Ecosystem Changes and Water Policy Choices:

Four Scenarios for the Lower Colorado River Basin to 2050

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Photos: Mark Lellouch and Karl Flessa
Millennium Ecosystem Assessment

**Direct Drivers of Change**
- Changes in land use
- Species introduction or removal
- Technology adaptation and use
- External inputs (e.g., irrigation)
- Resource consumption
- Climate change
- Natural physical and biological drivers (e.g., volcanoes)

**Indirect Drivers of Change**
- Demographic
- Economic (globalization, trade, market and policy framework)
- Sociopolitical (governance and institutional framework)
- Science and Technology
- Cultural and Religious

**Human Well-being and Poverty Reduction**
- Basic material for a good life
- Health
- Good Social Relations
- Security
- Freedom of choice and action
Scenarios for the Lower Basin

- **Drivers**
  - Climate change
  - Population growth
  - Policies

- **Outcomes**
  - Ecosystem changes in the Delta
  - Changes in human well-being in the Lower Basin
Scenario 1: Dry Future

- Long-term drought
- Streamflows keep declining
- Lake Mead level drops
- Compact is eventually scrapped
- New water allocation based on population

<table>
<thead>
<tr>
<th>State</th>
<th>Water Allocation (maf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA</td>
<td>4.4 to 4.4 maf</td>
</tr>
<tr>
<td>CO</td>
<td>3.9 to 1.2 maf</td>
</tr>
<tr>
<td>AZ</td>
<td>2.8 to 2.2 maf</td>
</tr>
<tr>
<td>UT</td>
<td>1.7 to 0.7 maf</td>
</tr>
<tr>
<td>NV</td>
<td>0.3 to 0.9 maf</td>
</tr>
<tr>
<td>WY</td>
<td>1.0 to 0.1 maf</td>
</tr>
<tr>
<td>Mexico</td>
<td>1.5 to 1.0 maf</td>
</tr>
<tr>
<td>NM</td>
<td>0.8 to 0.4 maf</td>
</tr>
</tbody>
</table>
Agriculture declines, urban water prices skyrocket
Economic dislocation
Limited interstate water market
Quality of life suffers
Campaign to uproot all vegetation along the LCR
Delta? What Delta?
Scenario 2: The Market Rules

- Unfettered interstate water market
- Ambitious augmentation and efficiency projects
- Accelerating rural to urban transfers
- Tremendous urban growth
Scenario 2: The Market Rules (cont’d)

- Water conservation cannot keep pace with population increases
- Window of opportunity to restore Delta ecosystems closes
Scenario 3: Powell’s Prophecy

- Development of a comprehensive vision for water resources management in the arid West
- Limits on rural to urban transfers
- Aggressive urban water conservation programs and shared best practices
Scenario 3: Powell’s Prophecy (cont’d)

- Water efficiency projects in Mexico
- Base and pulse flows for the Delta
- Recovery of estuarine conditions and indigenous communities
- Delta becomes a model for restoration worldwide
Scenario 4: A Delta and Estuary Once More

- Growing recognition of the importance of biological and cultural diversity
- New research on freshwater flows and endangered species in the Upper Gulf
- US Supreme Court intervenes to apply ESA
- US and Mexico embark on ecosystem-based management of the river
Scenario 4: A Delta and Estuary Once More (cont’d)

- Environmental assessment per af
- Best practices in cities and agriculture
- Development of regional water conservation goals
- Fisheries thrive and endangered species recover in the Upper Gulf
- Communities and ecotourism flourish in the Delta
Scenario Trade-offs

Dry Future

The Market Rules

Powell’s Prophecy

A Delta and Estuary Once More

Provisioning services

Regulating services

Supporting services

Cultural services

Ecological engineering capacity & knowledge

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Scenario Trade-off
Recommendations

- Extend ICS
- Dedicate base and pulse flows to Delta ecosystems
- Encourage water conservation in agriculture and cities
- Create mechanisms to safeguard rural communities
I would love to live
Like a river flows
Carried by the surprise
Of its own unfolding

John O’Donohue