic well use*



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Water Conveyance System

- Nine individually operated irrigation ditches, serving approximately 140 farms.
- Bear Canyon Reservoir is operated for summer irrigation and recreation

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Water Use Priority

- Each of the 9 ditches has a different priority date.
- The senior ditch is downstream of all junior ditches.
- Domestic well users are junior to all ditches.

Our Job

- Design a water market that:
  - Is consistent with State water law,
  - Provides “value” to basin water users, and
  - Is simple as possible.
- Pilot study for New Mexico

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Methods: Stakeholder Team

- New Mexico Office of the State Engineer
- Mimbres Water Users Group:
  - Irrigators
  - Domestic Wells
  - Mutual Domestic, and
  - NM Fish and Game.

UPPER MIMBRES WATER DISTRICT
ADVISORY COMMITTEE MEMBERS

San Lorenzo CD	Jupe Bounds PO Box 4069 Silver City, NM 88062 (505-)
Heuchling Ditches	Ron Strain PO Box 171 Mimbres, NM 88049 (505-536-9856)
Montoya Ditch	Manuel Galaz Rt. 15, Box 615 San Lorenzo, NM 88041 (505-536-9307)
Grijalva Ditch	Danny Joe Roybal HC 68 Box 27 Mimbres, NM 88049 (505-537-2969)
Kenly #1 & #2	Joe Miller PO Box 532 Mimbres, NM 88049 (505-536-3313)
Mimbres Basin (at large)	G.X. McSherry 8600 Hwy 377 SE Deming, NM 88030 (505-546-8086)
Casas Adobes	Al Wegher ~ c/o Casas Adobes Route 15, Box 2540 Mimbres, NM 88049 (505-536-9918)
Game & Fish	Leon Redman PO Box 1421 Silver City, NM 88062 (505-)
Domestic Well Users	Sue Richins HC 68 Box 3150 Mimbres NM 88049 (505-536-2866)

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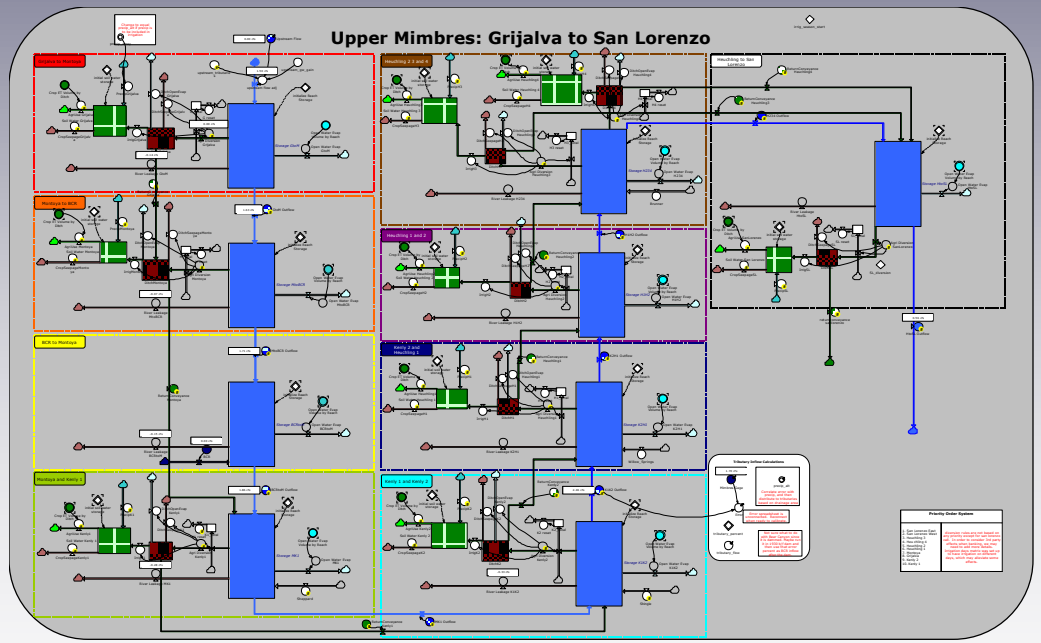
Methods: Integrated Modeling

- Model Purpose
  - Address the deliverability of water to upper ditches,
  - 3rd party effects,
  - Scheduling of deliveries, and
  - Identify unintended consequences.

Methods: Integrated Modeling

- Hydrology model
  - Upper Mimbres river,
  - Nine irrigation ditches,
  - Bear Canyon Reservoir,
  - Fluvial and regional groundwater system,
  - Domestic and irrigation demands.
- Water rights
  - Priority allocations, and
  - Priority call procedures.



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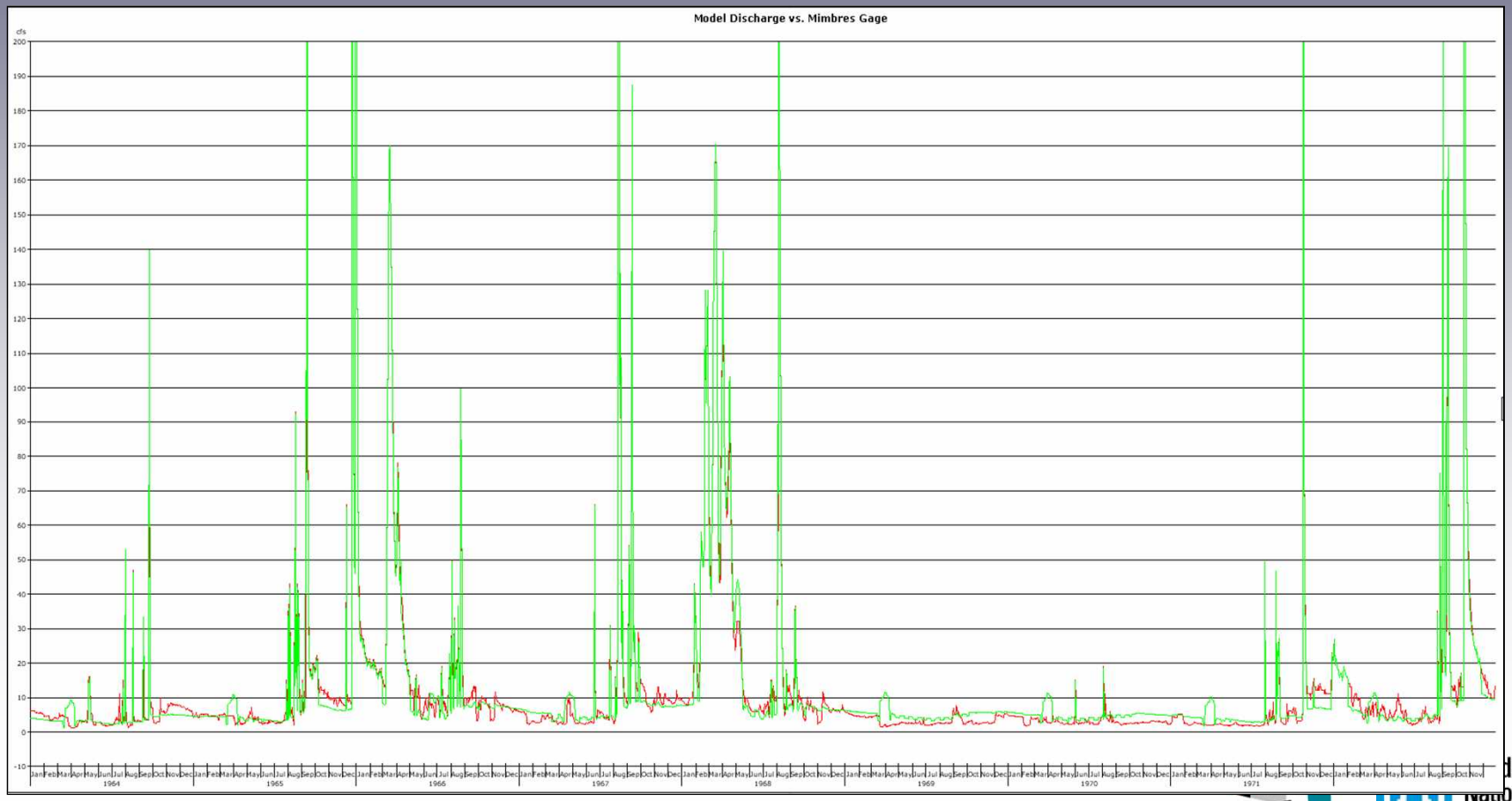
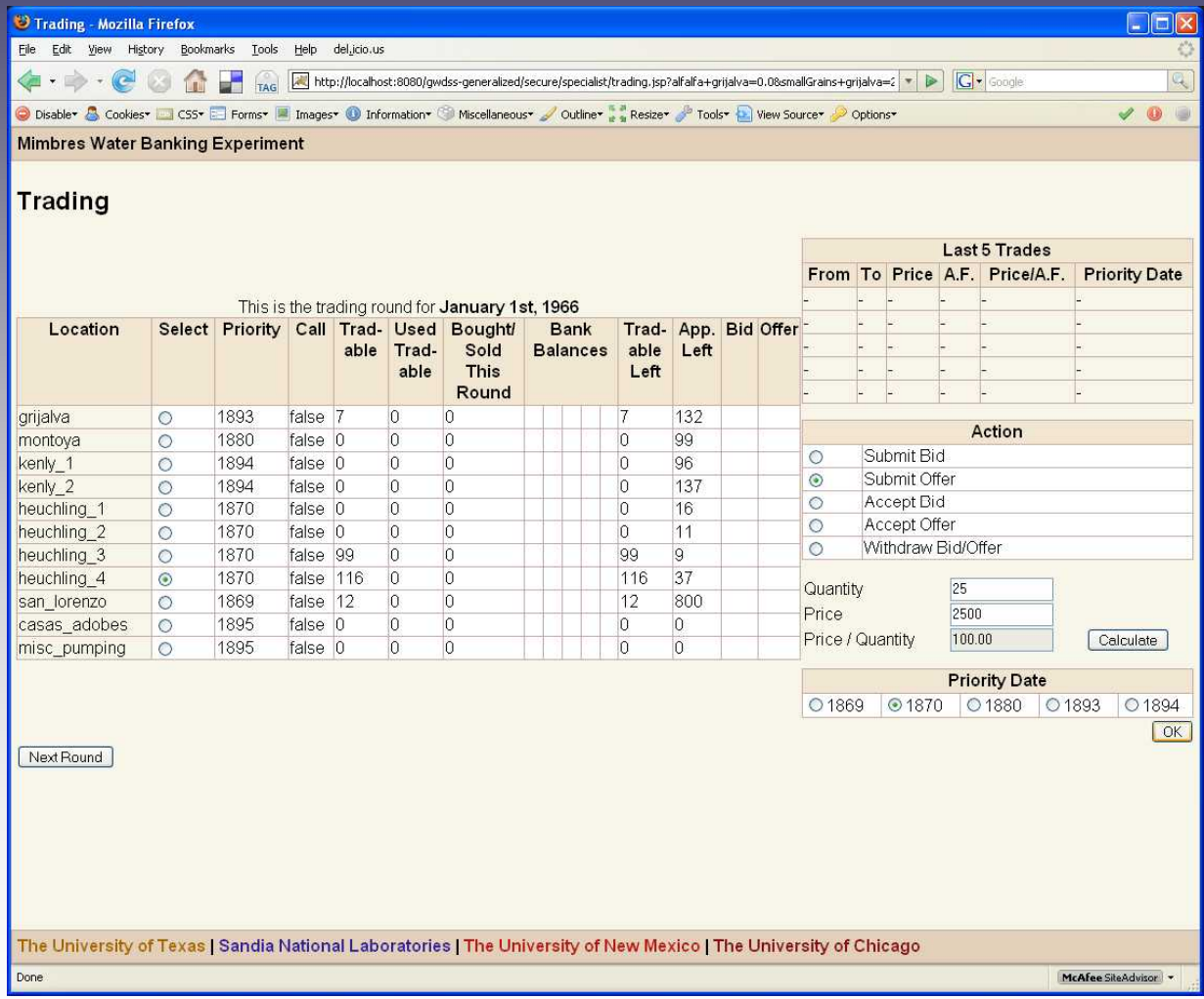
Methods: Integrated Modeling

- Calibrated on available data, which is very limited



Methods: Integrated Modeling

- Link hydrology model to market "storefront".
- Let participants design market through series of trading experiments.



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Methods: Experiments

- June 2006 — Initial Contact
- December 2006 — Kickoff Meeting
- February 2007 — Model Introduction and Market Definition
- June 2007 — Model Demonstration
- October 2007 — Project Recalibration

Results: Market Regulations

- Water “stacking”:
  - The application of more water than the adjudicated right (2.7 AF/acre),
  - Constitutes waste,
  - Concession: can exceed right slightly if improves crop yield.
- Stakeholders lack clear understanding of regulations

Results: Improved "Value"

- NMOSE Perspective
  - Facilitate Active Water Resource Management in time of priority call.
- Water Users Perspective
  - Lease of unused water:
    - Limited stacking allowed,
    - Higher water use crop (e.g., pecans),
    - Multiple cropping,
    - Irrigation of "new" acreage,
    - Lease outside the AWRM

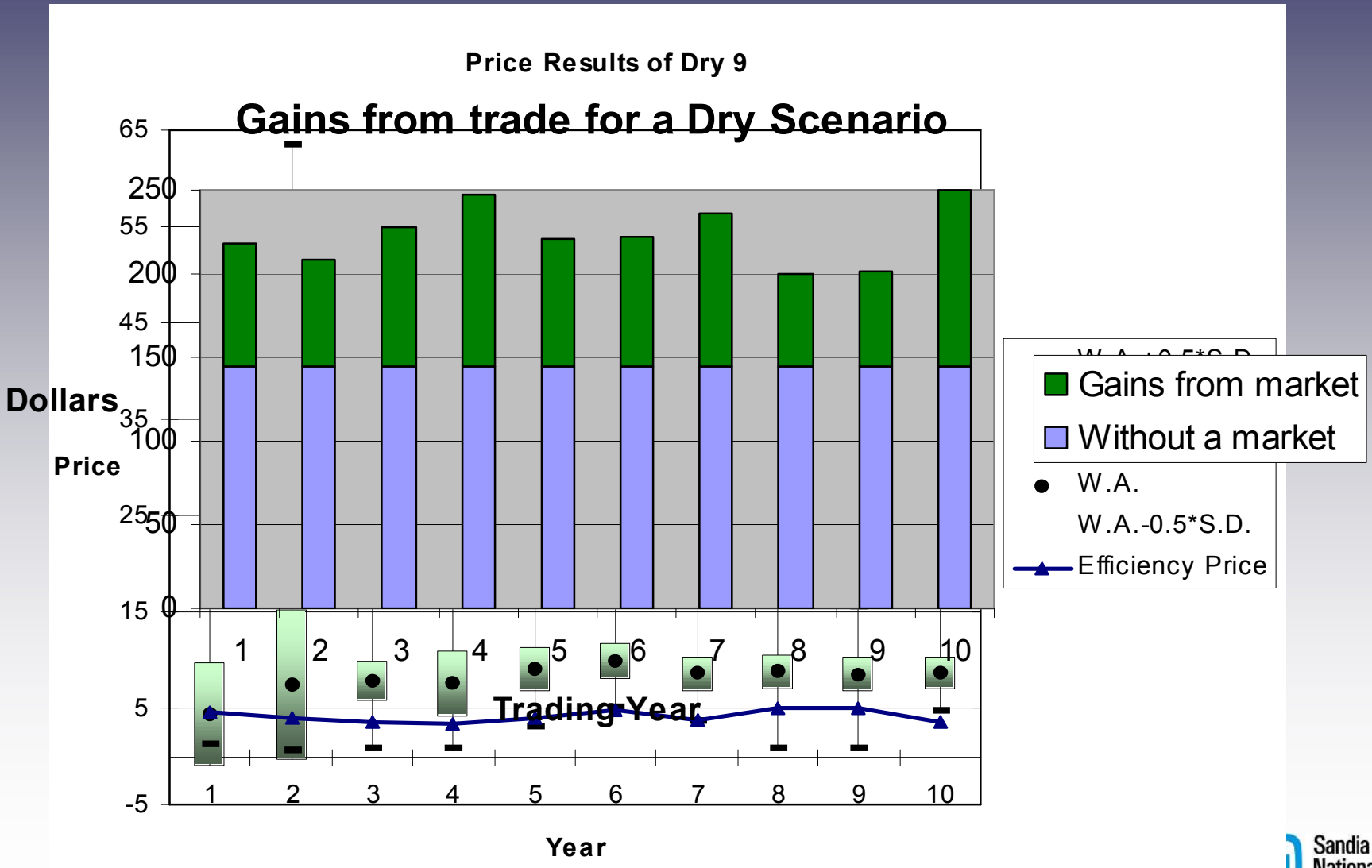
Results: Market Administration

- NO COMPUTERS!
- Chalkboard and piece of paper with rules.
- NMSOE nor water users want responsibility of administration.
- Water users willing to pay administration fee.

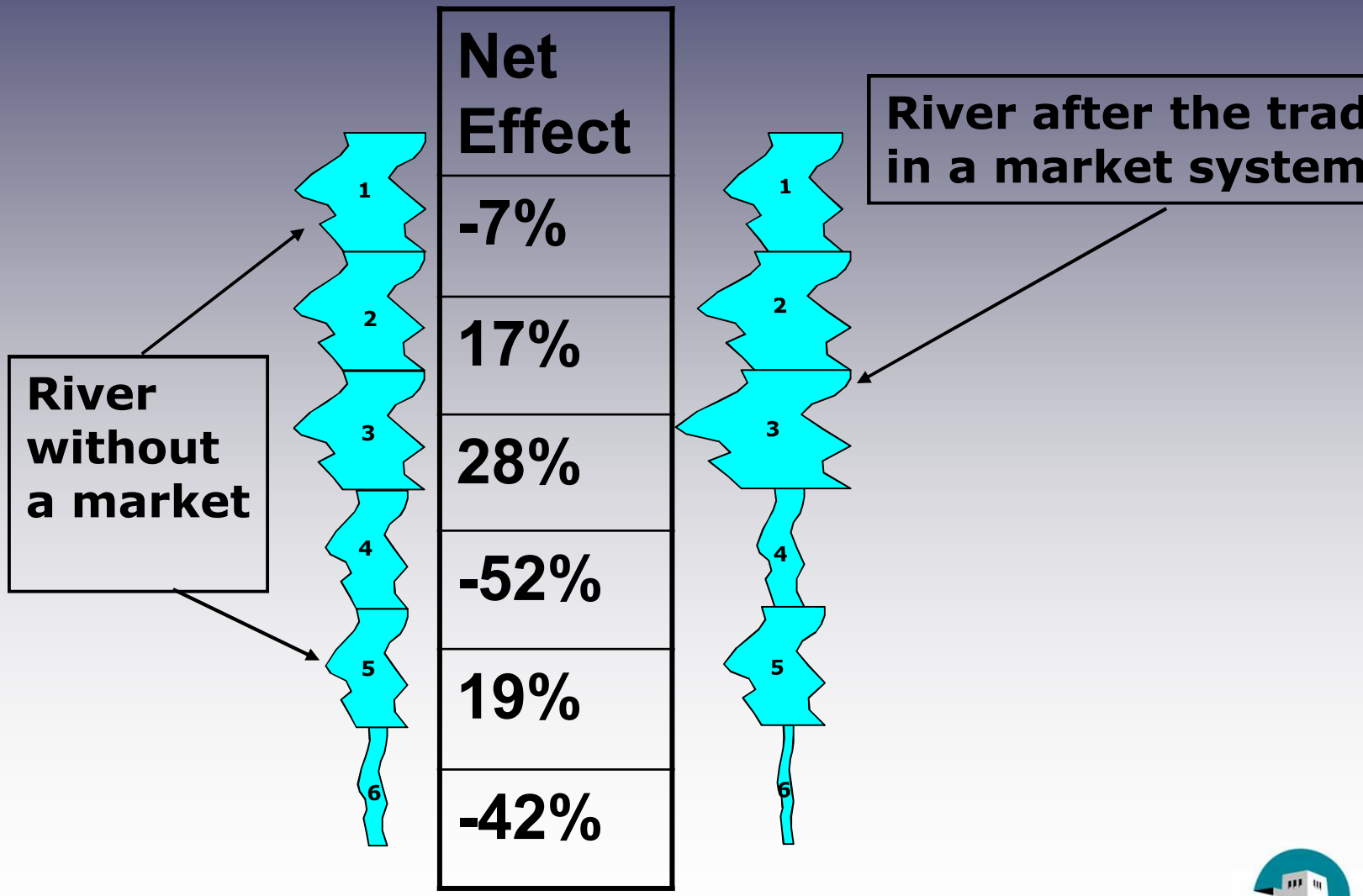
Next Steps

- Perform experiments at UNM to:
  - Identify market consequences, and
  - Identify hydraulic consequences.

Next Steps


Price Results of Dry 9
Gains from trade for a Dry Scenario
Dollars
Price
65
250
55
200
45
150
35
100
25
50
15
0
5
-5
1
2
3
4
5
6
7
8
9
10
Trading Year
Year
Gains from market
Without a market
W.A.
W.A.-0.5*S.D.
Efficiency Price

Next Steps



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Next Steps

- Perform experiments at UNM to:
  - Identify market consequences, and
  - Identify hydraulic consequences.
- Develop rule set with input from NMOSE and results of experiments.
- Iterate on rules.
- Identify administrator.