SLIDES: Interstate Marketing and Similar Economic Approaches

Jim Booker

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INTERSTATE MARKETING AND SIMILAR ECONOMIC APPROACHES

Jim Booker
Siena College
WHAT IF MARKETS REALLY HAPPEN?
If markets happen:

• Where does the water go?

• What are the net benefits to the buyers and sellers?

• What are the impacts to third parties?
Market scope

- Intrastate
- Interstate but intrabasin
- Interstate and interbasin
The conventional wisdom -

Clear hierarchy of economic value:

1. urban use
2. lower basin agricultural use
3. upper basin agricultural use
Supporting the conventional wisdom:

Pat Tyrrell  
- June 8, 2005

“We can’t argue dollars with Las Vegas.”

Las Vegas $1/square foot turf removal is
$1/ft^2 \times 43,560 \text{ ft}^2/\text{acre} = $43,560 per acre

Compare this to your favorite per acre irrigated land value
Market impacts in the Basin

based on


and

*containing* Booker, “Hydrologic and Economic Impacts…”
Contrasting markets in the Basin

**Idea:** *with and without*

- Water use: how does it change *with vs. without* the market?
- Economic impact: what are the net $ impacts of market transfers (i.e. the difference between *with and without*?)
- Contrast hydro and other values *with and without* a market.
Contrasting markets in the Basin

One scenario:

• 10% level of historic 10 year Lee Ferry mean
  (almost identical to Stockton and Jacoby median: 13 maf)

• Current (not future) depletion schedule
The Model

[Diagram showing the water flow and resource management system, including tributary sources, economic demands, and reservoir evaporation losses.]

Legend:
- Tributary Sources
- Economic Demands
- Reservoir Evaporation Losses

1. Green River
2. Yampa & White
3. Upper Colorado (including Grand Valley)
4. Gunnison
5. Dolores
6. San Juan
7. Lake Powell
8. Glen Canyon Hydropower
9. Lee's Ferry
10. Lakes Mead, Mohave, and Havasu
11. Lower Basin Hydropower
12. Bill Williams
13. Central Arizona Project
14. Colorado River Aqueduct (MWD)
15. Colorado River Indian Reservation
16. Palo Verde
17. Imperial Valley
18. Coachella
19. Yuma
20. Mexican Deliveries
Contrasting markets in the Basin

**Intrastate**
- Ag to urban transfer within states
- $128 million
- Hydro benefits unchanged

**Interstate**
- Ag to urban transfer within state
- $130 million
- Hydro benefits unchanged
Preliminary conclusion

Intrastate markets do virtually as well as interstate markets in maximizing the beneficial use of basin water.
An unconventional wisdom -

A simpler hierarchy of economic value in basin consumptive uses:

1. urban use
2. agricultural use
What did we leave out?

1. Las Vegas future demands

2. Hydropower, salinity, and other instream values.
Power producers enter market

**Intrastate**
- Ag to urban transfer within states
- $128 million
- hydro benefits unchanged

**Interstate**
- Ag transfer to lower basin
- $190 million
- hydro (and salinity) benefits increase
The bottom line - clear hierarchy of economic value:

1. urban use
2. instream use (hydro, water quality, ...)
   ==> 
3. lower basin ag use economically favored over upper basin ag use
## More results

Differences from "law of the river" are shown
all data in 1989 million $

<table>
<thead>
<tr>
<th></th>
<th>Institution</th>
<th>Use</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current historic</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(13.0 maf/yr)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Intra use</td>
<td></td>
<td>93</td>
<td>69</td>
</tr>
<tr>
<td>Inter use</td>
<td></td>
<td>94</td>
<td>88</td>
</tr>
<tr>
<td><strong>(JEEM 1994)</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Inter all</td>
<td></td>
<td>72</td>
<td>138</td>
</tr>
<tr>
<td><strong>Current tree ring</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(11.7 maf/yr)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intra use</td>
<td></td>
<td>172</td>
<td>132</td>
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<tr>
<td>Inter use</td>
<td></td>
<td>178</td>
<td>93</td>
</tr>
<tr>
<td>Inter all</td>
<td></td>
<td>161</td>
<td>159</td>
</tr>
<tr>
<td><strong>2010 historic</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(13.0 maf/yr)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intra use</td>
<td></td>
<td>656</td>
<td>558</td>
</tr>
<tr>
<td>Inter use</td>
<td></td>
<td>657</td>
<td>560</td>
</tr>
<tr>
<td>Inter all</td>
<td></td>
<td>643</td>
<td>634</td>
</tr>
<tr>
<td><strong>2010 tree ring</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(11.7 maf/yr)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intra use</td>
<td></td>
<td>675</td>
<td>576</td>
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<tr>
<td>Inter use</td>
<td></td>
<td>693</td>
<td>515</td>
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<tr>
<td>Inter all</td>
<td></td>
<td>662</td>
<td>604</td>
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</table>

"Old river"

"New river"
Elephants in the room

- High cost of new supplies

- Beyond overappropriated: overused

- How much can we use
High cost of new supplies

Neglecting market opportunities leads to:

1. Multibillion dollar schemes like Nevada’s Virgin/Muddy River proposal.

2. Trying to use a desalting plant on agricultural return flows: Yuma.
Cost of new supplies vs. market options

Table B. Summary of annual costs of two alternatives for providing replacement water from a national accounting perspective. Assumes 78,000 acre-feet produced annually, the average of two potential Yuma Desalting Plant yields given in Department of the Interior (2003).

<table>
<thead>
<tr>
<th>Alternative</th>
<th>National cost estimate (annual)</th>
<th>Risk of substantially greater costs</th>
<th>Implementation risk</th>
<th>Flexibility</th>
<th>Secondary economic impacts</th>
<th>Environmental impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forbearance agreements</td>
<td>$3 million</td>
<td>low – large existing acreage of lower valued crops</td>
<td>moderate – institutional procedures not yet in place</td>
<td>high – temporary agreements</td>
<td>moderate – local loss of related economic activity</td>
<td>low – small reduction in flows to Cienaga</td>
</tr>
<tr>
<td>Restarting Yuma Desalting Plant</td>
<td>$25 million</td>
<td>high – track record of much higher costs; extensive pretreatment requirements; vulnerability to energy cost increases</td>
<td>high – updating of complex, older technology required</td>
<td>low – costs to maintain plant in ready reserve are greater than costs of forbearance agreements</td>
<td>moderate – temporary construction impacts; ecotourism impacts</td>
<td>high – loss of Cienaga wetlands</td>
</tr>
</tbody>
</table>
Elephant #2: Beyond overappropriation

“Estimated consumptive uses of the Basin’s water between 1996 and 2000 averaged over 19 MAF per year.”

## Colorado River System
### Consumptive Uses and Losses Report 1996-2000

<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>COLORADO RIVER SYSTEM</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Lower Basin Mainstem</td>
<td>8,028</td>
<td>8,101</td>
<td>7,621</td>
<td>7,977</td>
<td>8,222</td>
<td>7,989</td>
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<tr>
<td>Lower Basin Tributaries</td>
<td>2,827</td>
<td>2,488</td>
<td>2,465</td>
<td>2,368</td>
<td>2,391</td>
<td>2,508</td>
<td></td>
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<tr>
<td>Other</td>
<td>2,024</td>
<td>1,974</td>
<td>1,759</td>
<td>2,154</td>
<td>2,102</td>
<td>2,003</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td>16,638</td>
<td>16,196</td>
<td>15,547</td>
<td>16,037</td>
<td>16,668</td>
<td>16,217</td>
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</table>

### WATER PASSING TO MEXICO

<table>
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<tbody>
<tr>
<td>Treaty</td>
<td>1,500</td>
<td>1,700</td>
<td>1,700</td>
<td>1,700</td>
<td>1,700</td>
<td>1,660</td>
<td></td>
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<tr>
<td>Minutes 218, 241, and 242</td>
<td>112</td>
<td>89</td>
<td>114</td>
<td>79</td>
<td>108</td>
<td>100</td>
<td></td>
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<tr>
<td>Regulatory Waste</td>
<td>5</td>
<td>1,173</td>
<td>3,018</td>
<td>1,194</td>
<td>337</td>
<td>1,146</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td>1,617</td>
<td>2,962</td>
<td>4,832</td>
<td>2,973</td>
<td>2,145</td>
<td>2,906</td>
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### COLORADO RIVER SYSTEM GRAND TOTAL

<table>
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</thead>
<tbody>
<tr>
<td><strong>COLORADO RIVER SYSTEM GRAND TOTAL</strong></td>
<td>18,256</td>
<td>19,158</td>
<td>20,379</td>
<td>19,010</td>
<td>18,813</td>
<td>19,123</td>
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</tbody>
</table>
Elephant #3: How much use is possible?

It depends.

How much variability in use will we accept?

Maximizing use may require *reducing* reservoir evaporation.
It depends on storage

System storage for “basinwide” use
(largely carryover)

Headwaters storage supporting local use
(largely to reshape seasonal flows)
It depends on the willingness to accept shortages

Maximizing use may require reducing reservoir evaporation -- by storing less (Booker, 2005)

Increasing risk of shortage ==>
What have we learned

• Many new water demands can be met by intrastate markets (but Nevada…)

• Instream uses (e.g. hydro) suggest benefits of an interstate perspective

• New storage has a water cost
Loss = 3 %

\[ \eta = -0.1 \]
\[ \eta = -0.2 \]
\[ \eta = -0.5 \]
\[ \eta = -1 \]
\[ \eta = -2 \]

Maximum Storage

( Standard Deviation ) / ( Mean Inflow )