

Does Turf Removal Save Water?

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Metropolitan Water District of Southern California



- Regional water wholesaler
 - Serves 6 counties, 19 million people
 - 5,200 square mile service area
 - \$1 trillion regional economy
 - 50%+ of region's water supply
 - Spans 16 climate zones

Turf Removal Program

- Pays \$/sq.ft to customers who remove turf and replace it with a California Friendly Landscape



Before



After

Research Design

- Post-hoc pre-post design
- Billing data placed on daily basis
- Fixed effects panel regression model with robust standard errors
- Separate models for commercial and residential customers
- Controls for climate, weather and time

Data Overview

- 43 water agencies with turf removal programs
- 13 programs provided data
 - Program in place for at least 1 year
 - At least 6 months of post-replacement billing data
- Billing data available for 30 commercial and 287 residential sites

Model Specification

Dependent Variable

- log gallons per day per site

Independent Variables

- Fourier series on temperature and precipitation (climate)
- Lag orthogonal temperature and precipitation (weather)
- Program participation

Estimation

- Linear panel model with fixed effects
- Log-log form
- Exclusion of observations with robust regression weight ≤ 0.2
- Leverage and standardized residuals look good

Results

Item	Units	Site		Totals
		Commercial	Residential	
Number of Sites	sites	30	387	417
Average Pre-Replacement use	gpd/site	4071	631	
Estimate reduction	percent	23.9%	18.2%	
Water savings	AFY/site	1.09	0.13	
Program life	years	10	10	
Lifetime savings per site	AF	10.9	1.3	
Lifetime savings, all study sites	AF	327	503	830

Limitations and Caveats

- Sample group may not be representative of all turf removal programs
- Available data not suitable for assessing decay
- Not possible to place savings on a per unit (e.g., per square foot) basis
- Cost-effectiveness not considered

Future Analysis

- Additional “post” installation water usage data
 - Does water savings increase, decrease or persist?
- Total irrigated landscape
 - Calculate the gallons saved per square foot
- Larger sample size
 - Allow for analysis per climate zone or program rules
- More sites
 - Do savings generalize across sites?
- Cost effectiveness
 - Information on cost to customer and water agency

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