Economic Assessment of Outdoor Water Use Restrictions in South Florida

Lara Kiesau, Pallab Mozumder, Mahadev Bhat, Michael Sukop
Dept. of Earth and Environment, FIU.
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Overview

- Background on Outdoor Water Use and Restrictions
- Estimated Outdoor Water Use in South Florida
- Monetary Value of estimated restricted Water
- Study on Valuation of Ecosystem Services
- Outlook
Background: Outdoor Water Use

- The average American family uses over 300 gallons of water per day (gpd) (US EPA, 2017)

- About 8.1 million people live in 16 counties rely on public water supply (SFWMD, 2018)

  A daily consumption of above 2 billion gallons per day

- Growing population in South Florida increases pressure:
  - 10% population increase between 2010 and 2017 (Office of Economic & Demographic Research, 2017)

- 30-50% of total water consumption occurs outdoors (EPA, 2013; SFWMD, 2019; Lee, Tansel & Balbin, 2011)
Outdoor Water Use Restrictions (OWR)

• Common demand-side management policy tool (Survis & Root, 2012)

• 32 U.S. states have policy regulations requiring or recommending Outdoor Water Use Restrictions (Milman & Polsky, 2016)
  • Florida among those with highest number of policies requiring OWR

• Types of Outdoor Water Use Restrictions vary in frequency, time & duration

• Research mainly focused on conservation success
  • Economic effect/efficiency relatively understudied
Outdoor Water Use Restrictions in South Florida

- Year-Round Landscape Irrigation Rule
- In effect since 2010
- Prohibited between 10am and 4pm
Average monthly total water use, per capita in South Florida

Comparison of per capita total water use in South Florida counties

- Highest consumption: Monroe with average use of 227 gallons per day
- Lowest consumption: Okeechobee with average use of 53 gallons per day

Comparison of Household 50% Outdoor Water Use of Counties

- Average family size: 2.5
- Calculation of outdoor water use: 50% of total use
- Between ≈ 250 gpd (Monroe) and ≈ 75 gpd (Okeechobee)
Estimated average additional outdoor water use without restrictions

- Possible additional outdoor water use is estimated based on average current daily outdoor water consumption which is extrapolated to the amount of restricted days

- Example:

  \[
  \text{Average outdoor water use} \times \frac{\text{Number of restricted days}}{\text{Days in a given month}} = \text{Estimated additional outdoor water use}
  \]

  \[
  100 \text{gpd} \times \frac{18 \text{ days}}{30 \text{ days}} = 60 \text{gpd}
  \]

Average monthly water bill per household

- Different price rate structures among and within counties
- Average household water consumption was used to calculate water bill under lowest and highest rate structure for each county, then average was calculated
- Monroe highest water bill with $130
- Orange and Highlands lowest water bills around $30

Based on: SFWMD 2017 Utility Rate Survey
Estimated average **additional monthly water bill** per household without restrictions

- Monroe and Broward highest additional bill with around $40/$25
- Lowest additional bills Glades, Orange and Palm Beach with $5/$3

Based on: SFWMD 2017 Utility Rate Survey
Valuation of Ecosystem Services

- **Choice Experiment** to understand public preferences for Everglades Ecosystem Service Attributes & associated Trade-offs (work based on several Master Thesis of Nadia Seeteram, Abu HM Sikder, Mehrnoosh Asadi)

- Survey to elicit randomly selected households’ preferences (*willingness to pay*) for management/restoration alternatives accompanied by water restrictions
Estimated Willingness To Pay (WTP)

- Highest WTP for restrictions on water usage
- Marginal WTP of South Florida residents for one unit increase of OWR $11.95-13.35
- Large disconnect between respondents’ desire to maintain conveniences and how to achieve that through restoration
Comparison of surveyed WTP and estimated additional costs

For South Florida households for 1 year

<table>
<thead>
<tr>
<th>WTP Survey</th>
<th>Costs for 30% assumption</th>
<th>Costs for 50% assumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>$24-27 million</td>
<td>$400 million</td>
<td>$686 million</td>
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great discrepancy between estimated costs of OWR and stated willingness to pay
Outlook

• **Development of penalty function**
  
  • Following approaches by Takatsuka et al., 2018; Brown et al., 2018
  
  • Capturing economic loss due to having OWR/not meeting target flow
  
  • With monetary value or amount of water as dependent variable
  
  • Precipitation, evapotranspiration, lake levels, population growth etc. as independent variables
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Thank you for your attention
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