Manage What You Measure

Measuring a Region-Wide, Municipal Landscape Water Conservation Program

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Center for ReSource Conservation

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CRC Overview

CRC Mission

- To empower our community to conserve natural resources.

CRC History

- 35 year old nonprofit organization, founded by concerned citizens in 1976

CRC Program Areas

- Water
- Energy
- Materials

CRC Water Overview

- Programs help residents conserve water and help water providers meet conservation goals
- Business model:
  - Contract with water providers to provide conservation programs for their residents
  - Programs are generally provided free to end-users
- We are the leading implementer of water conservation programs in Colorado
  - Served over 30,000 residents. In 2012, we had over 4,000 customer interactions with residents in 28 communities.

Program Information

- Slow the Flow
  - Outdoor water audit service
  - Offered since 2004
  - 2,000 residential audits offered in 2012
  - 10,000+ audits offered to date, with 26 water providers
  - Service includes customized watering schedule and identification and prioritization of system repairs

Data and Program Measurement

- Historically provided extensive data to our water provider partners
  - Customer satisfaction and feedback
  - Survey data about conservation features
  - Data about customer water use habits
  - Results of sprinkler efficiency tests
  - Basic customer information
  - Landscape information
- WHAT'S MISSING???

The $64,000 Question

- How much water is being saved as a result of these programs?

Barriers – Why only the Cadillac?

- Consistent with most of the water conservation field
  - Not data driven
- Lack of technical sophistication
- Lack of demand from partners
- Answer might not be what we wanted
- Partners and the public might not understand the answer
- Outdoor water conservation is difficult to measure

Current Situation

- Major emphasis on impact analysis
- Focus: Answer the question of how much water is saved as a result of CRC's outdoor audit service
  - Provide answers on numerous scales:
    - Individual participant
    - Individual participant average
    - Community level per year
    - Community level in aggregate
    - Program level per year
    - Program level in aggregate

Impact Study

- Engaged in major study to calculate empirical, weather-normalized savings in volumetric terms
- 1600 customer records from 9 water providers
  - 5 years of data per customer
- 10 years of climate data from 4 weather stations
- Work to date
  - Completed pilot study
  - Reviewed methodology with partners
  - Completed 2nd round study
  - Produced impact reports

Impact Analysis Methodology

- Water savings = Projected water use – actual water use
- Projected water use: How much water the participant would have used, had they not participated in the audit
  - Based on historical consumption records as compared to climate conditions
- Actual water use: Directly from water usage records

Impact Analysis Calculations

CRC Method: An Example

Pre-Audit

ID	Outdoor Use (gal) Yr 1	ETR (in) Yr 1	Water needed to meet ETR (gal) Yr 1	Water over/under ETR (gal) Yr 1	AR Yr 1
User1	68,143	19.63	60,325	7,818	113%
User2	110,429	19.63	137,811	-27,382	80%

<--Over-watering pre-audit

<--Under-watering pre-audi

ID	Outdoor Use (gal) Yr 2	ETR (in) Yr 2	Water needed to meet ETR (gal) Yr 2	Water over/under ETR (gal) Yr 2	AR Yr 2
User1	72,033	20.11	62,457	9,576	115%
User2	112,214	20.11	141,225	-29,011	79%

Average Pre-Audit AR

User 1 = 114%

User 2 = 80%

Impact Analysis Calculations

CRC Method: An Example

Post-Audit

ID	Outdoor Use (gal) Yr 4	ETR (in) Yr 4	Water needed to meet ETR (gal) Yr 4	Water over/under ETR (gal) Yr 4	AR Yr 4	
User1	65,322	19.34	59,876	5,446	109%	<--Reduced water use post-audit
User2	115,021	19.34	135,421	-20,400	85%	<--Increased water use post-audit

Impact Analysis Calculations

CRC Method: An Example

ID	Pre-Audit AR	Yr 4 AR	Projected Use Yr 4	Savings Yr 4
User1	114%	109%	59,876*114% = 68,259	68,259 – 65,322 = **2,937**
User2	80%	85%	135,421*80% = 108,337	108,337 – 115,021 = **-6,684**

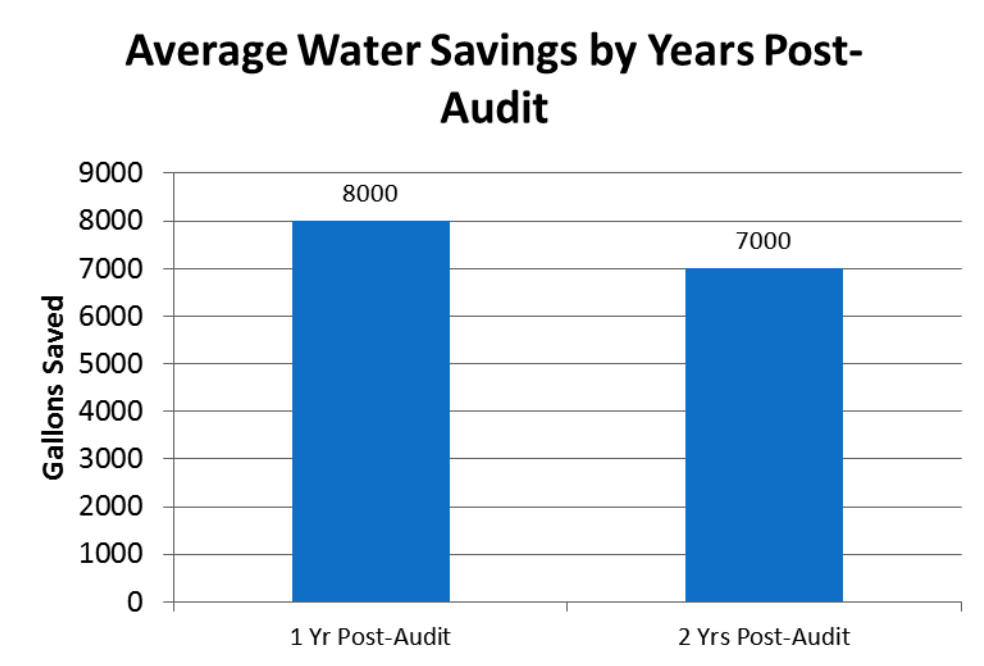
Major Impact Findings

- Statistically significant savings between pre- and post-audit water use
- Savings last for at least two years post-audit
- Average savings of 7,000 gallons per year, per audit customer
- Average 14% decrease in percent above ET
- Total STF savings (2004 – present):

  142,000,000 gallons

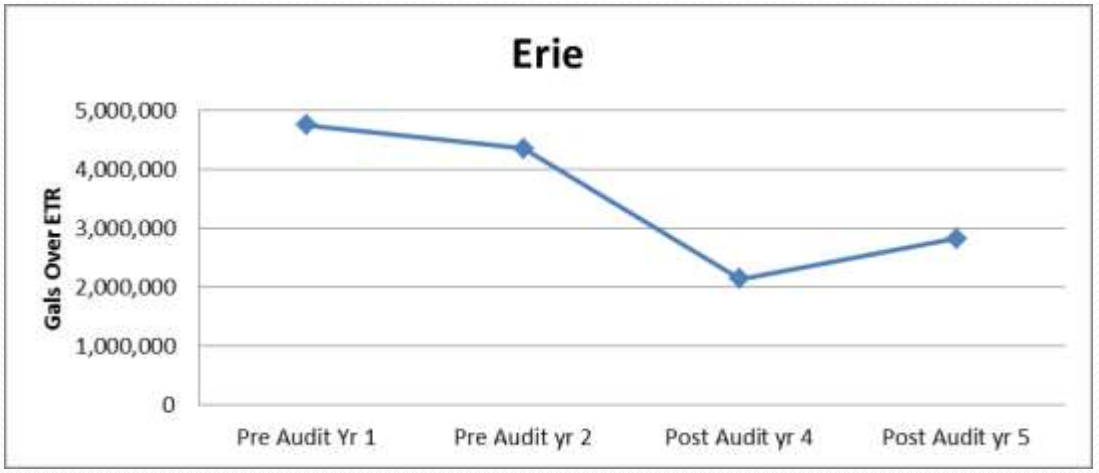
Water Savings

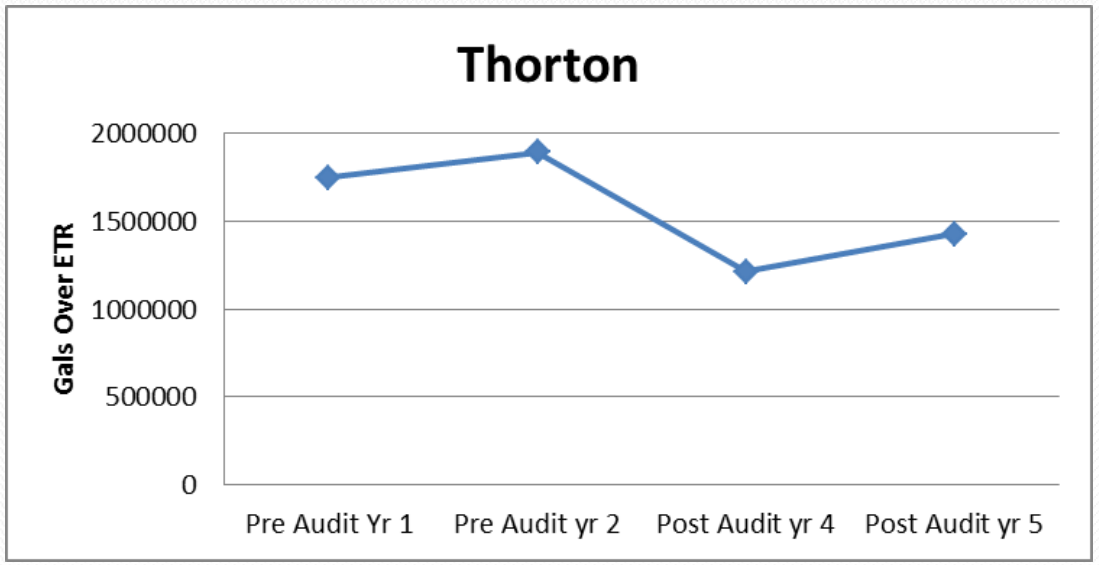
Water Savings (Gal)	
Mean	7,247
Standard Deviation	33,265
Median	5,634
Minimum	-223,060
Maximum	239,336



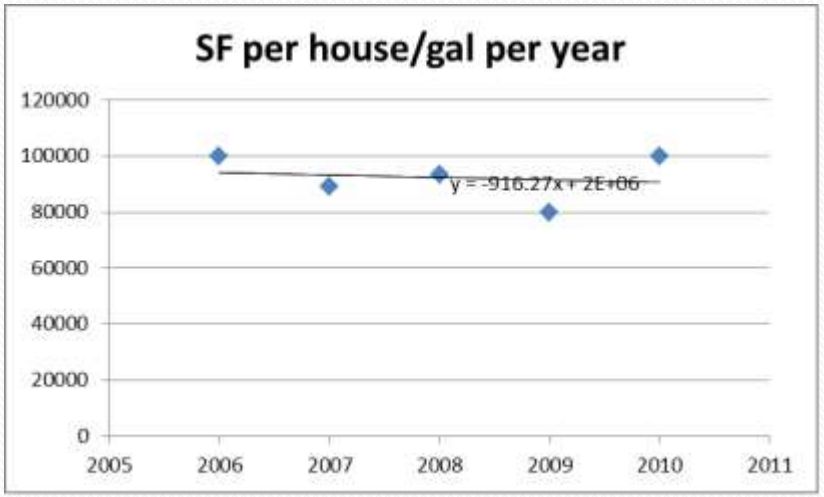
Additional Results

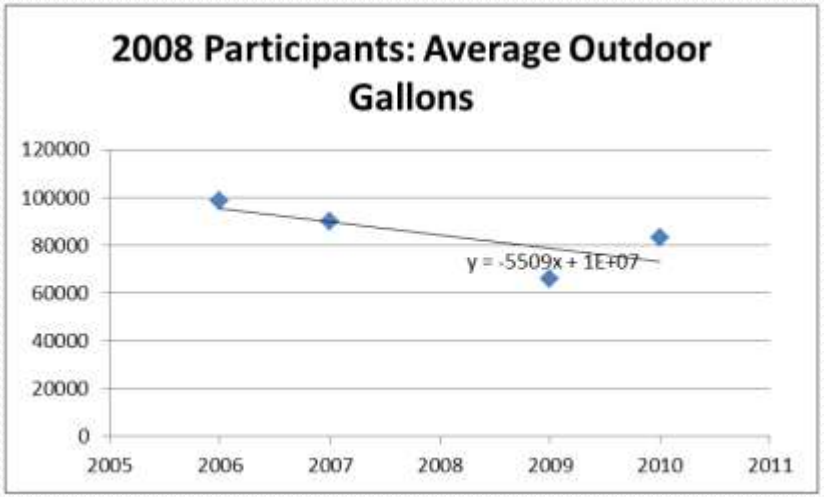
*City by city breakdowns show favorable trends

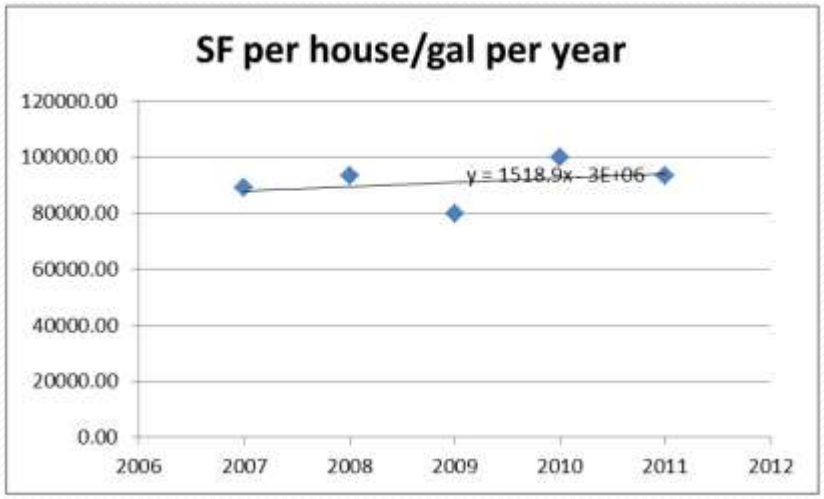


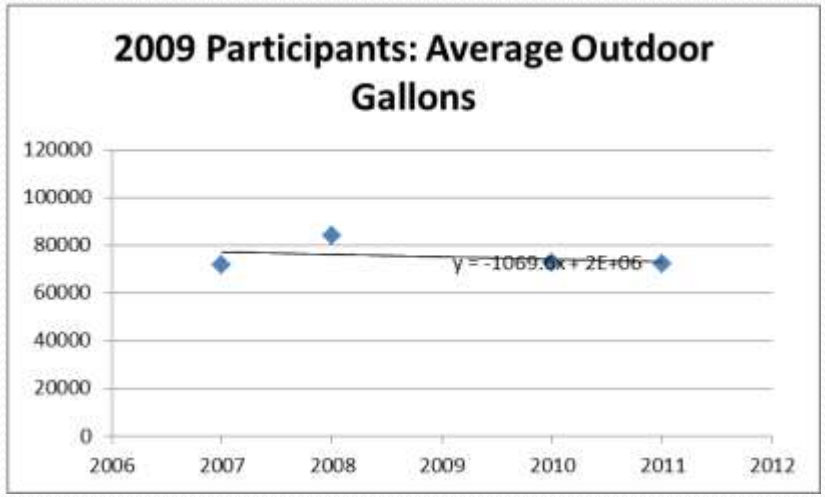


Results – Control Group Comparison









Results – Cost Analysis

- STF audit fee: ~$100 per audit
- $4,220 per AF of “saved” water
- New supply = $12,000 - $30,000 per AF

Impact Study Uses

- Meets needs of our partners!
- Promotional
  - Partner communication
  - New partner development
  - Fundraising and grantwriting
- Programmatic
  - Structural changes to the program to achieve greater savings
- New Business Area
  - CRC can conduct this type of analysis for other entities.

Impact Study Challenges

- Large standard deviation requires looking at more than mean
- Mean is not predicative of what will happen to any individual homeowner
- Other factors are also relevant
  - Participation in other water programs, education, rate changes
- Data represents a major challenge

Outstanding Questions

- What are other metrics that should be used to measure water conservation programs?
- Who should measure water conservation programs?
- Can “average” savings be meaningfully presented?
- Can water conservation programs, if measured appropriately and rigorously, represent a viable alternative to generating new sources of supply?

Thank you!