Managing Water Demand: Price v. Non-price Conservation Programs

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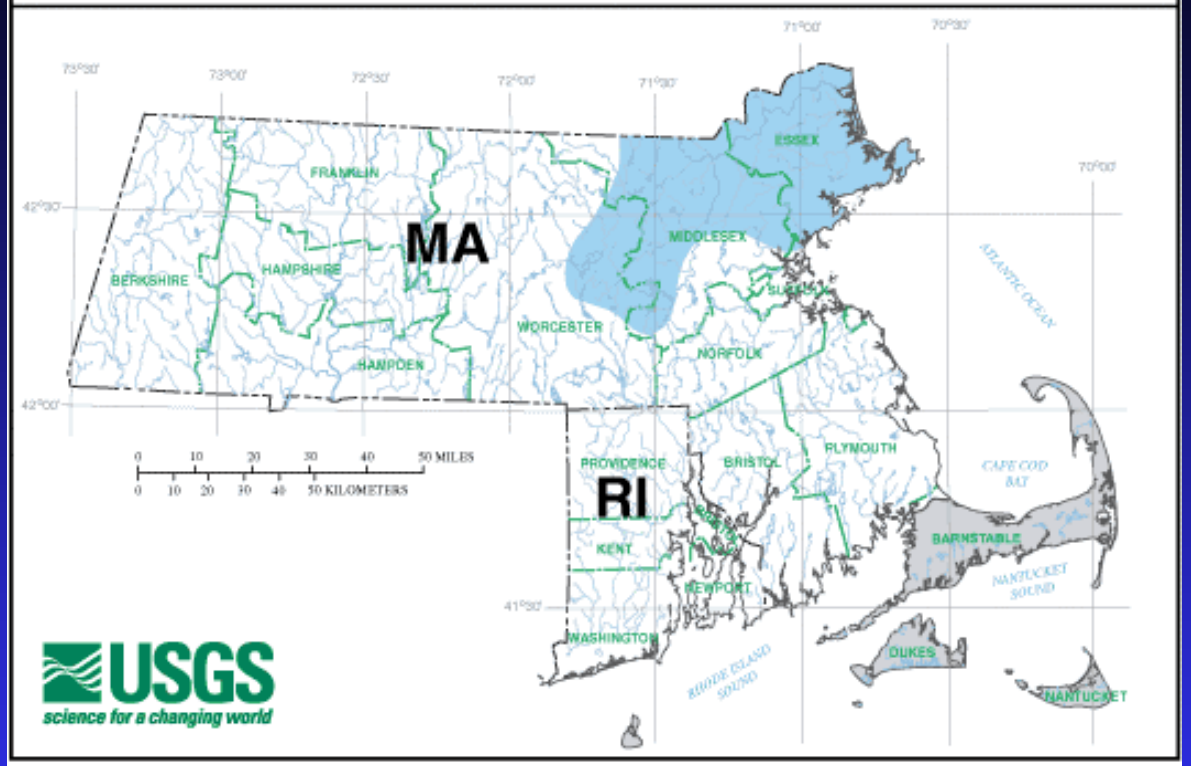
Surface-Water Runoff
June 2007

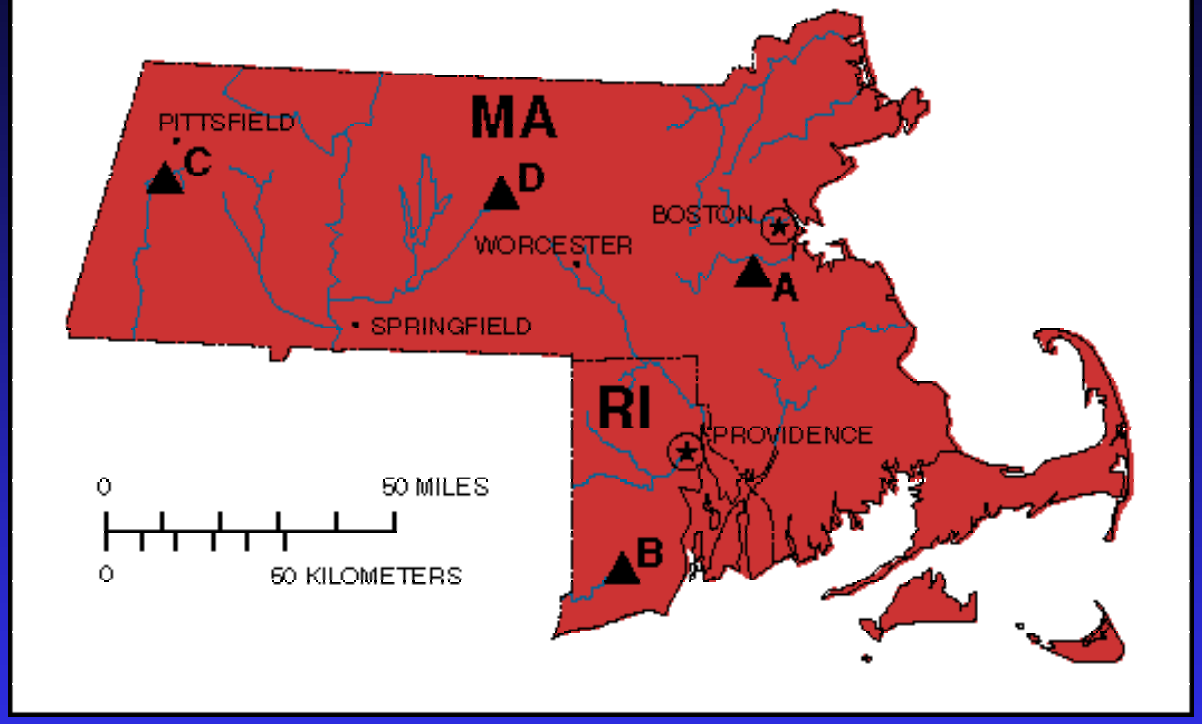


COMPARISON WITH MONTHLY NORMAL RANGE

- ABOVE NORMAL – within the highest 25 percent of record for this month
- NORMAL RANGE
- BELOW NORMAL – within the lowest 25 percent of record for this month
- NO STREAM DATA
- ▲ INDEX STREAM GAGE AND IDENTIFIER LETTER

NOTE: Additional sites from those shown are used to determine ranges

Surface-Water Runoff
June 1999



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The Boston Globe

"Already, N.E. Thirsty for Summer Showers"
June 23, 1999

"Drought Could be the Worst in a Decade"
June 26, 1999

The New York Times

"How to Stop Squandering Water? Raise its Price."
August 14, 1999

"Leaf-proud New England Braces for a Brownish Fall"
August 17, 1999

Purpose of this White Paper

- Offers an analysis, from the perspective of economics, of the relative merits of price- and non-price approaches to water conservation.
  - Through a synthesis of results from the economics literature on this topic.
- Emphasizes the strong empirical evidence that using prices to manage water demand is cost-effective.
- Focuses primarily on the residential sector.
  - Because this is the primary (and often exclusive) target of conservation policies.

Scarce Resources and the Market

- In Massachusetts and elsewhere, there are competing demands for water, and a limited supply.
- During periods of scarcity, how should water resources be allocated?
- Other scarce resources are allocated by markets, in which prices transmit information about a good's scarcity, and other aspects of its value.
- But for many reasons; the development of unregulated water markets is neither likely nor desirable.

Why Water is a “Special” Commodity

- Mobility
- Bulkiness
- Economies of scale
- Solvent properties (ability to assimilate wastes)
- Variability in supply
- Sequential use
- Complementarity
- Social and cultural values

Public Aspects of Water Resource Management

- ***Regulation***
  - Water pollution control
  - Legal apportionment of property rights
  - Water pricing
- ***Public infrastructure investment***
  - Flood control
  - Navigation
  - Hydroelectric power
  - Irrigation
- ***Public ownership and operation***
  - Municipal water treatment, distribution
  - Recreational areas

Water Pricing Then and Now…

- "Nothing is more useful than water, but it will purchase scarce anything; scarce anything can be had in exchange for it."

  – Adam Smith, *The Wealth of Nations*, 1776

- "Two hundred years later, I can refill an eight-ounce glass with tap water 2,500 times for less than the cost of a can of soda."

  – Robert Stavins, *The New York Times*, 1999

Key Conclusions: Water Demand and Prices

- On average, a 10% increase in the price of water reduces residential demand by 3 to 4% in U.S. cities.
- The sensitivity of residential water demand to price increases is similar to that of residential electricity demand.
- On average, the response of water demand to price increases is stronger under higher prices.

Key Conclusions: Water Demand and Non-price Conservation Policies

- Many non-price conservation policies do reduce water demand, though effectiveness varies.
- More stringent, mandatory policies (when well-enforced) tend to have stronger effects than voluntary policies and education.
- Water savings from policies that promote water-conserving fixtures may be smaller than expected, due to behavioral responses.

Key Conclusions: Comparing Price and Non-price Conservation Policies

- Cost effectiveness
  - Price increases are more cost-effective than non-price approaches, because reductions occur among households with the lowest value for water use.
  - Results of recent empirical work
    - 12 cities in the U.S. and Canada
    - Simulated replacing 2-day/week watering restrictions with drought pricing.
    - Both policies can achieve same level of water “savings”, with welfare gains from the price approach of $81 per household per drought.

Key Conclusions: Comparing Price and Non-price Conservation Policies, cont.

- Impact on utility net revenue
  - Non-price demand management policies increase total utility costs, and decrease total revenue (if demand reductions ensue).
  - At current estimates of price elasticity, utilities that increase water prices will increase total revenue.

Key Conclusions: Comparing Price and Non-price Conservation Policies, cont.

- Monitoring and enforcement
  - Non-price policies require significant monitoring and enforcement to achieve full compliance.
    - In a study of 85 California utilities during the 1990s drought:
      - More than ½ of customers violated quantity-of-use restrictions
      - Compliance with type-of-use restrictions was also low.
  - Non-compliance in the context of pricing would require that households consume water "off-meter", much more difficult to achieve.

Key Conclusions: Comparing Price and Non-price Conservation Policies, cont.

- Predictability in achieving conservation goals
  - A price elasticity estimate for a particular service area provides a good measure of expected effects of a price increase.
  - Statistical evaluation of water savings attributable to a non-price conservation policy provides a good measure of expected effects of a similar policy.
  - In the absence of statistical analysis, neither policy has an advantage over the other in terms of predictability.

Key Conclusions: Comparing Price and Non-price Conservation Policies, cont.

- Equity and distributional issues
  - With price increases, low-income households tend to contribute a greater share of aggregate water demand reductions than they do under non-price policies.
  - This does NOT mean that price-based approaches are regressive in *income*.
    - Progressive price-based approaches can be designed by rebating utility profits to low-income households.
  - The impact of non-price programs on distributional equity depends on how non-price programs are financed.

Key Conclusions: Comparing Price and Non-price Conservation Policies, cont.

- Political considerations
  - Raising water prices (like the elimination of any subsidy) can be politically difficult.
  - Does the prevalence of non-price conservation policies demonstrate:
    - Support for consumers for non-price approaches, even though they are more costly?
    - Misunderstanding of the full costs of non-price approaches?
    - Constraints faced by water suppliers in the ability to raise water prices?

Common Misconception #1

- Water prices are low, thus price cannot be used to reduce demand.
  - The 300+ published estimates of the sensitivity of water demand to prices are based on 50 years of low water prices.
  - Water demand is “inelastic” (a 1% increase in price causes a <1% decrease in demand); NOT unresponsive to price.

Common Misconception #2

- Water customers are unaware of prices, thus price cannot be used to reduce demand.
  - Consumers studied over the past 50 years act “as if” they are aware of water prices.
  - The 300+ published price elasticity estimates are based on consumers billed monthly, quarterly, and even less frequently.
  - Providing more information about prices and demand may boost the impact of price increases.

Common Misconception #3

- Increasing-block pricing provides an incentive for water conservation
  - *High prices* provide an incentive for water conservation.
    - A study of 85 MA communities suggests that IBPs, *per se*, have no impact on demand, controlling for price levels.
    - If the only way to increase price is to increase the price on some fraction of consumption, this is better than nothing.

Common Misconception #4

- Where water price increases are implemented, water demand will always fall.
  - Price elasticity estimates measure the reduction in demand for a 1% price increase, *all else held constant*.
  - Population growth, changes in weather or climate, income increases, etc. can increase demand.
  - If a price increase is followed by an increase in demand, these other factors are at work (and the price increase has reduced the rate of growth in demand).

Implications of Inefficiently Low Water Prices

- Short run
  - Consumers use too much water – more than efficient amounts.
  - Water conservation takes place only under “moral suasion or direct regulation.”
- Long run
  - Inefficient prices alter land-use patterns, industrial location decisions, household landscaping and appliance choices.

A Recommendation

- We recommend the increased application of benefit-cost analysis to water conservation policies.
  - Specific non-price conservation policies can only be compared to price increases if we have a measure of the benefits of non-price conservation policies
    - Costs of non-price policies often calculated.
    - Costs and benefits of price increases often calculated.
    - Benefits of non-price policies are poorly understood.