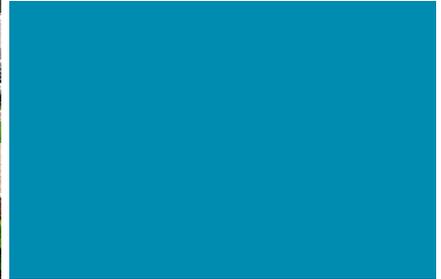


Water Conservation Pilot Program: Lawn Watering Reduction

Massachusetts Department of Environmental Protection



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Executive Summary

The Massachusetts Department of Environmental Protection (DEP) implemented a behavior change campaign pilot in the summer of 2018 with the water systems associated with the communities of Concord, West Springfield, and Hingham (Aquarion Water Company) with the goal of reducing summer water usage. The current pilot builds on the findings from the Massachusetts Division of Ecological Restoration's (DER) community-based social marketing project in the Ipswich watershed, conducted in the summer of 2017.

Water System Selection

To select potential water systems for participation, DEP reviewed annual statistical reports to create a short list of water systems with high summer-to-winter water use differences, suggesting there is a significant amount of lawn watering occurring. DEP reached out to the water supplier to provide an overview of the project. The towns of Concord and West Springfield, as well as Hingham, supplied by the Aquarion Water Company, opted in to the pilot.

Outreach Materials

Outreach materials developed in the previous DER pilot were leveraged in this DEP pilot, with initial message testing via intercept interviews conducted in the three participating water systems. Overall, the message results showed eight key findings from the interviews, some of which were used to modify the outreach, below:

1. **Increase Focus on Rain:** Increase focus on the amount of rain that Massachusetts receives, and that it is generally sufficient for grass lawns to stay alive throughout the summer.
2. **Keep Focus on the Amount of Water Saved:** Respondents who watered were more likely to believe that not watering would not really save much water.
3. **Keep Focus on Preventing Grass Death:** Concern about grass death was the highest rated barrier and was still highlighted in the materials.
4. **Importance and Norm of Green Lawns:** Keep the section that highlights how many residents already don't water, as there is an existing norm that green lawns are preferred.
5. **Strengthen Environmental Message:** Environmental benefits was one of the top benefits and was added to the flyer.
6. **Consider if materials should specifically call out manually watering:** The outreach doesn't break apart the amount of water used between different methods, as this added complexity.
7. **Update Color Scheme:** Respondents didn't respond well to the brown color of the grass. The outreach added a blue sky behind the brown grass and used more green in the grass.
8. **Feedback is critical for creating behavior change:** Participants expressed increased level of motivation to act, but still not as high as desired. This emphasizes the importance of going beyond the flyer to also provide the normative feedback.

The outreach materials were modified based on the pre-testing research, and are shown in Appendix A. Each treatment household received the materials listed below. A control group which received no materials was used for comparison.

Treatment Materials

1. Pre-notification postcard (designed to catch participants' attention and prompt them to watch their mail.)
2. Outreach materials (delivered once in late May/early June, and again in early August, with an updated cover letter. All other materials were identical for the second mailing.)
 - a. Cover letter
 - b. Motivational flyer
 - c. Feedback sheet with social norms

The motivational flyer corrected misperceptions about not watering (e.g., grass will die, watering lawns doesn't use much water) and provided tips on how to keep a lawn healthy with less or no water.

In the feedback sheet, the households' individual usage was compared to efficient and average neighbors in their own community. An efficient neighbor was defined as the top 30% of consumers (e.g., the lowest water consumers), while an average neighbor was the median usage in the full community. The sheet displayed whether they were consuming more, less, or the same as their neighbors, providing normative feedback to increase motivation to act.

Pilot Design

In order to select primarily households that watered in the summer, households were selected based on their water usage data from the previous year, 2017, comparing their winter use to their summer use, to determine the level of increased usage in the summer. Increased summer usage was used as an indicator of outdoor lawn watering. The comparison was based on raw water-usage increases.

Using the comparison between summer and winter watering, households were assigned to the *low*, *medium-low*, *medium-high*, or *high* quartile, creating four equal groups according to the distribution of values of the difference in summer and winter usage. The raw average usages in each quartile, minimum differences (**low boundary of quartile**), and maximum differences (**high boundary of quartile**) are summarized in the full report. Within each quartile, households were randomly assigned to treatment or control. Random assignment was used to ensure the groups were equivalent across other variables, such as income or household size, and representative of the community population. In total, 300 treatment and 300 control households were selected per water system, as shown in the table below.

Table 1: Sample Selection

Quartile of Summer-to-winter Water Use	Number of Treatment Households Randomly Selected Per Water System	Number of Control Households Randomly Selected Per Water System
Highest	100	100
Medium High	100	100
Medium Low	100	100

The pilot was evaluated using:

1. Water use data; and
2. Survey to assess attitudes, self-reported behavior, and reactions to the program materials

Results

Water use from the treatment and control group was compared in several ways – overall, by water system, and by quartile of water use, summarized below. Statistical significance is marked with **.

Table 2: Summative Water Data Results

Comparison	Average Savings per Household	Estimated gal saved per summer* per household
Overall Treatment vs. Control	39 gal/day (savings rate of 14%)**	3,510 gallons
By Quartile Treatment vs. Control	Highest Quartile 72 gal/day (savings rate of 15%)**	6,480 gallons
	Medium High Quartile 41 gal/day (savings rate of 12%)**	3,690 gallons
	Medium Low Quartile 17 gal/day (savings rate of 11%)	1,530 gallons
By Water System Treatment vs. Control	Concord 8 gal/day (savings rate of 3%)	720 gallons
	Hingham (Aquarion) 42 gal/day (savings rate of 14%)**	3,780 gallons
	West Springfield 66 gal/day (savings rate of 22%)**	5,940 gallons
By Quartile AND By Water System Treatment vs. Control	Concord, Highest Quartile 22 gal/day (savings rate of 6%)	1,980 gallons
	Hingham (Aquarion), Highest Quartile 62 gal/day (savings rate of 12%)**	5,580 gallons
	West Springfield, Highest Quartile 128 gal/day (savings rate of 25%)**	11,520 gallons

*“Summer” was considered 3 months (90 days), which assumes persistence through the summer

**Statistical significance at $p < .05$

Quartile Results

As shown in the table, the most significant reductions occurred in highest quartile households, or those who likely do more lawn watering based on their winter to summer water usage difference. These results are promising, as this group is the most able to have a significant impact on the actual gallons saved, as opposed to a percentage reduction.

Water System Results

The other segment that showed the most reduction was residents of West Springfield, followed by a significant reduction in Hingham (Aquarion). Finally, Concord residents only trended toward a reduction for the treatment group, meaning the treatment condition households used less water but the difference was not statistically significant. The project team hypothesized several potential reasons for the differences by water system.

Action Research

Differential Existing Outreach

The differing pattern among the water systems could potentially be related to the level of outreach outside the treatment program. All water systems currently have some level of outreach on water use, from water bans and signage to educational information, but there are differences by water system.

1. Concord has a staff member who is focused on conservation, and the town has implemented conservation outreach over the past 20 years, which is likely related to the lower amount of reduction in the treatment group as compared to any other water system.
2. Aquarion, Hingham's water supplier, currently does some educational outreach, but not to the same degree as Concord.
3. West Springfield's current educational or motivational outreach is limited in scope.

Given the differential results, the program may be more effective when there has not been other educational and motivational outreach.

Demographic and Socioeconomic Factors

However, between the water systems, there may be other demographic or socioeconomic factors that could influence the difference in water savings. These factors (e.g., income, lots size, or household sizes) were not part of the scope of our analyses; however, if these factors were significantly different between the water systems, they may also have influenced the difference in water savings.

Survey Results

A six-question postcard survey (See *Appendix B*) was sent to both the treatment and control households in each water system, using the Dillman Tailored Design method. The survey assessed attitudes, self-reported watering behavior, and perception of the program. The overall response rate was 30.5%, with a nearly even split between control (50.6%) and treatment (49.4%) households. For the survey, the results showed that all households had similar attitudes about green grass, protecting the environment, and saving money and water. In addition, nearly two-thirds of treatment households remembered the materials, and rated them fairly and moderately helpful, understandable, and appealing.

Treatment households reported less frequent summer watering during 2018. Respondents could report their watering frequency from the following categories: *Every day, a few days per week, once a week, every other week, once a month, once or twice per summer, or never*. For the following bullets, "*Every day and a few days per week*" are considered frequent watering and "*once or twice per summer and never*" are considered low waterers. When split by water system, the survey results mirrored the water data, outlined below.

1. **Concord** had the same percentage of low waterers across the treatment (47%) and the control (47%), though the treatment had fewer frequent waterers (15%) than the control (28%). This reflects the same trend toward reduction in water use by the Concord treatment households without a statistically significant reduction.
2. **Hingham (Aquarion)** had more low waterers in the treatment (50%) than the control (43%), and the control also had more frequent waterers (38%) than the treatment (27%), which reflects more of a reduction than Concord.
3. **West Springfield** had many more low waterers in the treatment (56%) than the control (33%), and the control also had more frequent waterers (40%) than the treatment (26%), which reflects more of a reduction than Concord or Hingham.

In addition, when the survey results were matched with the water usage results, households who self-reported lower usage were significantly more likely to consume less water ($p < .01$), validating the accuracy of the self-report behavioral data.

Recommendations

Overall, the results indicate that the pilot program could be successfully utilized to decrease summer watering. We have the following recommendations for continued outreach:

1. **Continue to use best outreach practices:** The outreach was designed with best communication practices in mind, such as customizing the materials with the town name, including a cover letter with an official signature, individualizing the feedback graph to the household, focusing on the highest priority barriers to action, keeping messages simple, etc. Future delivery of the program should avoid significant modification to the materials, given the success of savings, and that the materials were remembered by the majority of treatment households months after delivery, and were rated fairly positively.
2. **Repeating historical feedback is effective if current feedback is not available:** The best practice for behavioral feedback is to deliver feedback that is close to in time to the behavior. However, for this project, it was not possible provide an updated feedback graph, giving the timing on water data collection. However, the individualized feedback and motivational outreach still reduce water use, even if delivered without a current update (e.g., feedback was not updated to reflect the household's usage in summer 2018).
3. **Consider prioritizing locations that do not have existing outreach.**
4. **Consider prioritizing households that likely water their lawns.**
5. **Consider strategic audience targeting:** Consider if implementing the program is worth the return on investment for households below a medium-high summer-to-winter water usage difference.
6. **Use best suited evaluation option:** The preferred metric for evaluation is the water data, as that data allows for an understanding of actual water usage, and therefore likely actual behavior, changed as a result of the program. However, both the survey and the water data showed similar findings, suggesting that self-report could be successfully utilized as an effective evaluation metric if water data is not available.

Additional Research

Based on these findings, we have two suggestions for potential additional research avenues.

1. **Determine the effect of weather:** The pilot was implemented in a high rain summer. It may be worth the time to determine if the program would have similar success in dry years.
2. **Determine the additive effect of other programs/messaging:** All water systems had water bans or other conservation-related messaging in place, which could have had additive effects. The use of a control group mitigates this effect, as control households should have been affected by the additional outreach, but not the pilot. However, if the pilot is implemented in other locations with different results, it may be worth considering any differences in other messaging.

1: Background and Purpose

The Massachusetts Department of Environmental Protection (DEP) implemented a behavior change campaign pilot for Massachusetts residents with the goal of reducing summer water usage. To accomplish this goal, DEP created an advisory board to guide the development of the campaign and engaged Action Research to develop and implement the pilot. The current pilot builds on the findings from the Massachusetts Division of Ecological Restoration's (DER) community-based social marketing project in the Ipswich watershed, conducted in the summer of 2017.

Ipswich Project

The Ipswich project went beyond an “information-intensive” campaign and incorporated evidence-based behavioral strategies to address barriers to behavior and provide motivation to act. Below, the findings of the Ipswich project are summarized. The full report on this foundational research, *Ipswich River Watershed Summer Water Conservation Actions: Community-based Social Marketing Benefit and Barrier Research*, is available through the DER website.¹

The Massachusetts Division of Ecological Restoration (DER) hired Action Research to develop a behavior change program using the community-based social marketing (CBSM) framework. CBSM is based upon extensive research in the social sciences which demonstrates that behavior change is often most effectively achieved through initiatives delivered at the community level that focus on removing barriers to an activity while simultaneously enhancing the activity's benefits. CBSM brings together knowledge from the field of social marketing with a variety of behavior change “tools” drawn from social psychology, environmental psychology, and other social sciences. CBSM involves five steps:

1. Selecting which behaviors to target;
2. Identifying the barriers to and benefits of the selected behavior(s);
3. Developing strategies that reduce the barriers to the behavior(s) to be promoted, while simultaneously enhancing the benefits;
4. Piloting the strategies; and
5. Broadly implementing and evaluating the most cost-effective strategies from the pilot tests.

After conducting a literature review and surveying two towns in the watershed (Wenham and Topsfield), the team identified a series of behaviors related to reducing the frequency and duration of summer lawn watering as the target (Step 1). Next, a second survey was used to identify the top barriers and benefits to engaging in these actions (Step 2). The results of the survey provided the following insight:

Perceived Barriers

1. Belief that grass will die if not watered
2. Belief that eliminating grass watering would not save much water

Perceived Benefits

1. Helping the community to reduce water usage
2. Personal water savings
3. Personal financial savings

¹ Report available at: <http://www.mass.gov/eea/agencies/dfg/der/aquatic-habitat-restoration/ipswichriver-flow-restoration-project.html>

Action Research developed a strategy table (Step 3) to link specific behavior change tools to address the top barriers and amplify the top benefits.

A flyer was designed to address the barriers and benefits found in the foundational research. The outreach was distributed through two channels – door to door and postal mail for a small-scale summer pilot (Step 4). For the mailed outreach, the flyer was delivered along with an individualized feedback sheet on the household's previous water usage as compared to their neighbors. The door to door group received the flyer and was asked to make a commitment to reduce or stop watering their lawn. The pilot had a significant number of findings and lessons learned, but the results suggested that the mailed outreach with feedback had led to reductions in usage, though sample size created challenges in discerning significant results.

Expanded Pilot

Given these initial positive results, the Massachusetts Department of Environmental Protection DEP decided to scale up the pilot to three water systems, with a greater number of participating households in each water system, to serve as a more robust test of the outreach. This report goes through the methodology and results of that pilot.

2: Methodology

In the summer of 2018, DEP, the advisory board, the towns of Concord and West Springfield, Aquarion water company (supplier to the town of Hingham), and Action Research collaborated to develop and implement a pilot program to promote summer water conservation.

Water System Selection

To select potential water systems for participation, DEP reviewed annual statistical reports to create a short list of water systems with high summer-to-winter water use ratios, suggesting there is a significant amount of lawn watering occurring. DEP reached out to the water suppliers to provide an overview of the project. Concord, West Springfield, and Hingham (Aquarion Water Company) opted in to the pilot.

Pre-Testing Outreach

The pilot was implemented in three water systems – Concord, Hingham (Aquarion), and West Springfield. The original DER outreach materials were refined based on the results of intercept interviews conducted in each participating water system. The intercept interview results are detailed in a separate memo. Overall, the results reflected the Ipswich results, with eight key findings from the interviews below:

1. **Increase Focus on Rain:** Bolded text to increase focus on the amount of rain that Massachusetts receives, and that it is generally sufficient for grass lawns to stay alive throughout the summer.
2. **Keep Focus on the Amount of Water Saved:** Respondents who watered were more likely to consider that not watering a lawn would not really save much water. Therefore, the outreach continued to focus on the amount of water saved via the graphic.
3. **Keep Focus on Preventing Grass Death:** Concern about grass death was the highest rated barrier and was still highlighted in the materials.
4. **Importance and Norm of Green Lawns:** Keep the section that highlights how many residents already don't water during the summer, as it is motivational when there is an existing competing norm that green lawns are preferred.

5. **Strengthen Environmental Message:** Environmental benefits was one of the top benefits and was added to the flyer. It was not as highly rated in the Ipswich watershed.
6. **Consider if materials should specifically call out manually watering:** Automatic sprinklers are the method of choice for those who water but there are residents who water who are still using manual methods. The outreach doesn't break apart the amount of water used between an automatic and a manual method, as this addition was determined to add too much complexity.
7. **Update Color Scheme:** Respondents didn't respond well to the brown color of the grass. The outreach added a blue sky behind the brown grass and used additional green in the grass.
8. **Feedback is critical for creating behavior change:** Participants expressed increased level of motivation to act, but the overall rating was still not as high as desired. This emphasizes the importance of going beyond the flyer to also provide the normative feedback.

Outreach Design and Materials

The outreach materials were modified based on the pre-testing research, and are shown in Appendix A. Each treatment household received a pre-notification postcard, a cover letter, a motivational flyer, and a feedback sheet with individualized feedback relating to their household water use. A control group was used for comparison and received no materials.

Treatment Materials

1. Pre-notification postcard (designed to catch participants' attention and prompt them to watch their mail.)
2. Outreach materials (delivered once in late May/early June, and again in early August, with an updated cover letter. All other materials were identical for the second mailing.)
 - a. Cover letter
 - b. Motivational flyer
 - c. Feedback sheet with social norms

The motivational flyer corrected misperceptions about not watering (e.g., grass will die, watering lawns doesn't use much water) and provided tips on how to keep a lawn healthy with less or no water.

In the feedback sheet, the households' individual usage was compared to efficient and average neighbors in their own community. An efficient neighbor was defined as the top 30% of consumers (e.g., the lowest water consumers), while an average neighbor was the median usage in the full community. The sheet displayed whether the household was consuming more, less, or the same as neighboring households, providing normative feedback to increase motivation to act.

Sampling

Households were sampled from the full population in each water system. First, households who used more than 500% their winter usage in the summer and all households who dropped usage were removed from the sample. Households with a more than 500% increase likely have another water issue, such as a broken meter or a leak, and households that decrease in usage are very likely not watering their lawns.

Next, in order to select primarily households that watered in the summer, households were selected based on their water usage data from the previous year, 2017, comparing their winter use to summer use. Increased summer usage was used as an indicator of outdoor watering.

Using these differences, households were assigned to the *low*, *medium-low*, *medium-high*, or *high* quartile, creating four equal groups according to the distribution of values of the difference in summer

and winter usage. The raw average usages in each quartile, minimum differences (**low boundary of quartile**), and maximum differences (**high boundary of quartile**) are summarized in Table 3. There are no households in the gaps between quartiles. Within each quartile, households were randomly assigned to treatment or condition. Random assignment was used to ensure the groups were equivalent across other variables, such as income or household size, and representative of the water system population.

Table 3: Quartile Divisions

Water system	Quartile	Average Jan 2017 Usage (gal)	Average July 2017 Usage (gal)	Min Difference (gal) (low bound)	Max Difference (gal) (high bound)
Concord	Low	3,092	3,250	-	374
	Medium Low	3,631	4,525	441	1,122
	Medium High	4,189	6,688	1,163	4,282
	High	4,973	14,830	4,488	38,527
Hingham (Aquarion)	Low	3,194	3,328	-	333
	Medium Low	3,642	4,454	667	1000
	Medium High	4,341	6,490	1,333	3,667
	High	7,544	18,191	4,000	346,667
West Springfield	Low	3,269	3,389	-	249
	Medium Low	3,749	4,565	499	1,247
	Medium High	4,821	7,171	1,496	3,490
	High	7,098	15,483	3,740	108,966

Three hundred households were selected in each water system by summer-to-winter usage differences for both the treatment and the control, for a total of 600 households per water system. Those in the top three quartiles were included, with 100 households randomly selected for the treatment and 100 households randomly selected for the control from each quartile, in each water system (See Table 4). This selection was driven by a goal to understand how the program may differently affect people with higher and medium summer-to-winter water usage difference – for example, are those highest users too difficult to shift, suggesting a greater impact from the medium-high and medium-low residents, or would enough of those highest users reduce usage to create significant impact?

Table 4: Sample Selection

Quartile of Summer-to-winter Water Usage Difference	Number of Treatment Households Randomly Selected Per Water System	Number of Control Households Randomly Selected Per Water System
Highest	100	100
Medium High	100	100
Medium Low	100	100

Data Collection

The pilot was evaluated using both water data collected by the water supplier and by a self-report survey. All three water suppliers provided water data from January 2017 to September 2018. Second, a post-pilot survey was sent to households to assess attitudes, self-reported behavior, and reactions to

the program materials. Residents were first sent a pre-notification postcard stating that a survey would be coming, and then each household was sent an addressed and stamped survey postcard to fill out and return. If a survey was not received, the household was sent a reminder postcard, and then a second copy of the survey postcard. The survey consisted of six questions, shown in *Appendix B: Survey*, and was sent to both treatment and control households in late September and October to avoid priming the control group to their household’s outdoor water use and potentially leading to an unintentional effect.

Project Timeline

The following table summarizes the project timeline.

Table 5: Project Timeline

Activity	Timing
Treatment Mailing Round 1	Late May
Treatment Mailing Round 2	Early August
Survey Round 1	Late September
Survey Round 2	Early October

3: Water Data Results

As mentioned previously, the pilot was evaluated based on the water consumption and a self-report survey. The results section begins with the water data, as that is the direct measure of behavior, then summarizes the findings from the survey.

Data Quality

Water consumption was quantified on a quarterly basis across each of the three water systems: Concord, Hingham (Aquarion), and West Springfield. For each account, the data were converted into gallons, divided across the billing period, and then aggregated into quarterly consumption. Water consumption was available from January 2017, through September 2018, for a total of 7 quarterly consumption points (see Table 6).

Table 6: Timepoint Labels

Label	Months
2017_Q1	Jan – Mar 2017
2017_Q2	Apr – Jun 2017
2017_Q3	Jul – Sept 2017
2017_Q4	Oct – Dec 2017
2018_Q1	Jan – Mar 2018
2018_Q2*	Apr – Jun 2018
2018_Q3*	Jul – Sept 2018

*Implementation timepoints

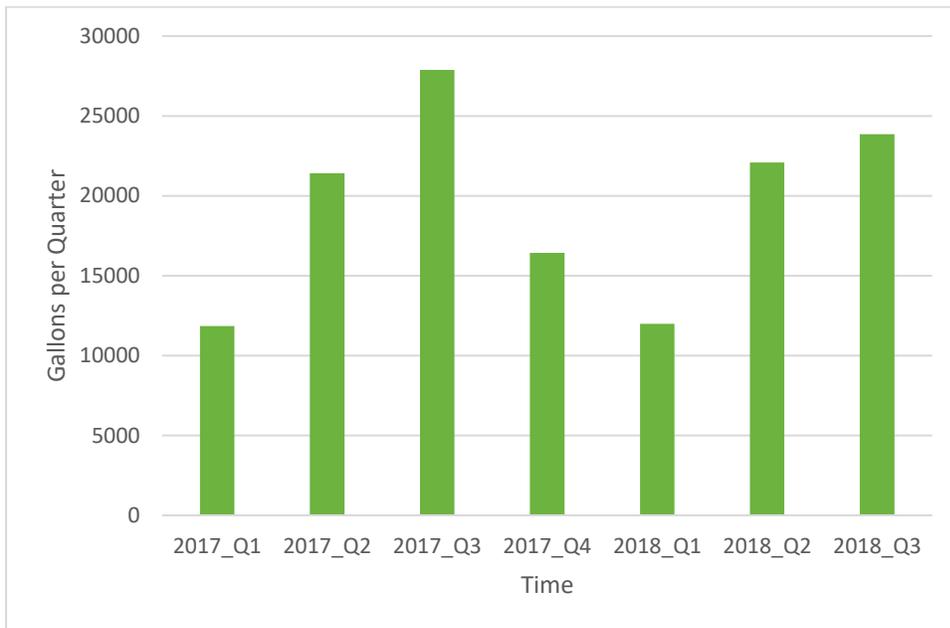
After households had been removed for invalid addresses, there were 1,775 households included in the study. These were divided across the three water systems: Concord (N=591), Hingham (N=590), and West Springfield (N=594). Five households in Concord did not have data for 2018 and were removed

from the analysis. In addition, there were six instances of zero water consumption. For analytic purposes, these were treated as missing, and were excluded from the analysis. This resulted in an analytic sample of 1764 households. The shapes of the distributions of water consumption per quarter were positively skewed, with a few outlying scores. To reduce the impact of extreme water consumption scores on the results, the maximum value was capped at 100,000 gallons per quarter. Across the total of 12,425 data points, there were 122 instances of quarterly consumption that exceeded the 100,000 maximum, spread across 71 accounts. A cap was used to avoid an over influence of extremely high outliers on the data, and was chosen based on a review of the data set and the amount of water a household would reasonably use.

Patterns of Water Use

Prior to looking at specific water systems or households, the data were reviewed to understand patterns of consumption. Across the seven quarterly periods, water consumption was lowest in the winter and fall, increasing into the spring, and peaking during the summer. Figure 1 illustrates this pattern across the three water systems.

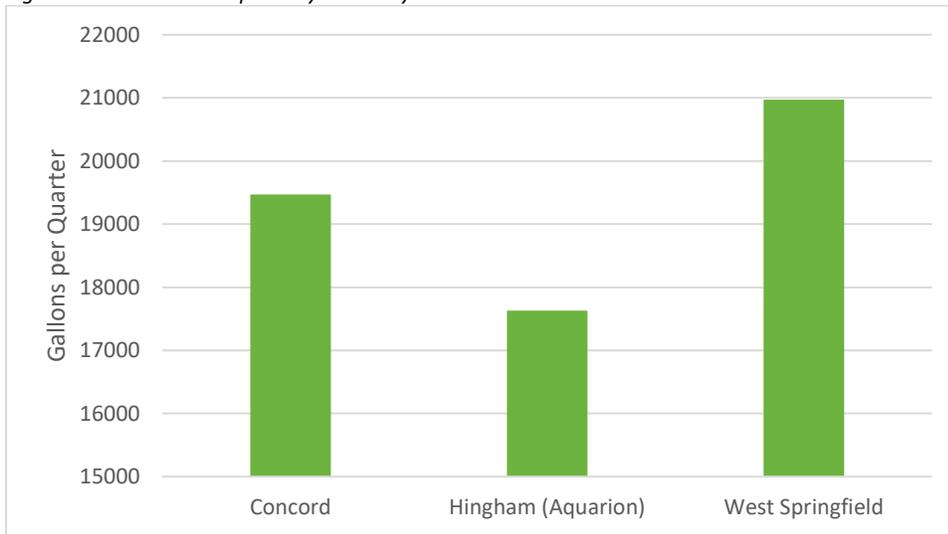
Figure 1: Quarterly Water Consumption per Household



Water Consumption by Water System

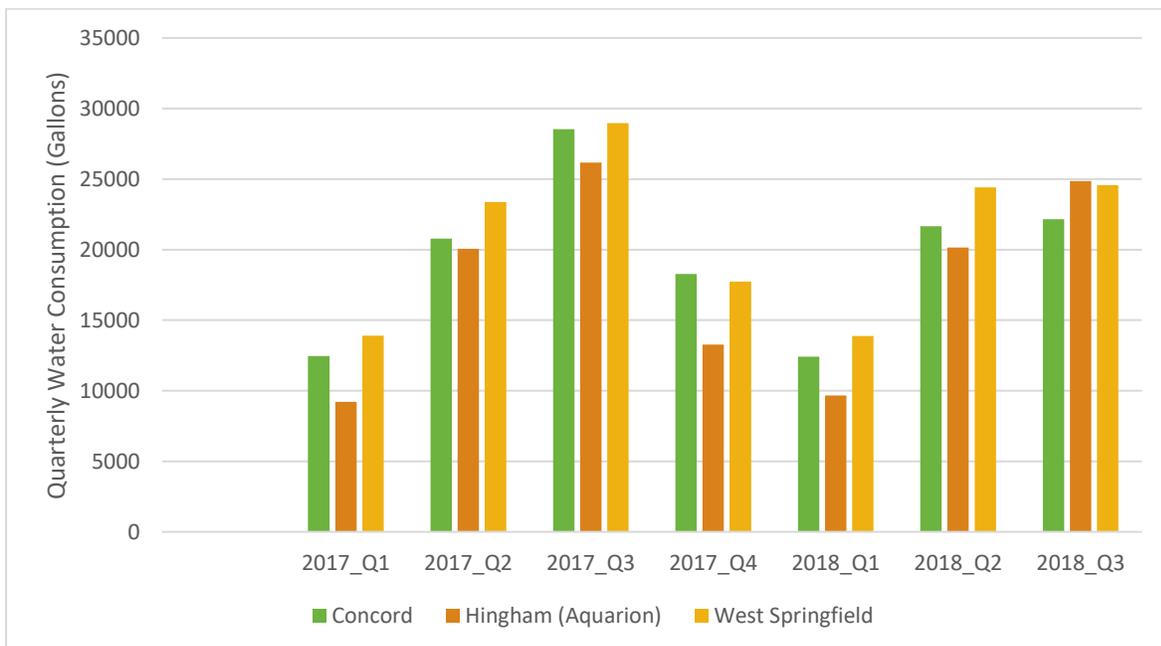
Complete and usable water consumption data were obtained for 1,764 households across the three water systems: Hingham (588 households), Concord (583 households), and West Springfield (593 households). As shown in the figure below, water consumption was highest for West Springfield (average quarterly consumption of 20,974 gallons), followed by Concord (average consumption = 19,468), and then Hingham (17,629). These analyses are based on average gallons consumed per account, per quarter.

Figure 2: Water Consumption by Water System



Each of the three water systems showed similar seasonal patterns of consumption, with usage higher in the spring and summer, and lowest in winter and fall. See Figure 3.

Figure 3: Quarterly Water Consumption by Water System



Water Data Analysis

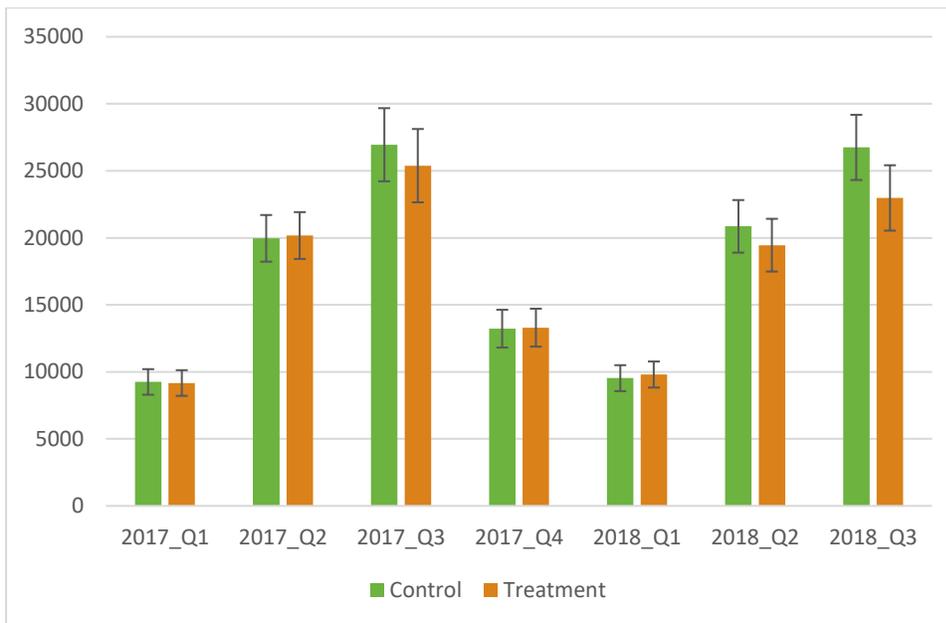
Prior to data analysis, three evaluation questions were drafted to guide the initial work.

Evaluation question #1: Did the treatment condition differ from the control group in water use for the implementation summer and over time?

To test the first evaluation question, a repeated measures ANOVA was conducted comparing water consumption across time for the two treatment groups. As a reminder, households in each of the three water systems had been randomly assigned to either treatment (N=883: Concord 294, Hingham 294, West Springfield 296) or control (N=881: Concord 292, Hingham 296, West Springfield 298).

Results showed a statistically significant time x treatment interaction ($F(6,10608)=6.28, p<.001$). As shown in the figure below, water consumption was relatively similar for households in the treatment and control in the months preceding the treatment. For interpretation, time represents the several available quarters of data, from 2017_Q1, through 2018_Q3. The intervention was conducted at 2018_Q2 and 2018_Q3. The planned comparison showed that in the quarter following the outreach (2018_Q3), households in the treatment consumed significantly less water (average = 22,130) compared to households in the control (average = 25,611). In daily units, this is approximately 246 gallons per day during the summer, compared to 285 gallons per day for households in the control, reflecting an overall water savings rate of 14%. See Figure 4.

Figure 4: Comparison of Usage Between Groups



Note: Error bars represent 95% confidence intervals, based on the repeated measures ANOVA. Scores that fall outside of the 95% error bar confidence interval of the comparison group can be interpreted as significantly different. In the graph above, there is one significantly different effect: 2018_Q3 (corresponding to the first quarter following the intervention period).

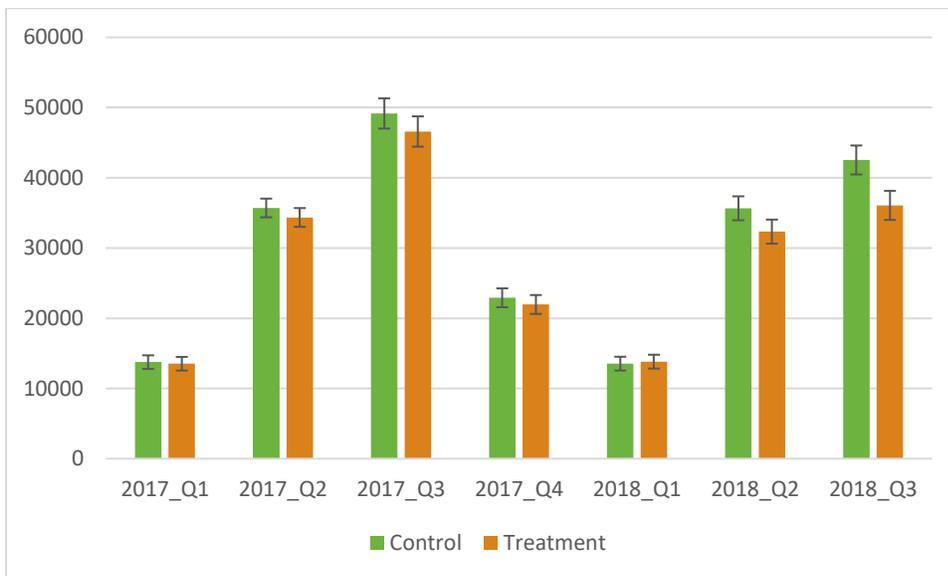
Evaluation question #2: Did the treatment have a differing effect on users at highest, 2nd highest, and 2nd lowest quartiles?

To test the second evaluation question, households were sorted by their quartiles, based on baseline water consumption during the summer of 2017_Q3 as compared to their usage in 2017_Q1 (winter). The lowest quartile of baseline consumption households was omitted entirely from the study, so they do not appear at all in the study or the table below.

Highest Quartile Households

A repeated measures ANOVA was conducted, mirroring the analysis used for evaluation question #1, but adding baseline consumption (prior to the program) as a between-subjects variable. Results showed a marginally significant 3-way interaction (time x treatment x baseline consumption, $F(12,10548) = 1.70$, $p=.06$). For high consuming baseline households, the water savings were statistically significant for both the period during the intervention, and the period following the intervention (2018_Q3). During the summer months of 2018 (2018_Q3), treatment households in the highest baseline consumption group used 36,076 gallons compared with control households that used 42,537 gallons. The full graph for high consuming households is in Figure 5. This translates into an average daily consumption of approximately 401 gallons for households in the treatment, and 473 for households in the control—a savings of 15%.

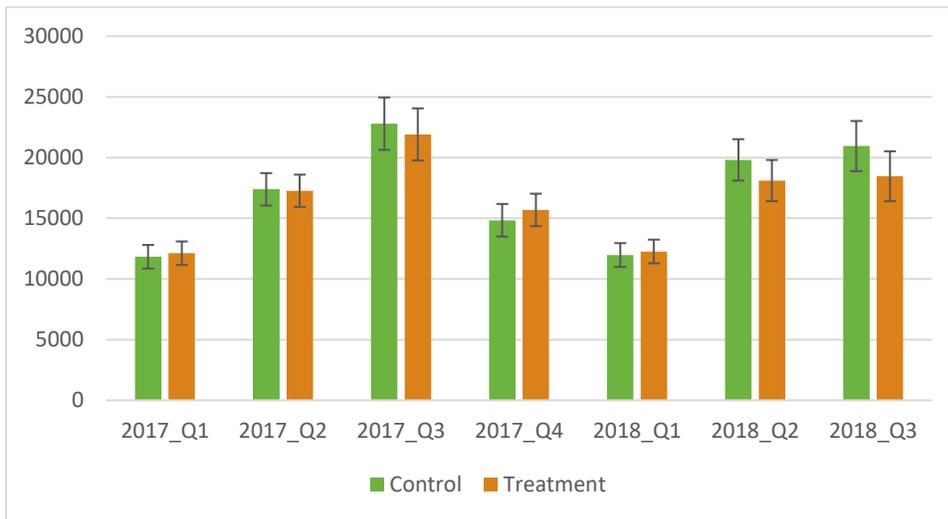
Figure 5: Quarterly Water Consumption for High Consuming Households



Medium-High Quartile Households

Next, an analysis was run for the medium-high quartile households. During the summer months of 2018 (2018_Q3), treatment households in the mid-level of baseline consumption used 18,461 gallons compared with control households that used 20,946 gallons. This translates into an average daily consumption of approximately 308 gallons for households in the treatment, and 349 for households in the control. The difference was statistically significant and translates into a savings of 12%. See Figure 6.

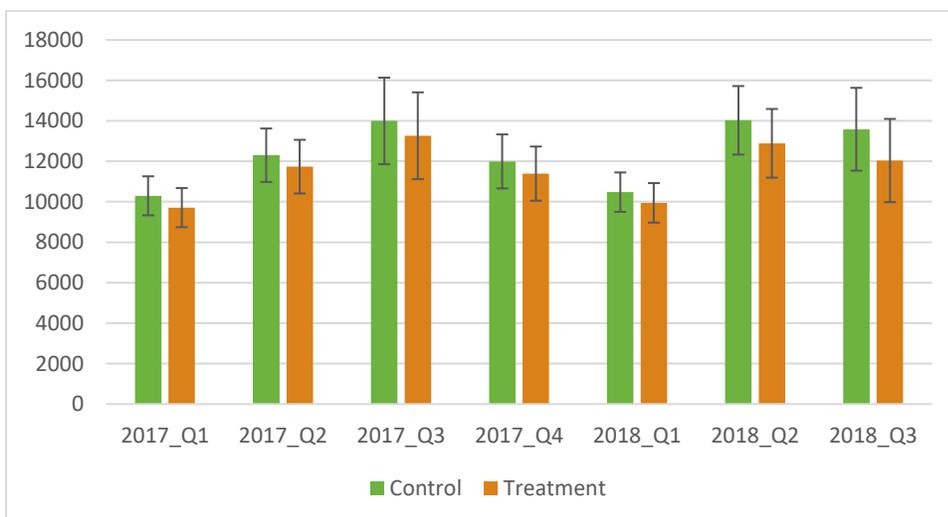
Figure 6: Quarterly Water Consumption for Medium-High Consuming Households



Medium-Low Quartile Households

Finally, a similar analysis was conducted for medium low-consuming baseline households. During the summer months of 2018 (2018_Q3), treatment households in the lowest level of baseline consumption used 12,042 gallons compared with control households that used 13,584 gallons. The full graph for medium-low consuming households is shown below. This translates into an average daily consumption of approximately 134 gallons for households in the treatment, and 151 for households in the control, and translates into a savings of 11%. The direction was in the expected direction, with treatment households using less water than control households, but the difference was not statistically significant.

Figure 7: Quarterly Water Consumption for Medium-Low Consuming Households

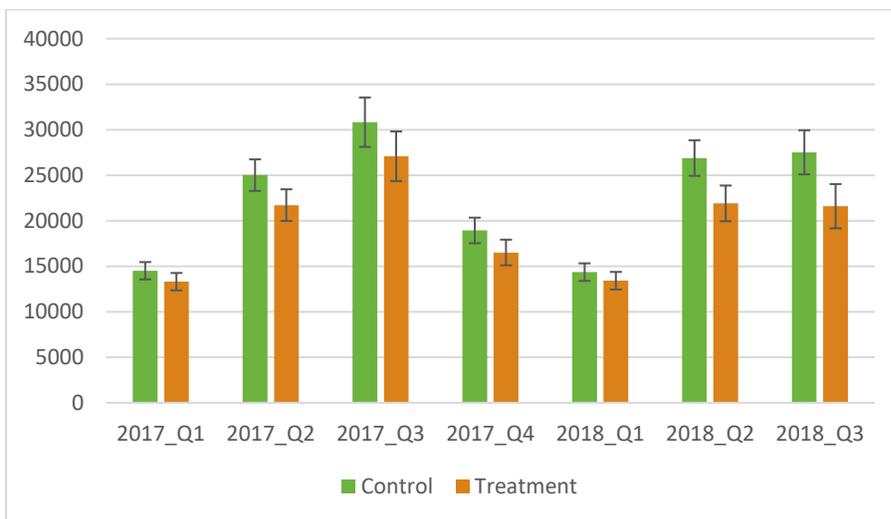


Evaluation question #3: Did the treatment have a differing effect on residents in each water system?

To test the third evaluation question, the primary analysis conducted for question #1 was extended to include water system as an additional between-subjects variable in the ANOVA. The results showed that there were significant differences across the three water systems ($F(2,1758)=10.51, p<.001$) with West Springfield using more water per quarter on average than Concord, which used more than Hingham (Aquarion) (Figure 2). The 3-way interaction of time x condition x water system was not statistically significant ($p=.55$).

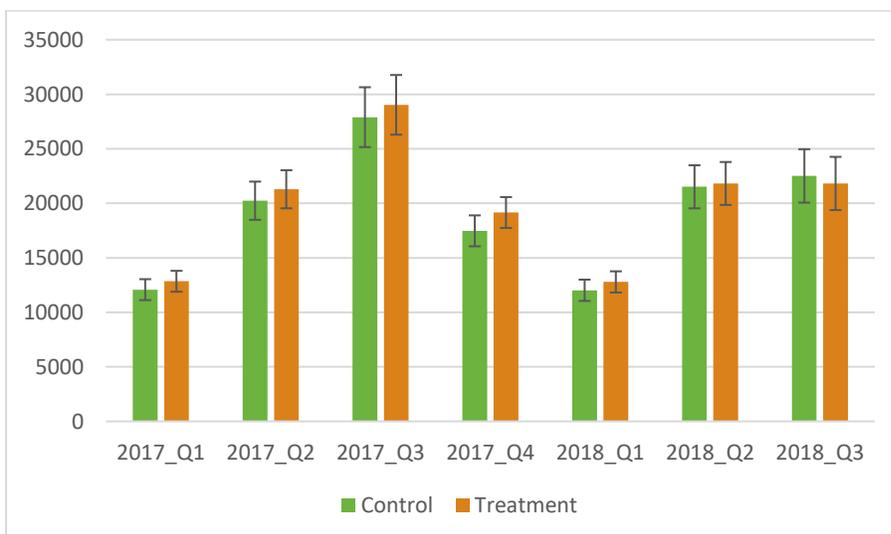
Focusing on the water consumption in the summer of 2018 following the outreach (2018_Q3) showed that the results were strongest for West Springfield. West Springfield treatment households used 21,597 gallons, compared with 27,518 for the control. This translates to approximately 240 gallons per day for the treatment, and 306 for the control—a statistically significant savings of 22%. See Figure 8.

Figure 8: Quarterly Water Consumption for West Springfield



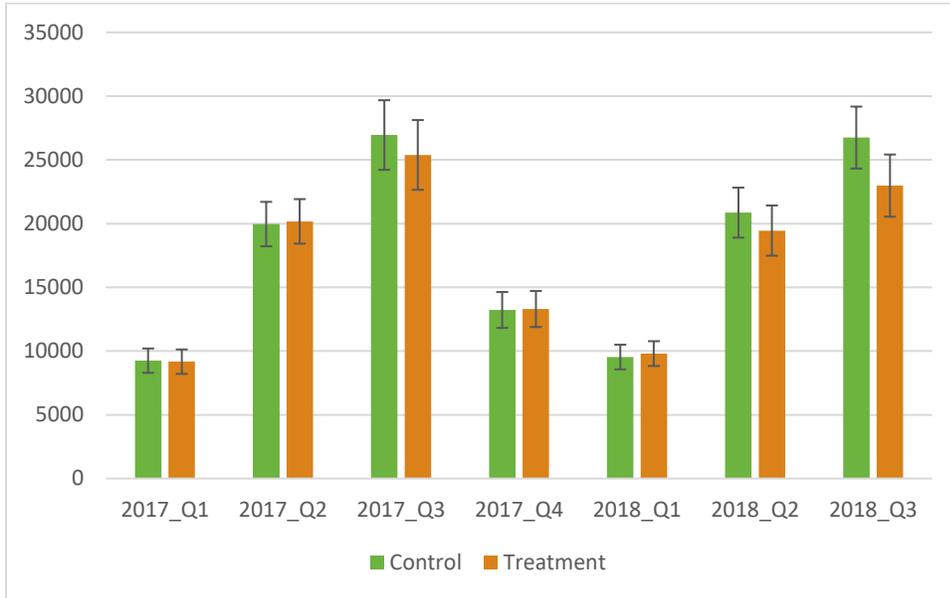
Following the outreach, Concord treatment households used 21,820 gallons, compared with 22,511 for the control. This translates to approximately 242 gallons per day for the treatment, and 250 for the control—a savings of 3%. The water savings in Concord were not statistically significant. See Figure 9.

Figure 9: Quarterly Water Consumption for Concord



Following the outreach, households in the treatment group for Hingham (Aquarion) used 22,977 gallons, compared with 26,748 for the control. This translates to approximately 255 gallons per day for the treatment, and 297 for the control—a savings of 14%. The water savings in Hingham (Aquarion) were statistically significant. See Figure 10.

Figure 10: Quarterly Water Consumption for Hingham (Aquarion)



Supplemental Evaluation: Did the treatment have a differing effect on high-use households by water system?

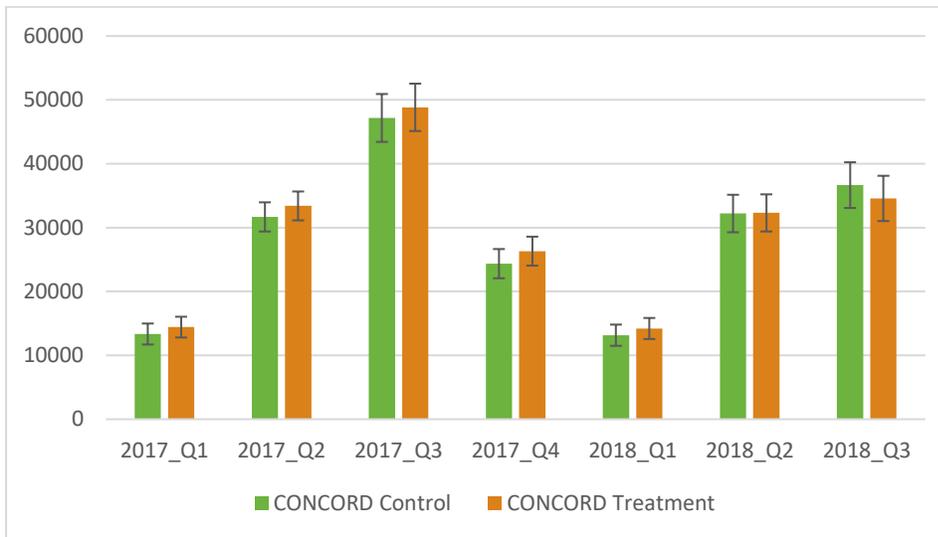
After reviewing the initial results, a supplemental analysis was conducted showing a breakdown of the results for high using households within each water system. To address this question, an additional analysis was conducted for each of the three water systems, limited to just high-consuming baseline households. Results from the equation of 7 (time) x 2 (treatment) x 3 (water system) showed the expected statistically significant effects for time ($p < .01$), water system ($p < .05$), treatment ($p = .07$), and the time x treatment interaction ($p < .05$). All of these statistically significant effects have been discussed in earlier sections of the report. The results did not show a statistically significant interaction by water system, suggesting that high-consuming households responded similarly across the three water systems ($p = .37$). As shown below, high consuming households in all three of the cities used less water after receiving the treatment, compared to control households. The water savings are quantified below.

Action Research

Concord – Highest Quartile

Consistent with the previous results for all Concord households, the focused analyses for just high consuming households were not statistically significant. The trend was in the expected direction, with high consuming households that received the treatment using less water in the quarter following outreach (34,574) than households in the control (36,655), for a 6% reduction. In daily units, this is approximately 385 gallons per day during the summer, compared to 407 gallons per day for households in the control. See Figure 11.

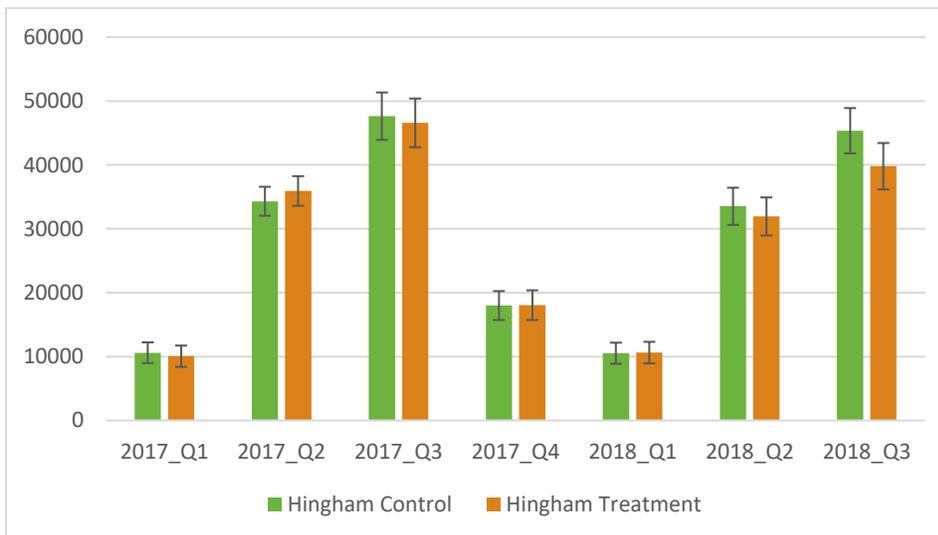
Figure 11: Highest Quartile Households in Concord



Hingham (Aqurion) – Highest Quartile

Results for high consuming households in Hingham (Aqurion) showed a statistically significant reduction in water consumption for households that received the treatment. In the quarter following outreach, households in the treatment condition used 39,803 gallons of water, compared to 45,362 for households in the control condition, for a significant 12% reduction. In daily units, this is approximately 443 gallons per day during the summer, compared to 505 gallons per day for households in the control.

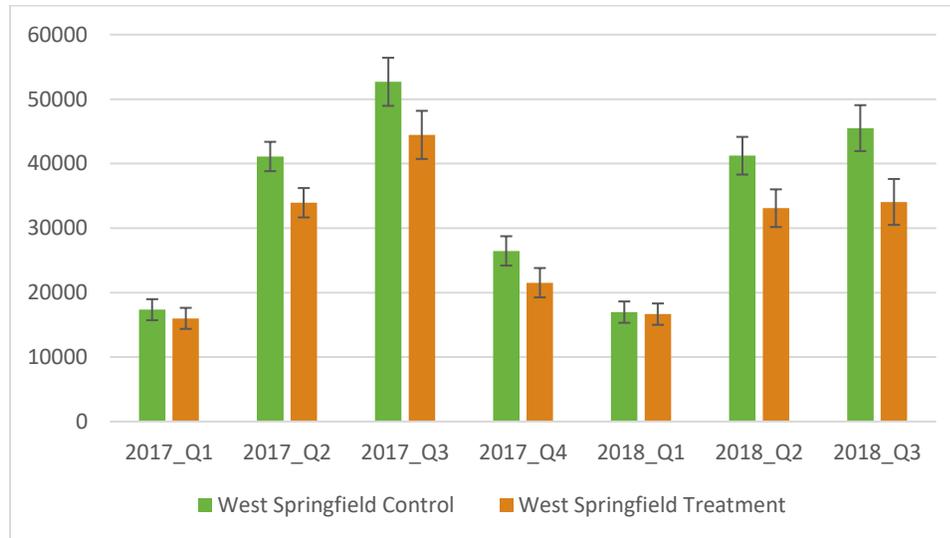
Figure 12: Highest Quartile Households in Hingham (Aqurion)



West Springfield – Highest Quartile

Consistently across the analyses, households in West Springfield responded the most favorably to the outreach. Results for high consuming households in West Springfield showed a statistically significant reduction in water consumption for households that received the treatment. In the quarter following outreach, households in the treatment condition used 34,056 gallons of water, compared to 45,503 for households in the control condition, for a significant 25% reduction. In daily units, this is approximately 378 gallons per day during the summer, compared to 506 gallons per day for households in the control.

Figure 13: Highest Quartile Households in West Springfield



4: Survey Results

The six-question postcard survey was sent to both the treatment and control households in all water systems. The overall response rate was 30.5%, with a nearly even split between control (50.6%) and treatment (49.4%) households. The response rate did vary by water system, as shown below. The topline responses are available in *Appendix C: Topline Results for Full Sample*.

Table 7: Survey Response Rate by Water System

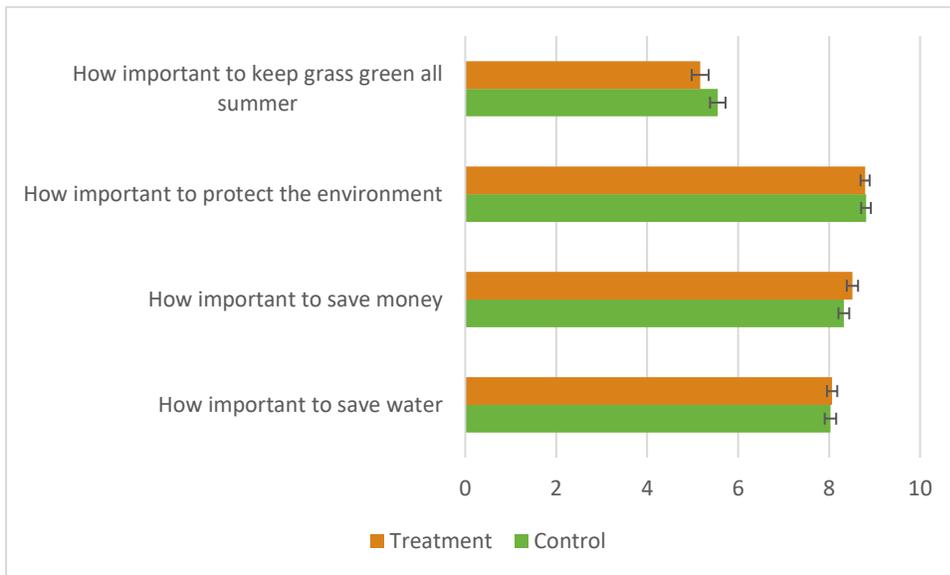
Water system	Number of respondents	Percentage
Concord	210	47.9%
Hingham (Aquarion)	120	27.4%
W Springfield	205	46.8%

Full Sample Results

Conservation Attitudes

Residents were first asked about their attitudes toward water conservation and their lawns. Overall, both groups had similar attitudes about water conservation. In the previous Ipswich research, residents generally valued saving water and money, as well as protecting the environment, so we did not expect there to be significant differences between the treatment and the control.

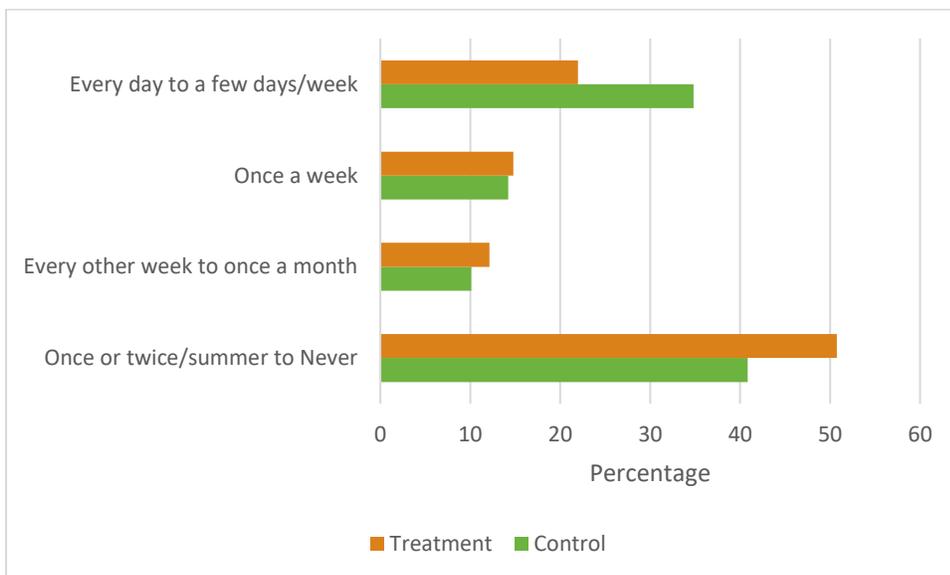
Figure 14: Water Conservation Attitudes



Watering Frequency

Next, residents were asked to report their lawn watering frequency for the past summer (during the pilot study). The treatment residents reported less frequent lawn watering than the control residents.

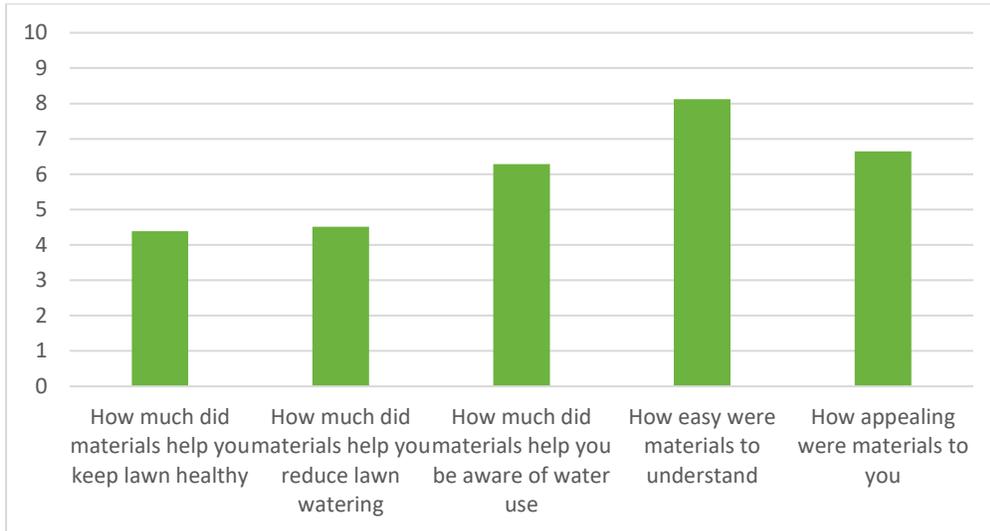
Figure 15: Reported Watering Frequency



Outreach Ratings

Overall, 60.5% of the treatment households remembered receiving the outreach materials. The materials were generally positively received. The residents who received outreach rated the materials as moderately to fairly helpful, particularly for making them more aware of their usage. Residents also found the materials fairly easy to understand and appealing.

Figure 16: Material Ratings

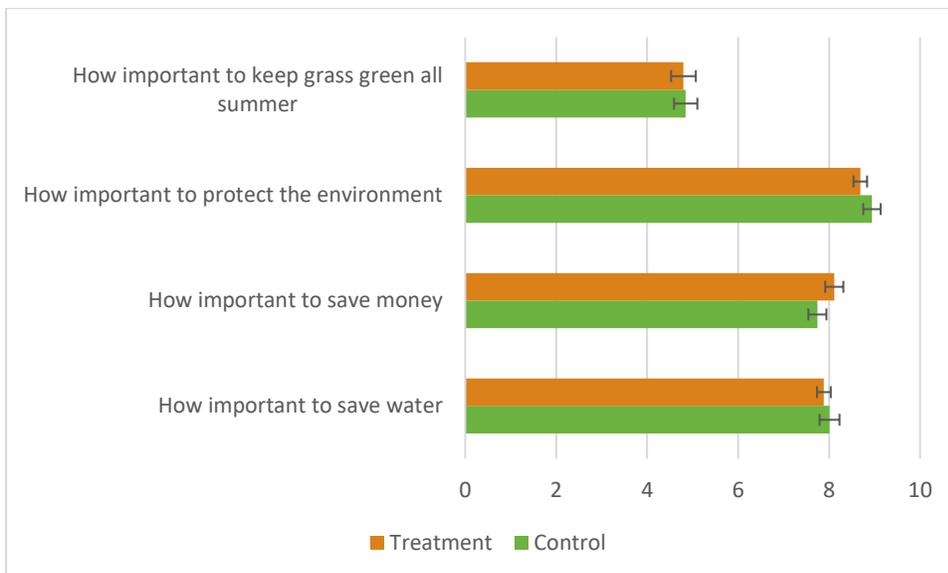


Concord – Survey Results

Conservation Attitudes - Concord

Again, residents were first asked about their attitudes toward water conservation and their lawns. Overall, both groups had similar attitudes about water conservation.

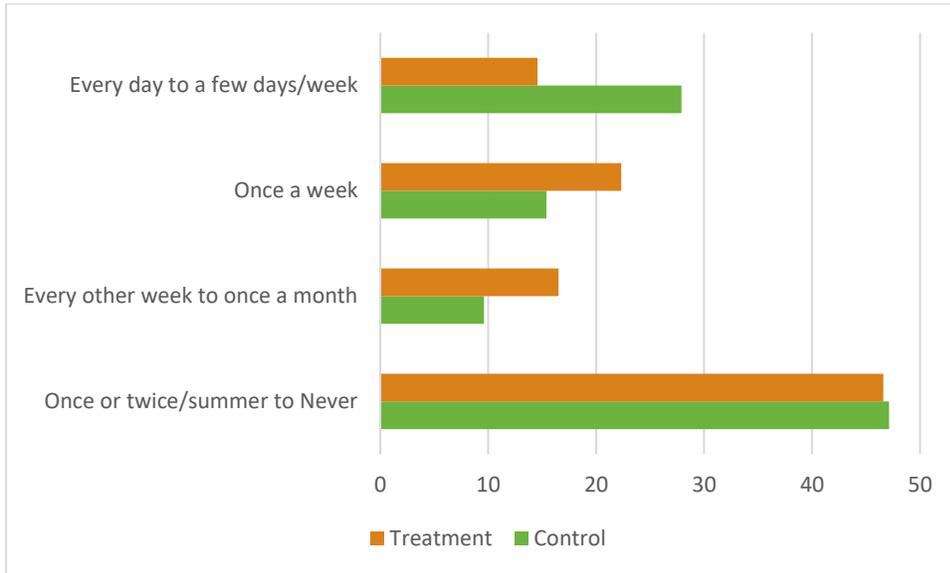
Figure 17: Water Conservation Attitudes - Concord



Watering Frequency - Concord

Next, residents were asked to report their lawn watering frequency for the summer. The treatment residents reported less frequent lawn watering than the control residents. The groups were about equal for the very low watering group, but 13% more of the control group reported watering every day to a few days per week.

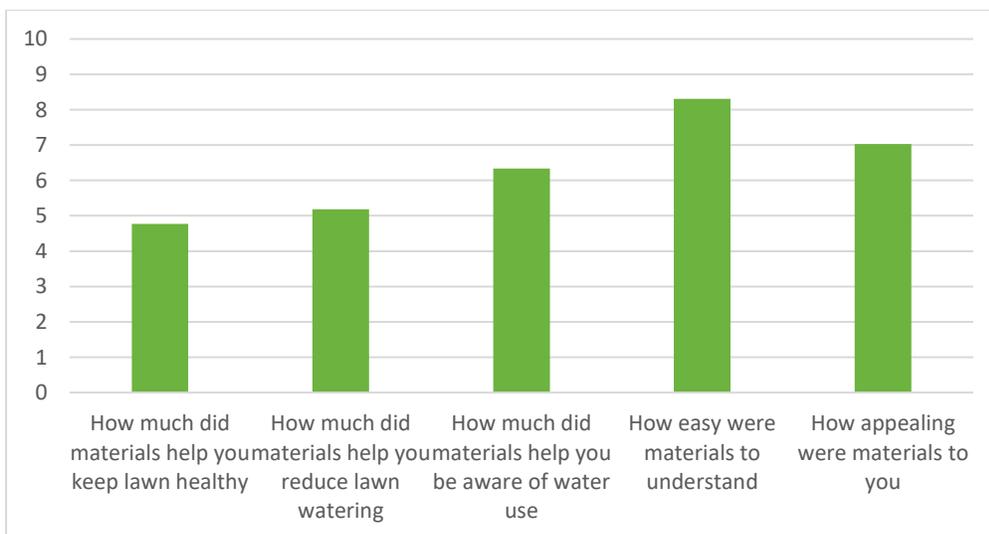
Figure 18: Reported Watering Frequency - Concord



Outreach Ratings - Concord

Overall, 62.9% of the treatment households remembered receiving the outreach materials. The materials were generally positively received. The residents who received outreach rated the materials as moderately to fairly helpful, particularly for making them more aware of their usage. Residents also found the materials fairly easy to understand and appealing.

Figure 19: Material Ratings - Concord

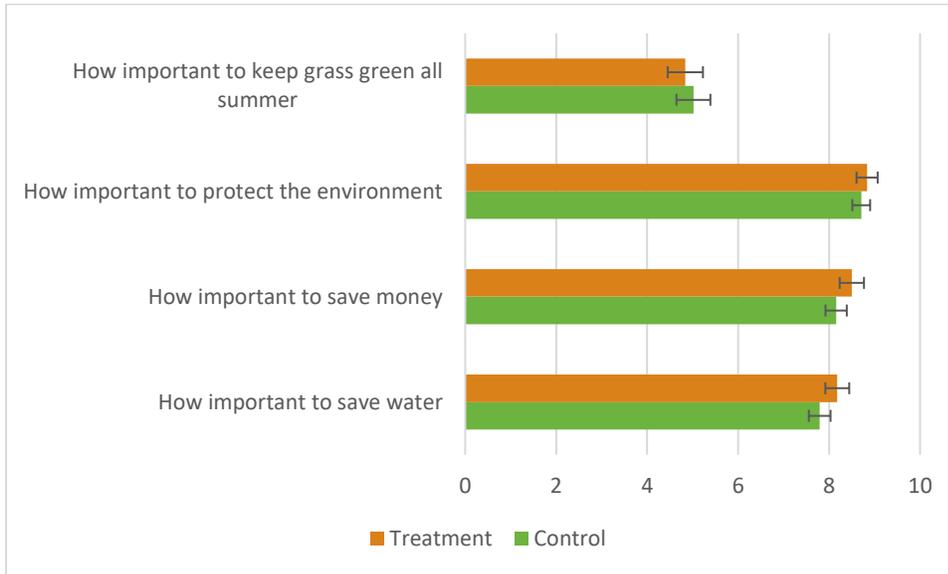


Hingham (Aquarion) – Survey Results

Conservation Attitudes – Hingham (Aquarion)

Again, residents were first asked about their attitudes toward water conservation and their lawns. Overall, both groups had similar attitudes about water conservation.

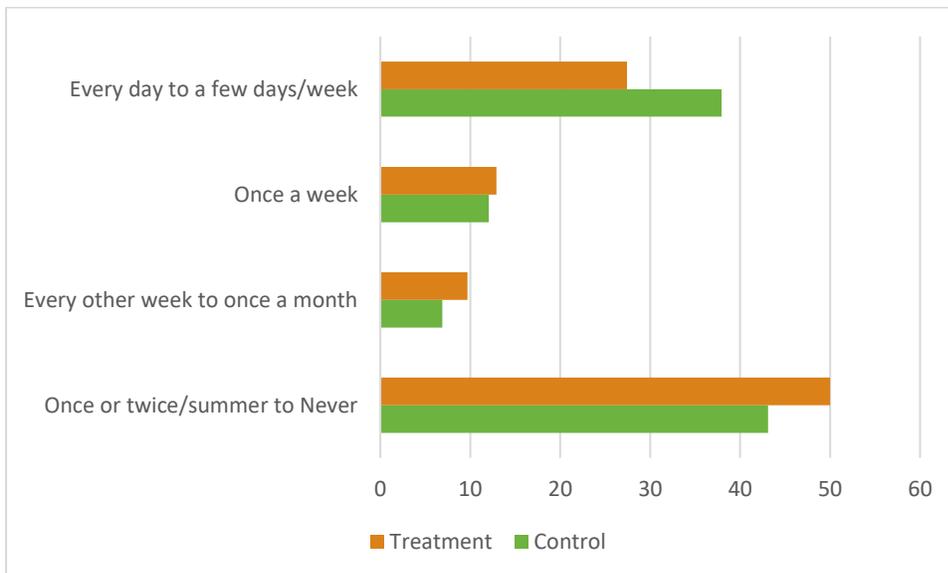
Figure 20: Water Conservation Attitudes – Hingham (Aquarion)



Watering Frequency – Hingham (Aquarion)

Next, residents were asked to report their lawn watering frequency for the summer. The treatment residents reported less frequent lawn watering than the control residents. More of the control group (11%) reported watering every day to a few days per week, and 7% more of the treatment group reported very low watering.

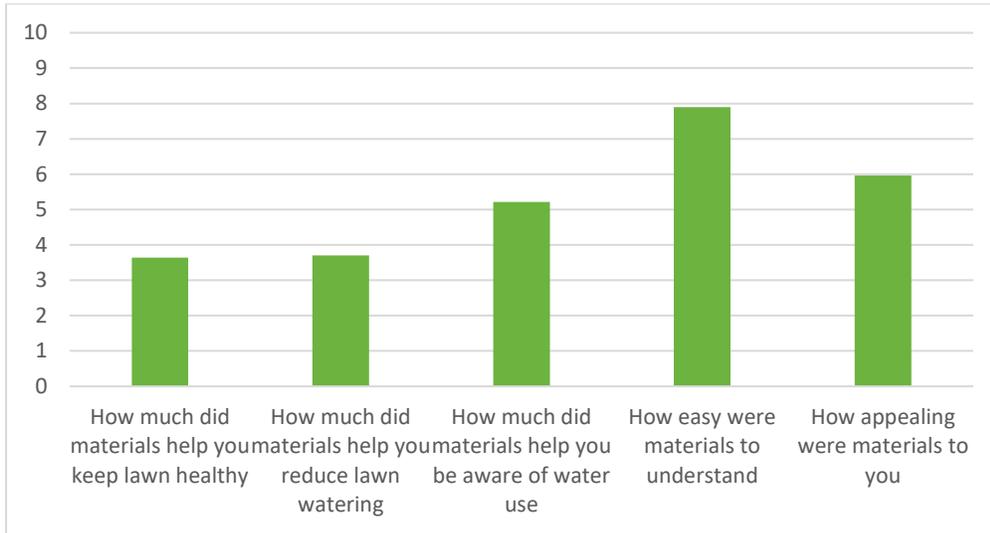
Figure 21: Reported Watering Frequency – Hingham (Aquarion)



Outreach Ratings – Hingham (Aquarion)

Overall, 51.6% of the treatment households remembered receiving the outreach materials. The materials were generally positively received. The residents who received outreach rated the materials as moderately to a bit helpful, and somewhat helpful for making them more aware of their usage. Residents also found the materials fairly easy to understand and somewhat appealing.

Figure 22: Material Ratings – Hingham (Aquarion)

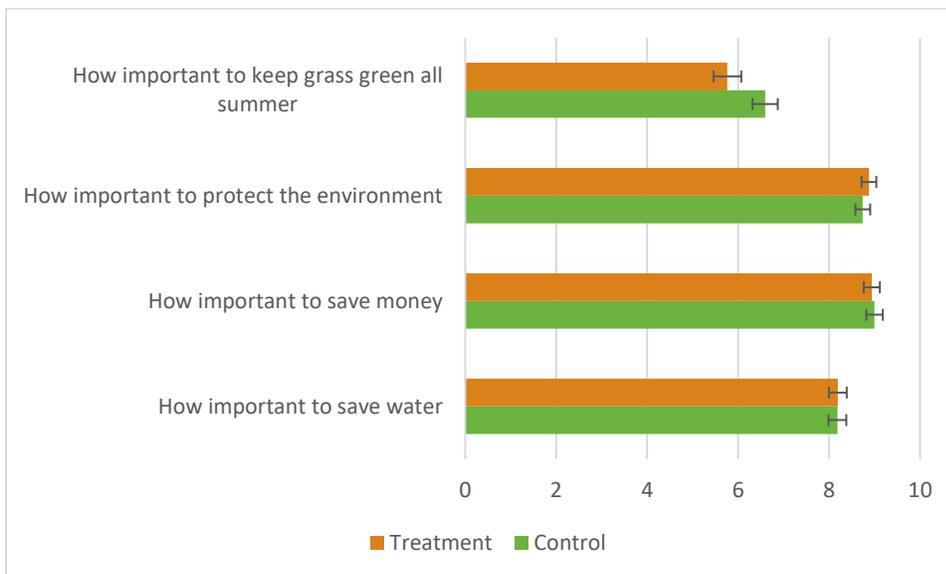


West Springfield – Survey Results

Conservation Attitudes - West Springfield

Again, residents were first asked about their attitudes toward water conservation and their lawns. Overall, both groups had similar attitudes about water conservation.

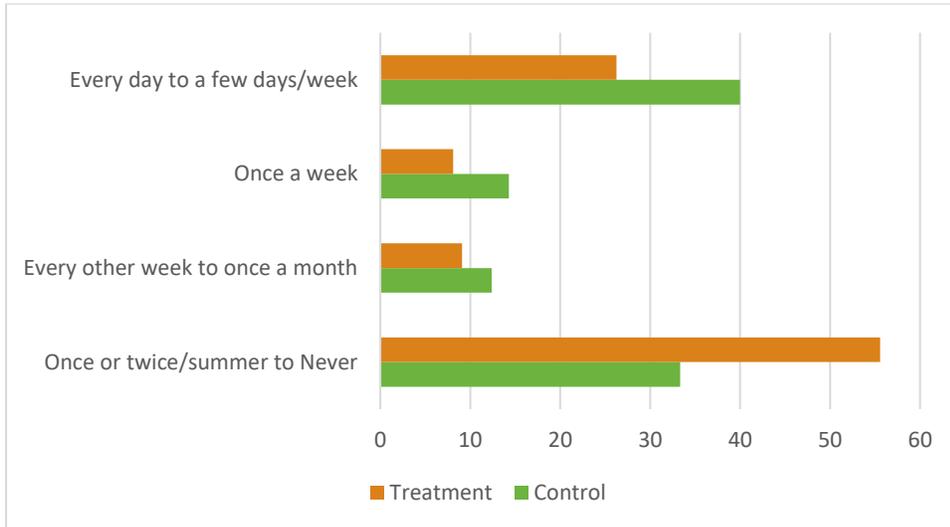
Figure 23: Water Conservation Attitudes - West Springfield



Watering Frequency - West Springfield

Next, residents were asked to report their lawn watering frequency for the summer. The treatment residents reported less frequent lawn watering than the control residents. More of the control group (14%) reported watering every day to a few days per week, and 23% more of the treatment group reported very low watering.

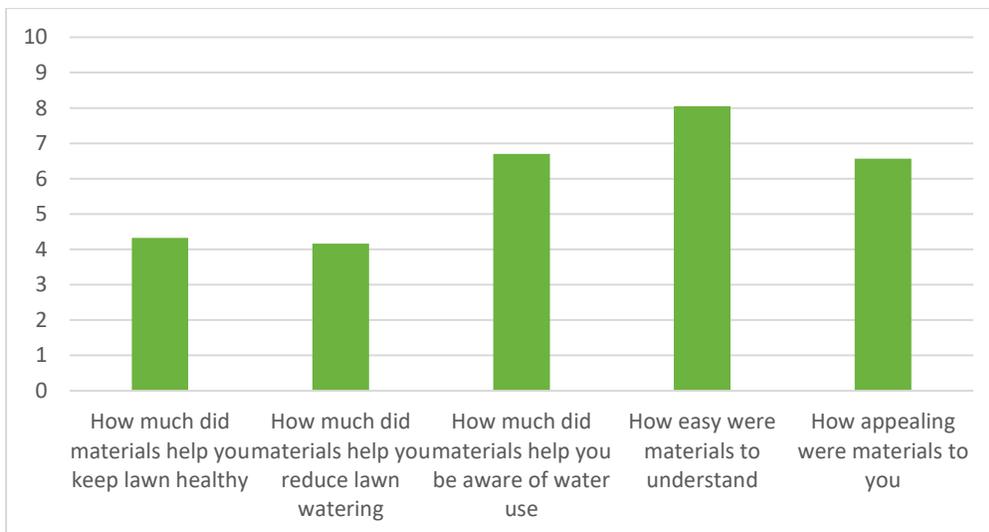
Figure 24: Reported Watering Frequency - West Springfield



Outreach Ratings - West Springfield

Overall, 63.3% of the treatment households remembered receiving the outreach materials. The materials were generally positively received. The residents who received outreach rated the materials as moderately helpful, and somewhat helpful for making them more aware of their usage. Residents also found the materials fairly easy to understand and somewhat appealing.

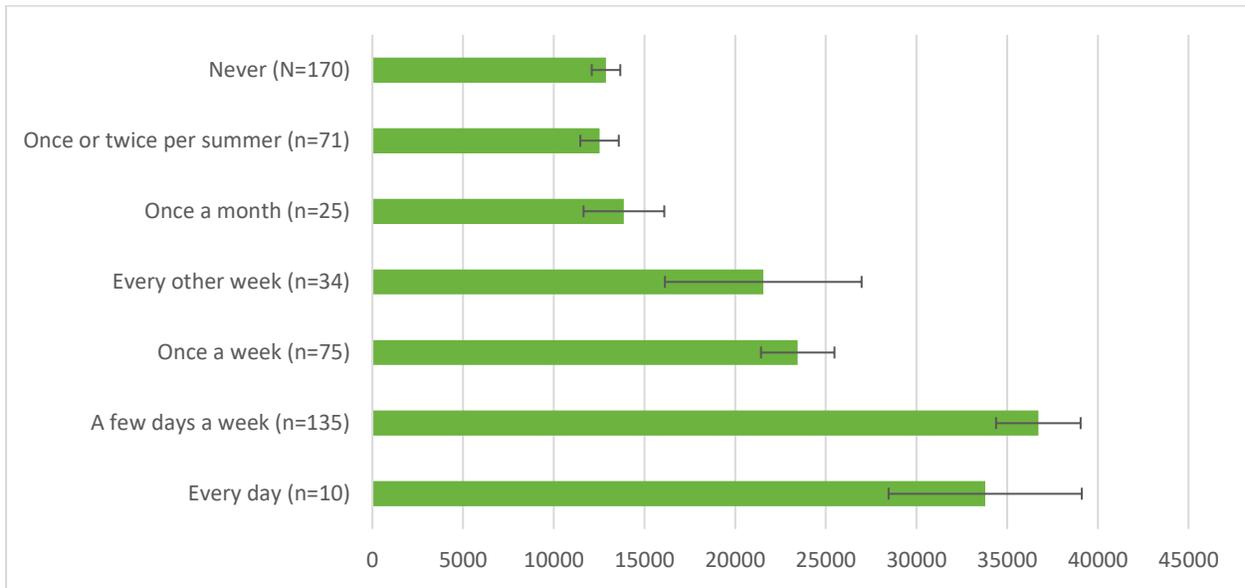
Figure 25: Material Ratings - West Springfield



Survey Data and Water Data

Finally, analyses were run on a data set that combined the survey data with the water data. The results are based solely on those who responded to the survey, introducing some response bias, but provide some interesting results on the veracity of the self-reported data. A clear pattern emerged when looking at average use at each self-report level, where those who reported less usage did use less water (See Figure 26). Between the level breaks, the differences in usage were statistically significant, ($p < .001$).

Figure 26: Self-Reported Watering Behavior with Water Use



N = sample size

Self-Report Behavior by Water System

Based on the natural breaks shown in Figure 26, the following categories were collapsed to increase the category sample size and allow for analysis by water system:

1. Reported High Watering (*Every day, A few days a week*)
2. Reported Medium Watering (*Once a week, Every other week*)
3. Reported Low Watering (*Once a month, Once or Twice per summer, Never*)

In Figure 27 – 29, the water usage for each self-report behavior level is shown for each water system, demonstrating that the pattern of fairly accurate self-report of water use is consistent across all water systems, as the differences between the reported levels is statistically significant for each water system.

Figure 27: Self-Reported Behavior with Water Use - Concord

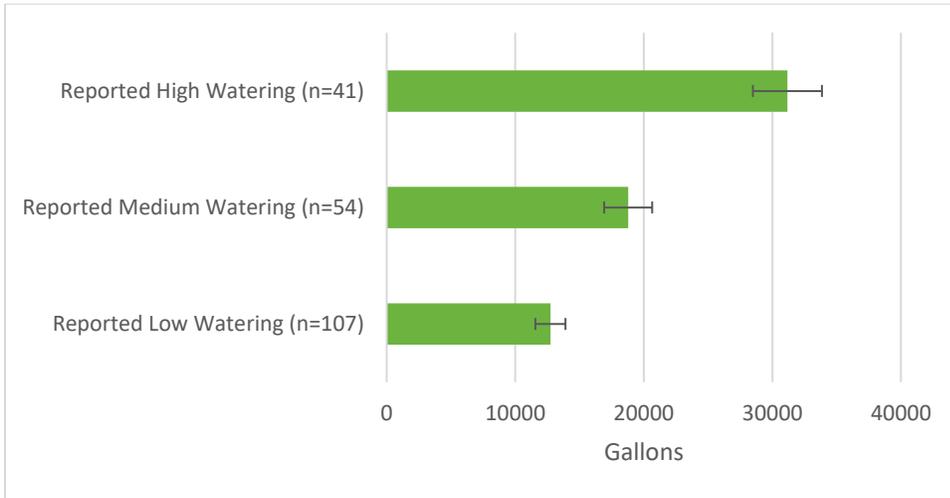


Figure 28: Self-Reported Behavior with Water Use – Hingham (Aquarion)

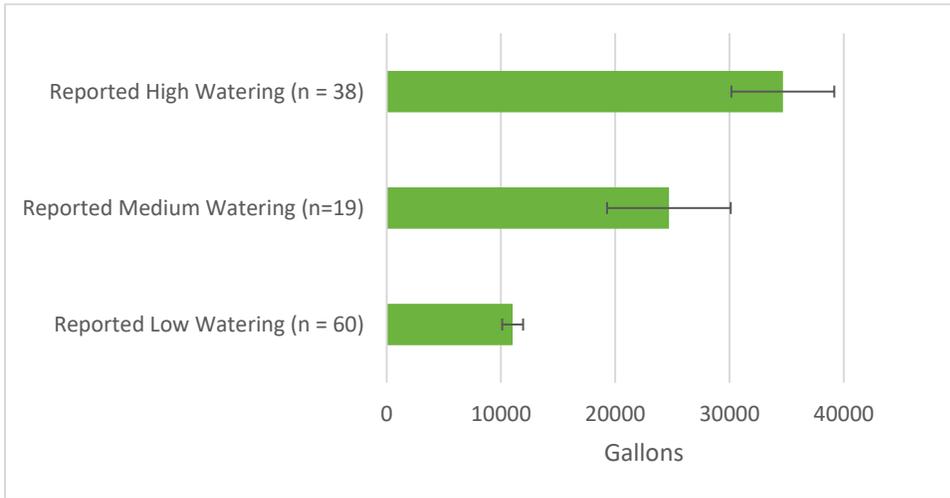
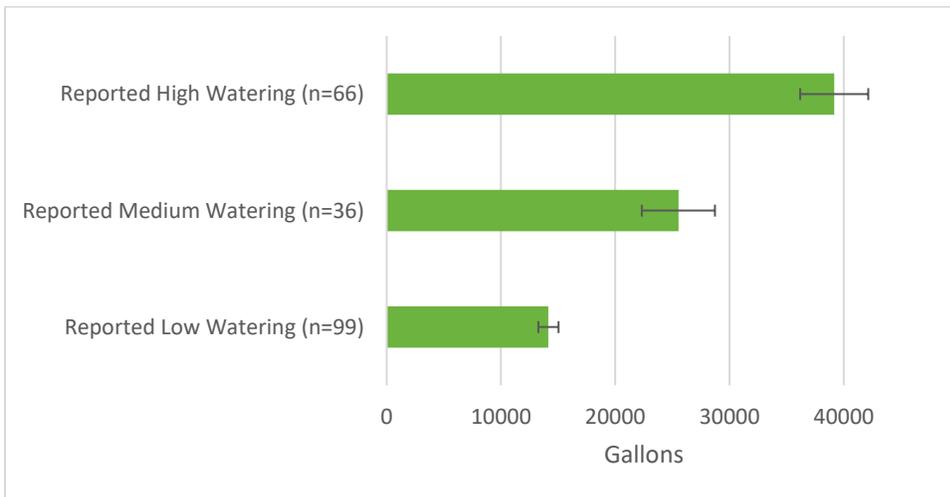


Figure 29: Self-Reported Behavior with Water Use - West Springfield



5: Conclusions and Recommendations

Overall, the results demonstrate that the program was successful in reducing summer water use, as the treatment group used significantly less water than the control. In addition, treatment households in the highest quartile used even more significantly less water, while the medium-low group did not have significant differences between the control and treatment groups. There were also differences by water system, with West Springfield showing the largest effect, and Concord showing a positive trend.

The survey results mirror these patterns, with the treatment households reporting less watering than the control, and when linked to the water data, demonstrate that self-reported behavior was strongly related to actual summer water usage. The survey results also support the goal of going beyond changing attitudes, as both the treatment and control households demonstrated positive attitudes toward conservation, while showing a difference in their conservation behavior.

As discussed in the report, water use from the treatment and control group was compared in several ways – overall, by water system, and by quartile of water use, summarized below. Statistical significance is marked with **.

Table 8: Summative Water Data Results

Comparison	Average Savings per Household	Estimated gal saved per summer* per household
Overall Treatment vs. Control	39 gal/day (savings rate of 14%)**	3,510 gallons
By Quartile Treatment vs. Control	Highest Quartile 72 gal/day (savings rate of 15%)**	6,480 gallons
	Medium High Quartile 41 gal/day (savings rate of 12%)**	3,690 gallons
	Medium Low Quartile 17 gal/day (savings rate of 11%)	1,530 gallons
By Water System Treatment vs. Control	Concord 8 gal/day (savings rate of 3%)	720 gallons
	Hingham (Aquarion) 42 gal/day (savings rate of 14%)**	3,780 gallons
	West Springfield 66 gal/day (savings rate of 22%)**	5,940 gallons
By Quartile AND By Water System Treatment vs. Control	Concord, Highest Quartile 22 gal/day (savings rate of 6%)	1,980 gallons
	Hingham (Aquarion), Highest Quartile 62 gal/day (savings rate of 12%)**	5,580 gallons
	West Springfield, Highest Quartile 128 gal/day (savings rate of 25%)**	11,520 gallons

*"Summer" was considered 3 months (90 days), which assumes persistence through the summer

**Statistical significance at p<.05

Differences by Water System

The differing pattern among the water systems is potentially related to a few factors.

Previous Outreach Levels: All water systems currently have some level of outreach on water use, from water bans and signage to educational information, but there are differences by water system.

1. Concord has a staff member who is focused on conservation, and the water system has implemented conservation outreach over the past 20 years, which is likely related to the lower amount of reduction in the treatment group as compared to any other water system.

2. Aquarion, Hingham's water supplier, currently does some educational outreach, but not to the same degree as Concord.
3. West Springfield's current educational or motivational outreach is limited in scope.

These findings suggest that the program may be more effective when there has not been other educational and motivational outreach.

Other Demographic Factors: Between the water systems, there may be other demographic or socioeconomic factors that could influence the difference in water savings. These factors (e.g., income, lots size, or household sizes) were not part of the scope of our analyses; however, if these factors were significantly different between the water systems, they may also have influenced the difference in water savings.

Differences by Quartile

The most positive results were experienced by those households in the highest quartile of summer-to-winter water usage. The high quartile households were the ones most likely to be currently watering their lawn in the summer to a significant degree, given their summer-to-winter water usage difference, so they have the most room to improve. As this group had both the highest percentage savings and the highest total gallon reduction, this suggests that our treatment is most influential to those who are in the highest bracket of summer-to-winter water usage difference.

Survey Results

Overall, the results showed that all households had similar attitudes about green grass, protecting the environment, and saving money and water. In addition, nearly two-thirds of treatment households remembered the materials, and rated them fairly and moderately helpful, understandable, and appealing. When split by water system, the survey results mirrored the water data, summarized below.

1. **Concord** had the same percentage of low waterers across the treatment (47%) and the control (47%), though the treatment had fewer frequent waterers (15%) than the control (28%). This reflects the same trend toward reduction in water use by the Concord treatment households without a statistically significant reduction.
2. **Hingham (Aquarion)** had more low waterers in the treatment (50%) than the control (43%), and the control also had more frequent waterers (38%) than the treatment (27%), which reflects more of a reduction than Concord.
3. **West Springfield** had many more low waterers in the treatment (56%) than the control (33%), and the control also had more frequent waterers (40%) than the treatment (26%), which reflects more of a reduction than Concord or Hingham.

In addition, when the survey results were matched with the water results, households who self-reported lower usage were significantly more likely to consume less water ($p < .01$), validating the accuracy of the self-report behavioral data.

Feedback from Residents

Overall, the feedback from local residents was fairly minimal. Each water supplier received a couple calls from residents, primarily to gather a better understanding of what the program entailed. Some resident feedback to consider included:

1. If including the medium-low households, consider if the level for receiving a "sad" face should be raised, given their likely lower total usage.

Action Research

2. Consider using a smaller metric for usage to create a number of gallons that is more understandable.
3. Consider how much historical data should be used to categorize, given differences in weather year to year. While this may result in more accurate categorization, implementers should consider the return-on-investment of additional data processing versus the increased accuracy.

Recommendations

The results indicate that the pilot program could be successfully utilized by other local governments to decrease summer watering. We have the following recommendations, based on the results:

1. **Continue to use best outreach practices:** The outreach was designed with best communication practices in mind, such as customizing the materials with the town name, including a cover letter with an official signature, individualizing the feedback graph to the household, focusing on the highest priority barriers to action, keeping messages simple, etc. Future delivery of the program should avoid significant modification to the materials, given the success of savings, and that the materials were remembered by the majority of treatment households multiple months after delivery, and were rated fairly positively.
2. **Repeating historical feedback is effective if current feedback is not available:** The best practice for behavioral feedback is to deliver feedback that is close to in time to the behavior. However, for this project, it was not possible provide an updated feedback graph, giving the timing on water data collection. However, the individualized feedback and motivational outreach still reduce water use, even if delivered without a current update (e.g., feedback was not updated to reflect the household's usage in summer 2018).
3. **Prioritize locations that do not have existing outreach:** The outreach may work best in locations without significant other educational outreach but may still have an effect when combined with existing work.
4. **Prioritize households that likely water their lawns:** The outreach may work best households with a higher summer-to-winter water usage difference.
5. **Consider strategic audience targeting:** Consider if implementing the program is worth the return on investment for households below a medium-high summer-to-winter water usage difference.
6. **Use best suited evaluation option:** The preferred metric for evaluation is the water data, as that data allows for an understanding if actual water usage, and therefore likely actual behavior, changed as a result of the program. However, both the survey and the water data showed similar findings, suggesting that self-report could be successfully utilized as an effective evaluation metric if water data is not available.

Additional Research

Based on these findings, we have two suggestions for potential additional research avenues.

1. **Determine the effect of weather:** The pilot was implemented in a high rain summer. It may be worth the time to determine if the program would have similar success in dry years, or if the materials would need to be modified directly to address lawns needing watering to survive a drought.
2. **Determine the additive effect of other programs/messaging:** All water systems had water bans or other conservation-related messaging in place during the summer, which could have had additive effects on the results. The use of a control group mitigates this effect, as control households should have been affected by the additional outreach, but not the pilot program. However, if the pilot is implemented in other locations with different results, it may be worth considering any differences in other messaging or political policies from the pilot water systems.

Concord

Pre-notification Postcard

Introducing *Healthy Lawn, Happy Summer*

Dear Resident,

Within the next week, you will receive an envelope with materials on the new *Healthy Lawn, Happy Summer* campaign developed by Concord Public Works and MassDEP. It will include tips on how to conserve water in the summer months and information on how your water use compares to your neighbors.

Healthy Lawn, Happy Summer encourages those who live in Concord to save water and protect the environment while keeping their lawns healthy all summer.

Be on the lookout for the envelope. Together, we can make a big difference.

Sincerely,

Alan H Cathcart
Water and Sewer Division Superintendent

For questions contact: Melissa Simoncini
Sr Environmental and Regulatory Coordinator - (978) 318-3250



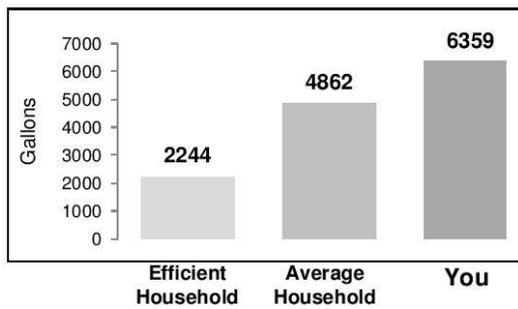
Join Concord Neighbors In Summer Water Savings!

How do you compare?



More than half of Concord residents don't water their lawns in the summer. These residents are not only saving money, but also doing their part to save water. To prepare for this summer, we wanted to let you know where you stand based on your water usage last summer.

Average Water Use Per Month (Summer 2017)



During the summer of 2017, your household used **more water** than the average Concord household.

Your household has room to improve your water usage.

Check out the **Healthy Lawn, Happy Summer flyer** for tips to reduce your water use.

Together, we can conserve Concord's water resources while keeping our lawns healthy all summer.



**Thank you for
helping your community!**

Please visit this Concord's website for more information: www.concordma.gov/conservation

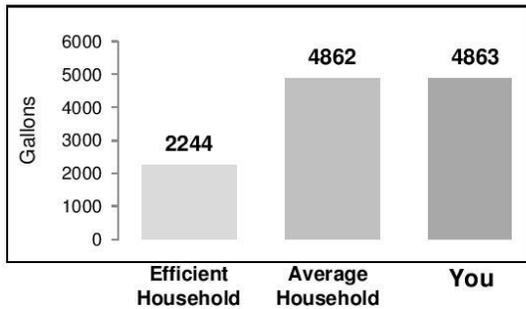
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Average Water Use Per Month (Summer 2017)



During the summer of 2017, your household used about **the same** as the average Concord household.

Your household is doing great but can save more water.

Check out the **Healthy Lawn, Happy Summer flyer** for tips to reduce your water use.

Together, we can conserve Concord's water resources while keeping our lawns healthy all summer.



**Thank you for
helping your community!**

Please visit this Concord's website for more information: www.concordma.gov/conservation

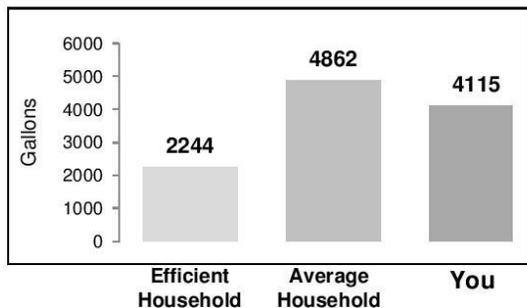
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CONCORD PUBLIC WORKS

Water and Sewer Division

135 KEYES ROAD

CONCORD, MASSACHUSETTS 01742-1601

ALAN H. CATHCART
SUPERINTENDENT

TEL. : 978-318-3250
FAX. : 978-318-3204



MAY 10, 2018

Dear Resident,

As summer approaches, the Town of Concord is working with the Massachusetts Department of Environmental Protection (DEP) to assist our residents in saving water and protecting the environment while keeping their lawns healthy. As a community, we have a finite amount of water, even in years when we receive average rainfall. It is important we conserve our water resources to make sure there is enough for all. Residents can still maintain a healthy lawn while watering more efficiently, or not at all.

We thank our residents who are already taking action to conserve water. More than half of residents have reported watering their lawn in the summer minimally or not at all. However, our community still has room to improve in saving water during the summer. In conjunction with DEP, we developed the enclosed "Healthy Lawn, Happy Summer" to help inform residents on ways to keep their lawns healthy in summer while saving water at the same time.

If you have any questions, please contact Melissa Simoncini, Senior Environmental and Regulatory Coordinator, at (978) 318-3250.

Sincerely,

Alan H. Cathcart
Water and Sewer Division Superintendent



CONCORD PUBLIC WORKS
Water and Sewer Division
135 KEYES ROAD
CONCORD, MASSACHUSETTS 01742-1601

ALAN H. CATHCART
SUPERINTENDENT

TEL. : 978-318-3250
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JULY 14, 2018

Dear Resident,

Now that we are in the heart of summer, Concord Public Works and the Massachusetts Department of Environmental Protection (DEP) are reaching out again to assist our residents in saving water and protecting the environment while keeping their lawns healthy. We have a finite amount of water in our area, even in years when we receive average rainfall. It is important we conserve our water resources to make sure there is enough for all.

As water levels naturally drop in our rivers, lakes, and ponds in the summer, it is especially important that we conserve water by irrigating efficiently (or not at all). We thank our many residents who have already taken action to conserve water. More than half of residents have reported watering their lawn in the summer minimally or not at all.

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HEALTHY **LAWN** HAPPY SUMMER!

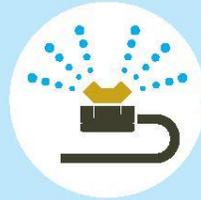
Each of us makes a big impact in Concord.

Reduce Lawn Watering

Eliminating or reducing summer lawn watering makes a big difference. Concord households that water their lawns in the summer use an average of 1,900 gallons a week. That's like running your shower for 12 hours!

The fact is, *a Concord lawn doesn't need much water to stay healthy.* Overwatering your lawn can cause shallow roots and make it susceptible to pests, disease, and drought.

LAWN WATERING



1,900 Gallons

SHOWERING



12 Hours!

Water Only With Rain

In most years, we get enough rain to maintain a healthy summer lawn. *Healthy grass can go dormant (turn golden) during dry periods but it is not dead* and will green up with the return of rain. Going dormant creates more drought resistance and deeper roots, making a healthier, less sensitive lawn.



Dormant Grass

HEALTHY GRASS

DEEPER ROOTS

Half of Concord homes already let their lawn go dormant each summer. *Join them by letting your lawn be healthy and natural while saving water, money, and time.*

OR

Water Wisely

A healthy established lawn will likely not need irrigation. However, if you do water your lawn, follow the tips below to water wisely.

- 1 Water before 9 am to avoid evaporation.
- 2 Water infrequently and deeply to encourage deep roots.
- 3 Keep grass long to stay healthy (at least 2.5 to 3 inches).
- 4 Leave grass clippings on your lawn to keep soil moist.
- 5 Use a WaterSense-labeled controller on automatic irrigation systems.
- 6 Tell your lawn care crew to follow these guidelines.



Save water for your community and the Environment by watering your lawn wisely or not at all.

Please visit Concord's website for more information:
www.concordma.gov/conservation

Hingham (Aquarion)

Pre-notification Postcard

Introducing *Healthy Lawn, Happy Summer*

Dear Customer,

Within the next week, you will receive an envelope with materials on the new *Healthy Lawn, Happy Summer* campaign developed by Aquarion Water Company and MassDEP. It will include tips on how to conserve water in the summer months and information on how your water use compares to your neighbors.

Healthy Lawn, Happy Summer encourages Hingham customers to save water and protect the environment while keeping their lawns healthy all summer.

Be on the lookout for the envelope. Together, we can make a big difference.

Sincerely,

Stephen C. Olson, P.E.
Director of Operations, MA
(781) 740-6694
SOlson@aquarionwater.com



AQUARION
Water Company

Stewards of the Environment™

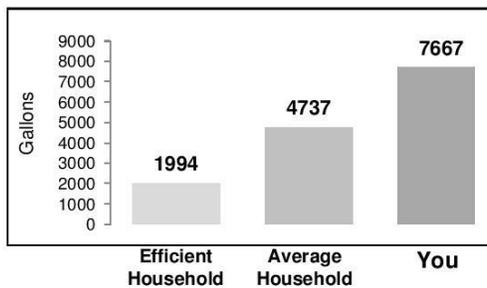
Join Hingham Customers In Summer Water Savings!

How do you compare?



More than half of our Hingham customers don't water their lawns in the summer. These customers are not only saving money, but also doing their part to save water. To prepare for this summer, we wanted to let you know where you stand based on your water usage last summer.

Average Water Use Per Month (Summer 2017)



During the summer of 2017,
your household used
more water
than the average Hingham
customer.

Your household has room to improve your water usage.

Check out the **Healthy Lawn, Happy Summer** flyer for tips to reduce your water use.

Together, we can conserve our service area's water resources while keeping our lawns healthy all summer.



**Thank you for
helping your community!**

Please visit Aquarion's website for more information on maintaining a healthy lawn:
www.aquarionwater.com/watering

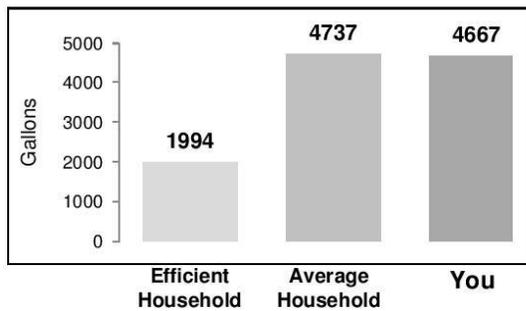
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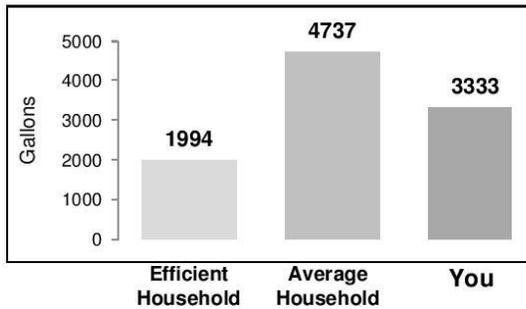


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**Thank you for
helping your community!**

Please visit Aquarion's website for more information on maintaining a healthy lawn:
www.aquarionwater.com/watering

Cover Letters



Dear Aquarion Customer:

As summer approaches, Aquarion Water Company is working with the Massachusetts Department of Environmental Protection (DEP) to assist our customers in saving water and protecting the environment while keeping their lawns healthy. We have a finite amount of water in our service area, even in years when we receive average rainfall. It is important we conserve our water resources to make sure there is enough for all. Customers can still maintain a healthy lawn while watering more efficiently, or not at all.

We thank our many customers who have already taken action to conserve water. More than half of our customers have reported watering their lawn in the summer minimally or not at all. However, there is still has room to improve in saving water during the summer. In conjunction with DEP, we developed the enclosed "Healthy Lawn, Happy Summer" to help inform customers on ways to keep their lawns healthy in summer while saving water at the same time.

Lastly, as outlined in our rules and regulations, watering days for customers with odd number street addresses are Tuesdays and Saturdays, and those with even number street addresses may only water on Wednesdays and Sundays. Irrigation systems or sprinklers can only be used on these days before 10 a.m. and after 6 p.m.

Please visit our website at www.aquarionwater.com/watering to learn more about the mandatory irrigation schedule.

If you have any questions, please contact me at (781) 740-6694 or SOlson@aquarionwater.com.

Sincerely,

A handwritten signature in blue ink, appearing to read "Stephen C. Olson", is written over a light blue circular watermark.

Stephen C. Olson, P.E.
Director of Operations, MA

Aquarion Water Company of Massachusetts
900 Main Street
Hingham, MA 02043

800-928-3734
www.aquarionwater.com



Dear Aquarion Customer:

Now that we are in the heart of summer, Aquarion Water Company and the Massachusetts Department of Environmental Protection (DEP) are reaching out again to assist our customers in saving water and protecting the environment while keeping their lawns healthy. We have a finite amount of water in our area, even in years when we receive above average or normal rainfall. It is important we conserve our water resources to make sure there is enough for all.

As water levels naturally drop in our rivers, lakes and ponds in the summer, it is especially important that we conserve water by irrigating efficiently (or not at all). We thank our many customers who have already taken action to conserve water and follow the restriction requirements. More than half of our customers have reported watering their lawn in the summer minimally or not at all.

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HEALTHY **LAWN** HAPPY SUMMER!

Each of our customers can make a big impact.

Reduce Lawn Watering

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The fact is, *a lawn in our service area doesn't need much water to stay healthy.* Overwatering your lawn can cause shallow roots and make it susceptible to pests, disease, and drought.

LAWN WATERING = **SHOWERING**

1,900 Gallons = **12 Hours!**

Water Only With Rain **OR** **Water Wisely**

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DEEPER ROOTS

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Stewards of the Environment™

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West Springfield

Pre-notification Postcard

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Healthy Lawn, Happy Summer encourages those who live in West Springfield to save water and protect the environment while keeping their lawns healthy all summer.

Be on the lookout for the envelope. Together, we can make a big difference.

Sincerely,

Robert J. Colson
Director of Public Works
(413) 263-3242



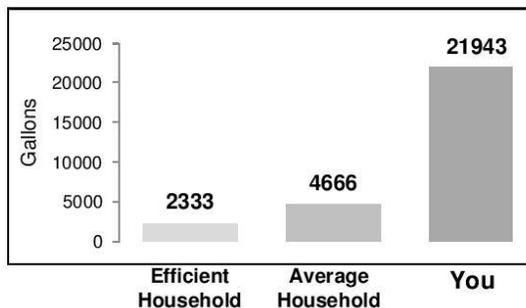
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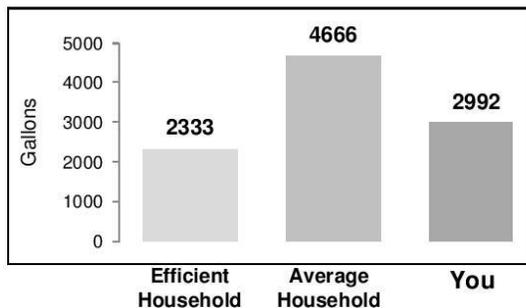
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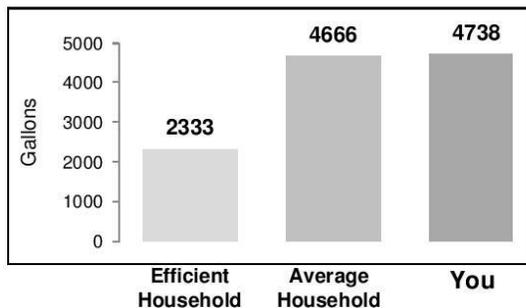
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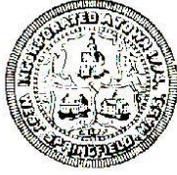
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Monday - Friday
8:00 AM - 4:30 PM

Tel: (413) 263-3030
Fax: (413) 734-9745

TOWN OF WEST SPRINGFIELD
DEPARTMENT OF PUBLIC WORKS
26 CENTRAL STREET
SUITE 17
WEST SPRINGFIELD, MA 01089-2763

Robert J. Colson
Director

James J. Czach, P.E.
Town Engineer
Trevor Wood
Deputy Director of Operations
Jeffrey R. Auer
Deputy Director of Water
Cynthia Zarichak
Office Manager

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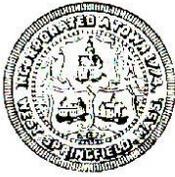
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If you have any questions, please call Jeff Auer at 413-263-3230 or email jauer@townofwestspringfield.org

Sincerely,

A handwritten signature in blue ink that reads "Robert J. Colson".

Robert J. Colson
Director



Monday - Friday
8:00 AM - 4:30 PM

Tel: (413) 263-3030
Fax: (413) 734-9745

TOWN OF WEST SPRINGFIELD

DEPARTMENT OF PUBLIC WORKS

26 CENTRAL STREET

SUITE 17

WEST SPRINGFIELD, MA 01089-2763

Robert J. Colson
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Robert J. Colson
Director

HEALTHY **LAWN** HAPPY SUMMER!

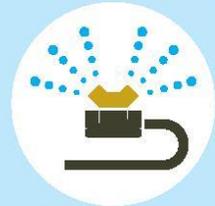
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LAWN WATERING



1,900 Gallons

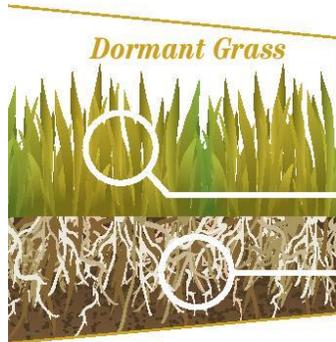
SHOWERING



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OR

Water Wisely

A healthy established lawn will likely not need irrigation. However, if you do water your lawn, follow the tips below to water wisely.

- 1 Water before 9 am or after 5 pm to avoid evaporation.
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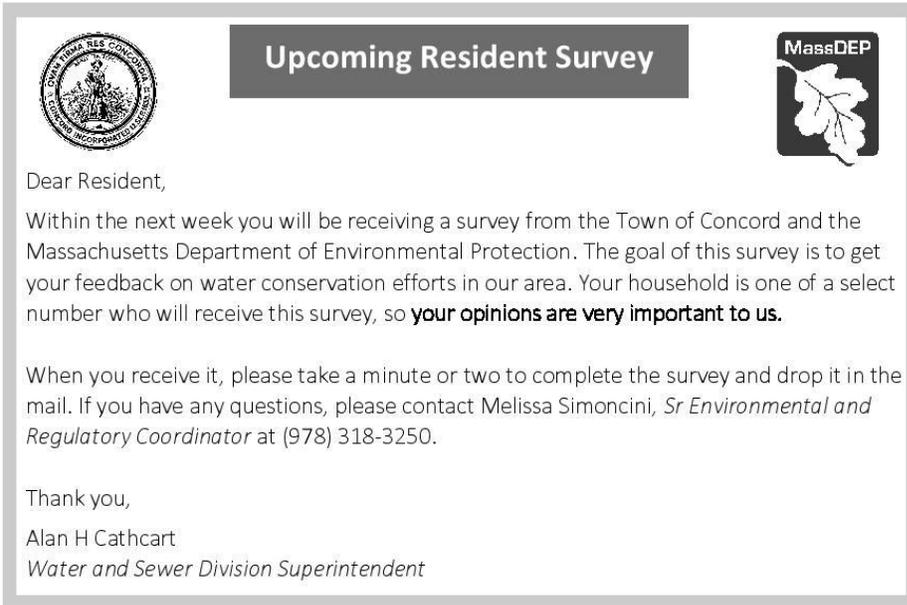
Please visit this website for more information:

www.epa.gov/watersense/outdoors

Appendix B: Survey

Each water system received a customized survey, with nearly identical language and identical questions. Concord's survey is shown below.

Pre-notification Postcard



Upcoming Resident Survey

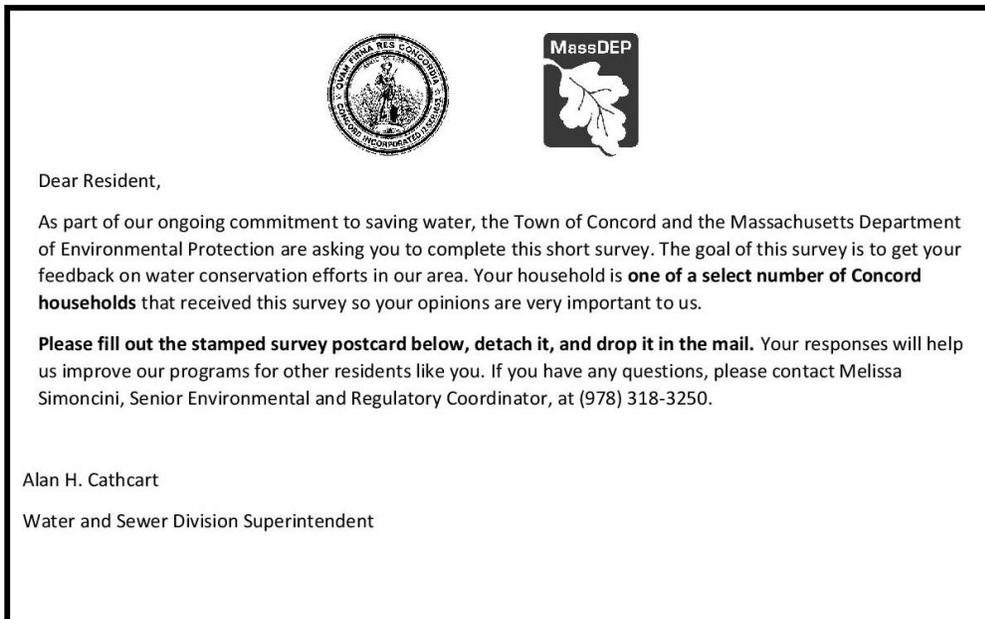
Dear Resident,

Within the next week you will be receiving a survey from the Town of Concord and the Massachusetts Department of Environmental Protection. The goal of this survey is to get your feedback on water conservation efforts in our area. Your household is one of a select number who will receive this survey, so **your opinions are very important to us.**

When you receive it, please take a minute or two to complete the survey and drop it in the mail. If you have any questions, please contact Melissa Simoncini, *Sr Environmental and Regulatory Coordinator* at (978) 318-3250.

Thank you,
Alan H Cathcart
Water and Sewer Division Superintendent

Cover Letter



Dear Resident,

As part of our ongoing commitment to saving water, the Town of Concord and the Massachusetts Department of Environmental Protection are asking you to complete this short survey. The goal of this survey is to get your feedback on water conservation efforts in our area. Your household is **one of a select number of Concord households** that received this survey so your opinions are very important to us.

Please fill out the stamped survey postcard below, detach it, and drop it in the mail. Your responses will help us improve our programs for other residents like you. If you have any questions, please contact Melissa Simoncini, Senior Environmental and Regulatory Coordinator, at (978) 318-3250.

Alan H. Cathcart
Water and Sewer Division Superintendent

Survey

Healthy Lawn, Happy Summer Survey

1. Using the scale, how important is it for your household to...												
	Not at all					Extremely						
a. save water?	0	1	2	3	4	5	6	7	8	9	10	
b. save money?	0	1	2	3	4	5	6	7	8	9	10	
c. protect the environment?	0	1	2	3	4	5	6	7	8	9	10	
d. keep your grass green all summer?	N/A	0	1	2	3	4	5	6	7	8	9	10
2. During this summer, how often did your household water your grass?												
<input type="checkbox"/> Every day			<input type="checkbox"/> Every other week			<input type="checkbox"/> Never						
<input type="checkbox"/> A few days/week			<input type="checkbox"/> Once/month			<input type="checkbox"/> N/A (No grass)						
<input type="checkbox"/> Once/week			<input type="checkbox"/> Once or twice/summer									
3. Did you receive mailed materials about the <i>Healthy Lawn, Happy Summer</i> Campaign this summer?												
<input type="checkbox"/> Yes → CONTINUE												
<input type="checkbox"/> No → SKIP TO #6												
4. Using the scale, how much did the program materials help you to...												
	Not at all					Extremely						
a. keep your lawn healthy?	0	1	2	3	4	5	6	7	8	9	10	
b. reduce your lawn watering?	0	1	2	3	4	5	6	7	8	9	10	
c. be aware of your water use?	0	1	2	3	4	5	6	7	8	9	10	
5. Using the scale, were the program materials...												
	Not at all					Extremely						
a. easy to understand?	0	1	2	3	4	5	6	7	8	9	10	
b. appealing to you?	0	1	2	3	4	5	6	7	8	9	10	
6. Please let us know if you have comments about summer water use:												

Reminder Postcard



Have you completed your survey?



Dear Resident,

You recently received a survey that is being conducted on behalf of the Town of West Springfield and the Massachusetts Department of Environmental Protection. If you have already completed and returned the survey, thank you. If you have not completed the survey, please take the time to do so today. Your confidential responses are extremely valuable to the success of this project.

If you have any questions, please call Jeff Auer at 413-263-3230 or email jauer@townofwestspringfield.org.

Thank you,

Robert J. Colson
Director, Department of Public Works

Appendix C: Topline Results for Full Survey Sample

Control - Treatment

1.	Using the scale, how important is it for your household to...	Not at all										Extremely				
a.	save water?	0	1	2	3	4	5	6	7	8	9	10	8.03	8.05		
b.	save money?	0	1	2	3	4	5	6	7	8	9	10	8.33	8.49		
c.	protect the environment?	0	1	2	3	4	5	6	7	8	9	10	8.82	8.78		
d.	keep your grass green all summer?	N/A	0	1	2	3	4	5	6	7	8	9	10	5.56	5.16	
2.	During this summer, how often did your household water your grass?															
	<input type="checkbox"/> Every day	2.6%	1.2%	<input type="checkbox"/> Every other week	7.5%	5.6%	<input type="checkbox"/> Never	28.6%	35.4%							
	<input type="checkbox"/> A few days/week	32.0%	21.2%	<input type="checkbox"/> Once/month	2.6%	6.9%	<input type="checkbox"/> N/A (No grass)	0%	.4%							
	<input type="checkbox"/> Once/week	14.3%	14.6%	<input type="checkbox"/> Once or twice/summer	12.4%	15.0%										
3.	Did you receive mailed materials about the Healthy Lawn, Happy Summer Campaign this summer?															
	<input type="checkbox"/> Yes→CONTINUE	60.3%														
	<input type="checkbox"/> No→SKIP TO #6															
4.	Using the scale, how much did the program materials help you to...	Not at all										Extremely				
a.	keep your lawn healthy?	0	1	2	3	4	5	6	7	8	9	10	4.43			
b.	reduce your lawn watering?	0	1	2	3	4	5	6	7	8	9	10	4.56			
c.	be aware of your water use?	0	1	2	3	4	5	6	7	8	9	10	6.37			
5.	Using the scale, were the program materials...	Not at all										Extremely				
a.	easy to understand?	0	1	2	3	4	5	6	7	8	9	10	8.12			
b.	appealing to you?	0	1	2	3	4	5	6	7	8	9	10	6.72			
6.	Please let us know if you have comments about summer water use:															