Water Resources Research Center

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# Unique Aspects of Valuing Groundwater Resources

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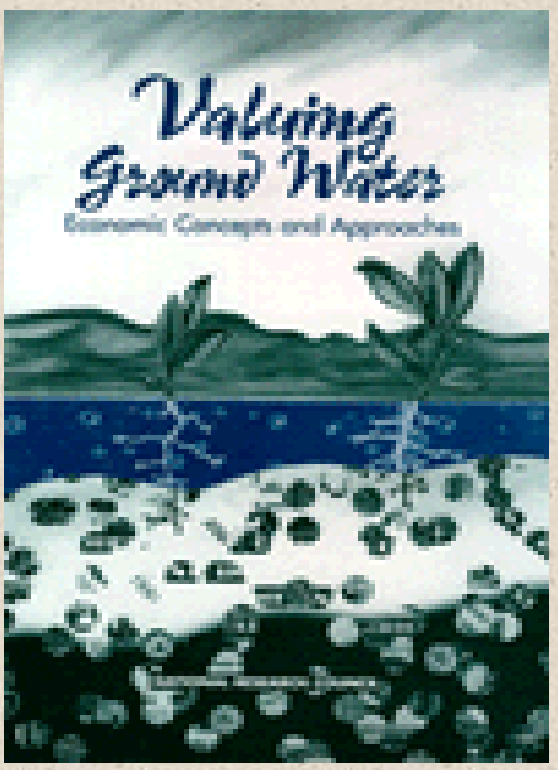
# Valuing Ground Water: Economic Concepts and Approaches

- Total economic value is the sum of direct use and in-situ or passive use values
- You can measure the total service flows of alternative water management policies
- Value is influenced by the institutional context



# Groundwater Values – Extractive vs. In-Situ

- Extractive (direct use) values
  - Consumptive uses (e.g. potable or agricultural use)
  - Non-consumptive uses (e.g. manage aquifer as a reservoir)
  - Water quality enhancements (soil-aquifer treatment)

# Groundwater values

- In-situ (passive) values
  - Buffer values (offsetting future shortages, drought supply)
  - Ecological and recreational values (e.g. base flow)
  - Saline intrusion buffers/barriers to contaminant flow
  - Subsidence avoidance
  - Existence value (intact natural systems)



# Price vs. Cost vs. Value

- Little relationship between price and value
- Price not always proportional to volume (other policy objectives beyond cost recovery or profit, like conservation, drought surcharges, consumer protection (ACC))
- Components of cost - energy, treatment, distribution and maintenance, administrative costs.  Rarely includes commodity charges.
- Water rights costs – lease and purchase costs - becoming a major factor (hookup fees, etc).

# Price as an Indicator of Value

- Willingness to pay varies depending on the sector and perceptions of users, profit margins, etc.
- Subsidies strongly influence price, many are hidden: energy, price supports, tax policy, etc.

# Evidence of Groundwater Value

(Numbers are not directly comparable)

| | |
|---|---|
| Withdrawal Fees | $2-3/AF |
| Type II Rights | Up to $2,700/AF of right |
| Ag Flex Credits | $1-10/AF (PHX) $100/AF (PRESCOTT) |
| **Replacement Cost** | |
| •CAGRD Replenishment Fee | >$200/AF - Phx-Tuc ($161 PINAL) |
| •CAP Prices (9 delivery rates) | $5/AF+energy, SRP; $153/AF interstate |
| •Recharge Credits | Water + facility charges up to $15 |
| •AWS Extinguishment Credits | $75-$110 (PRESCOTT) |
| Leases and Exchanges | T-II Prescott, $200/AF |
| **Water Prices for Consumers** | |
| •Private groundwater wells | $60-200/AF |
| •Reclaimed Water - Tucson | $610/AF |
| •Highest block - Tucson | $3,036/AF |
| •Bottled water | $1,300,000/AF @ $1/quart |

# Groundwater “insurance”

Increasing pressure on gw worldwide

- Overallocation of surface water
- Climate change and variability
- Increasing demand
- Changing values, eg salinity control in San Francisco Bay leading to restrictions on surface water use

# Groundwater vs. Surface Water Values

- Differences are context-dependent (direct use vs. in-situ, location, perceptions)
  - Quality
    - natural and man-made constituents,
    - implications for aesthetics,
    - treatment costs (appliances)
  - Access (availability of gw is distributed widely, access to sw more limited physically and legally)

# Groundwater vs. Surface Water Values

- Reliability (continuous availability)
  - Energy cost implications
- Regulatory implications – affecting scarcity, perception, access

# Regulatory Implications for Valuing Groundwater

Policy Choice : Regulatory drought

- Mandatory Conservation (vs. economic incentives to conserve; equity considerations)
- Assured Water Supply (100 years vs. short-term, marginal costs of new supplies need to be paid earlier, e.g. CAGRD looking at permanent supplies)
- Limitations on GW Transfers

# Regulatory Implications for Valuing Groundwater


- Actual drought – Scarcity impacts cost (and price)
- Physical/legal availability impacts on value
  - Grand Canyon Village
    - $20,000/AF
  - Western Slope of Colorado:
    - $50,000/AF for sw rights to offset groundwater use
    - impact fees up to $25,000

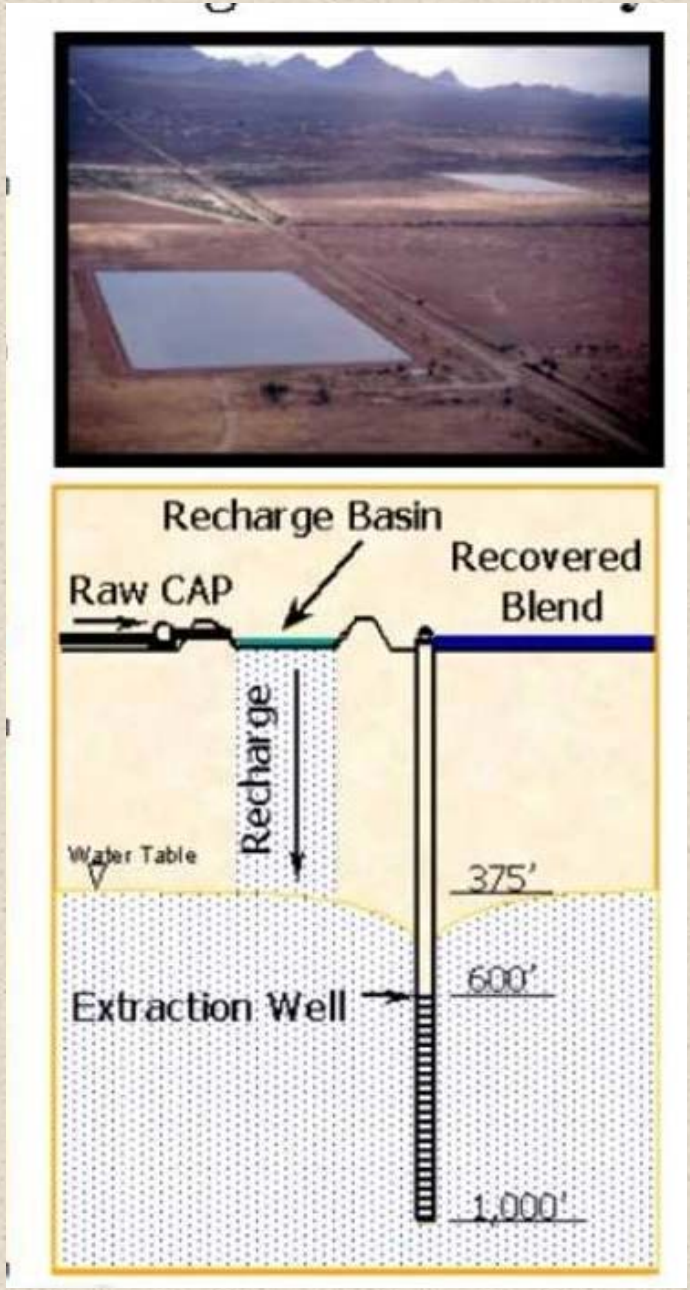
# The Need for Incorporating Economic Considerations in the Regulatory Approach

Lack of consideration of supply and demand

- Examples:
  - Projections regarding use of CAP water by ag
  - Formation of the CAGRD and requirements to accept members (projected obligation of 47,000 AF for 2025 in 2000, recent projections over 205,000 AF)
  - Formation of the AWBA's goals and revenue sources

# Implications of Conjunctive Use (Storage and Recovery)

- New sources of value, e.g. gw especially valuable for recovery outside the area of hydrologic impact; value of aquifer storage space in vicinity of canal, etc.




Graphic courtesy of
Tucson Water

Blending the values of gw and sw at Tucson Water's Sweetwater Facility: In the early years of this recharge and recovery program, the chemical composition of the recovered water is similar to groundwater. Over time, more and more CAP water mixes with the groundwater, changing the chemical composition of the recovered water.

# Conclusions

- All water is undervalued; Groundwater is a “hidden resource” and tends to be undervalued to a greater degree than surface water, yet the services provided are at least in some cases greater than sw
- Increasing competition leads to increased demand for groundwater

# Conclusions

*"All the water there will be, is" Water Follies*

- Value and cost of all supplies are accelerating (CAGRD)
- Need for new ways of evaluating management options including both regulations and market-based solutions; economic evaluation of service flows is one option, *but it is much more difficult to quantify environmental and in-situ values than it is to quantify extractive values.*


I'LL GUESS...
THE WATER AUTHORITY DID IT,
IN THE DISTRICT OF COLUMBIA,
WITH THE LEAD PIPES.
CLUE
TOLES
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TIME TO INVEST
A LITTLE MR. GREEN.