Healthy Lawn Happy Summer
Scalability and Toolkit Implementation Report
Massachusetts Department of Environmental Protection

action RESEARCH

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Executive Summary

Background

Over the last several years, the Massachusetts Division of Ecological Restoration (DER), the Massachusetts Department of Environmental Protection (DEP), the Massachusetts Department of Conservation and Recreation (DCR), University of Massachusetts Donahue Institute, and Action Research have collaborated to create a program to motivate behavior change to achieve summer water conservation using community-based social marketing (CBSM). The full reports are available online.[1]

Foundational Research

A literature review and a mail survey showed that the primary behavior that was driving the water usage spike in the summer is lawn watering. A second mail survey was conducted about why Massachusetts residents water their lawns and determined the behavior was primarily related to three factors:

1. Misperceptions of how much water is used while lawn watering
2. Misperceptions of how grass can go dormant (e.g., light brown but still alive), rather than die
3. Insufficient motivation to change their watering habits

Program Design

A program was designed that addressed the misperceptions and increased motivation through social norms (e.g., more than half of your neighbors already do not water their lawns in the summer) and normative feedback on the individual household's water use (e.g., graphical comparison of the household's usage compared to their neighbors). The program consists of three elements:

- Program Announcement Postcard
- First Outreach (cover letter, educational flyer, normative feedback) in late May/June
- Second Outreach (cover letter, educational flyer, normative feedback) in August

The cover letter assured the household that the materials were from a legitimate source (the town or water supplier). The educational flyer corrected misperceptions and provided tips on how to water efficiently. The normative feedback report provided historical information about the individual household's water consumption, and a social comparison of their level of consumption to the median household and the average efficient household (lowest 30%) in their town.

Pilot Testing

The program was first piloted in 2017, which had initial success, and was then scaled up and piloted again in 2018. The 2018 pilot had successful water usage reductions in the towns of Concord, Hingham, and West Springfield, with the average pilot household reducing their summer water usage by 14% (39 gallons/day) as compared to control households, and saw average water use reductions of 25% (128 gallons/day) in one of the pilot towns, for those households who increased their water use by the largest amount in the summer.

Implementation and Scalability - 2019

A primary goal of the expanded implementation was to develop and test a scalable and sustainable summer water conservation program. To achieve this goal, DEP contracted with Action Research to develop an easy-to-implement program tool kit, and then to test this tool kit in several towns across Massachusetts. This report summarizes the results from the implementation in six towns: Easton, Concord, Hanover, Hingham, West Springfield, and Westford. Of these towns, three (Concord, Hingham,

[1] https://www.mass.gov/service-details/water-conservation-pilot

West Springfield) had participated in the 2018 pilot, and they again implemented the program in the summer of 2019. The remaining three towns (Easton, Westford, Hanover) were new to implement the program. The program materials are available in Appendix A.

Toolkit

The toolkit was designed for towns to implement the program with minimal or no external assistance. The toolkit included a manual that provided the steps to complete each program activity, with images where possible and relevant. Templates were provided for the educational flyer and the program announcement postcard to allow for customization with the location name and a local contact. In addition, templates and software were provided to facilitate data processing, selection of high summer water consumption households, and to generate the individual feedback graphs. A copy of the manual is available on https://www.mass.gov/service-details/water-conservation-research-and-pilot-projects, which includes screenshots of the additional pieces.

Methodology

In the three towns that had participated in the previous pilot (Concord, Hingham represented by Aquarion, and West Springfield), 200 of the treatment households and 200 of the control[2] households were used again in 2019. The 2018 pilot was originally conducted with 300 treatment and 300 control households, but the lowest users, rated by their winter to summer usage, were removed from the pilot due to no significant change in usage. The 200 remaining treatment households were the households that had a significant reduction of usage in the original pilot, as the program had the most success with the highest users.

In the three towns that were new to the program in 2019 (Westford, Easton, Hanover), 300 treatment and 300 control households were randomly selected from the top 30% of households, based on their increase in usage from winter to summer in 2018. The selection criteria were determined based on the results from the 2018 pilot, where the most significant results were with households that increased their usage in the summer by the largest amount.

In total, there were 2,580 households included in the study. No data was provided by the town of Concord due to a change in their billing system, so this town was excluded from all subsequent analyses. The total sample size of 2,580 households was divided across the five towns: Easton (N=597), Hanover (N=599), Hingham (N=390), West Springfield (N=394), and Westford (N=600). The average quarterly consumption per household across all towns was 23,069 gallons (SD=11,064), which translates to ~256 gallons per household per day.

Results

Overall, the results from the 2019 pilot support that the *Healthy Lawn, Happy Summer* program is successful at reducing residential water consumption in the summer, with an overall water savings of 38 gallons per day (10%) across five towns. In 2018, the savings were 39 gallons per day (14%) between the treatment and control, demonstrating consistent savings year to year with program implementation

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[2] The randomly selected control group received no materials and is critical for a true evaluation, as the households in that control group should be experiencing the same external environment (e.g., weather) and by random selection, should be the same as the treatment households in most other ways. Therefore, if the treatment group uses less water than the control group, the program is effective.

(see section *Evaluation Question 1*). The results are summarized in the following sections, and in Table 1. For more detail, please see the full report.

New Vs. Original Results

After the overall results, the analysis looked specifically at the savings by those towns who had originally implemented in 2018 and those towns who implemented in 2019. The results showed that the water savings were similar for these two groups, with both showing statistically significant savings. The original implementation had a slightly higher savings rate (12%) as compared to the new implementation (9%), which was shown to be a statistically significant difference ($p<.05$), suggesting there may be an increased effect with subsequent implementations. See section *Evaluation Question 2* for more information.

Total Summer Usage Quartile Results

This analysis looked at the new towns' households' total summer usage as compared to their baseline summer (2018) usage, comparing the low, medium-low, medium-high, and high quartiles[3] of users. These results demonstrated that the greatest savings were realized in the top half (medium-high and high) of the participating households, based on their total use. See section *Evaluation Question 3* for more information.

Winter to Summer Increase Quartile Results

This analysis looked at all towns' households' summer usage increase compared to winter, as compared to their baseline (2018) winter to summer increase usage, comparing the low, medium-low, medium-high, and high quartiles of users. These results also demonstrated that the greatest savings were realized in the top half (medium-high and high) of the participating households, based on their increase in summer as compared to winter. See section *Evaluation Question 4* for more information.

By Town Results

Finally, analysis was conducted by town. The largest savings were seen in West Springfield (18%) and Westford (15%), followed by Easton (10%). Hingham, represented by Aquarion, did not see statistically significant savings, but the results trended toward savings (6%).

Hanover did not see any change between the treatment and control, which may be attributed to their low consumption on the whole, given that, as shown in *Evaluation Question 3, 4,* and in the 2018 pilot, the highest water consumers show the most significant results from the implementation of *Healthy Lawn, Happy Summer*. See section *Evaluation Question 5* for more information.

[3] A quartile is defined as each of four equal groups into which a population can be divided according to the distribution of values of a particular variable – meaning, within the treatment and control households, dividing into four equally sized groups based on either their total summer usage, or their increase from winter to summer.

Table 1: Summary of 2019 Program Results

Evaluation Question	Comparison	Average Savings per Household	Estimated Gal Saved per Summer* per Household
1	Overall Treatment vs. Control	38 gal/day (10% savings)**	3,420 gallons
2	Towns that Implemented in 2018 Treatment vs. Control	42 gal/day (12% savings)**	3,780 gallons
2	Towns that Did not Implement in 2018 Treatment vs. Control	36 gal/day (9% savings)**	3,240 gallons
3	Towns that Did Not Implement in 2018, By Quartile of Total Summer Usage	**Medium-High Usage Quartile ***** 43 gal/day**	**Medium-High Usage Quartile ***** 3,890 gallons
		High Usage Quartile*** 54 gal/day**	**High Usage Quartile***** 4,836 gallons
4	All Towns, By Quartile of Winter to Summer Increase	**Medium-High Increase in Usage Quartile ***** 34 gal/day**	**Medium-High Increase in Usage Quartile ***** 3,030 gallons
		High Increase in Usage Quartile*** 47 gal/day**	**High Increase in Usage Quartile***** 4,197 gallons
5	By Water System Treatment vs. Control – Towns that Did not Implement in 2018	**Easton** 53 gal/day (10% savings)**	4,770 gallons
		Hanover 0 gal/day (0% savings)	-
		Westford 59 gal/day (15% savings)**	5,310 gallons
5	By Water System Treatment vs. Control – Towns that Did Implement in 2018	**Hingham (Aquarion)** 18 gal/day (6% savings)	1,620 gallons
		West Springfield 66 gal/day (18% savings)**	5,940 gallons

*"Summer" was considered 3 months (90 days). Based on the results, more persistent savings are likely expected.

**Statistical significance at p<.05

***The quartiles represent the low, medium-low, medium-high, and high users within the selected households

2018 Pilot Results

Below is a table that summarizes the results of the 2018 pilot for comparison. Overall, the results reflect the savings from 2019, with small, expected variations. Similar patterns are observed, such as the highest users demonstrating the most savings, and differences in savings in different water systems, suggesting that individual locations will likely see differing results. Overall, however, these results demonstrate that the program has continued to motivate significant water savings.

Table 2: Summative 2018 Pilot 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). Based on the results, more persistent savings are likely expected.
**Statistical significance at $p<.05$

Feedback on the Toolkit

Hanover, Westford, and Hingham (Aquarion) implemented *Healthy Lawn, Happy Summer* in 2019 using the manual and templates developed by Action Research. Concord, Easton, and West Springfield's programs were created and mailed by Action Research. For all six towns, Action Research handled the data processing and generation of the feedback sheets, as the pilot was being run using experimental design (control group and treatment group) and required specific selection of households and more data analysis than would be required by a non-experimental implementation. However, several town staff and Advisory Council members tested the program with a sample dataset and confirmed that they were able to run it. The feedback from all toolkit pieces has been positive and suggests that the primary concern for implementation are two-fold: (1) obtaining, cleaning, and formatting water data from the previous year; and (2) time to get materials together, given other responsibilities by supplier staff.

Data Processing Concerns

To address the first concern, a template and detailed instructions are provided for the data process in the toolkit, but ultimately cannot address all the specific challenges that one may encounter with the variety of databases and data collection systems.

Implementation Time Concerns

To address the second concern, the toolkit timeline was moved up to suggest staff prepare the program earlier in the year, as soon as they are sure they want to implement, when suppliers reported that they have more time than the spring and early summer. In addition, the manual was written with the intention of being clear enough that someone not familiar with water data, such as a student or intern, could help with implementation. Finally, a supplier could contract with an external printer to do the printing, assembly, and mailing, or a consultant such as Action Research to run the full program.

Recommendations

Based on the successful implementation of this program, we recommend that towns in Massachusetts that have concerns with their residential summer water consumption and have a significant amount of lawn irrigation implement the program. While there have been some negative responses from residents to the feedback sheets, suppliers reported that most of these interactions opened up conversations with these residents to figure out why they were selected for the outreach and assist them in reducing their consumption. Towns reported that they felt that these conversations would not have happened without the prompting of the outreach. Based on the results by quartiles, we also recommend that the program be adjusted from selecting the top 30% of households to the top 15%, and that towns with resource restrictions may want to be even more limited (top 5%-7%).

Other Considerations for Future Implementation

Below are considerations that may change future implementations of the program.

- **Higher than Average Rainfall for Pilot Years:** The summer of 2019 received a higher than average amount of rain, with an average of 4.15 inches[4] per month between June through September. This average of 4.15 inches is relatively similar to the summer of 2018, which had 4.32 inches[5] per month between June through September. Given the higher rainfall both years, we would expect to see reduced lawn watering for all households. In a drier year, there may be even greater savings with the program, though the cover letters may need to be modified to address drought-specific concerns.
- **Implementation by Consultant in Pilot Years:** In 2018, the program was completely run by Action Research. In 2019, Action Research ran the full program for three towns, and ran the data processing and feedback sheet generation for all suppliers. Future implementation without a consultant may run into unforeseen challenges. We do not anticipate these challenges being significant, but still may occur, such as implementation on a different timeline. As these problems are addressed, they can be added to the FAQ section of the manual.
- **Alteration of Materials**: As part of the process of creating the toolkit, the program materials are now editable in multiple areas. The program was designed using foundational research and put together using best research and communication practices. The pieces were not tested separately, nor were other versions of the materials tested. If the program materials are altered significantly from their current form, it may lead to different results.

[4] https://usclimatedata.com/ for Boston, MA
[5] Ibid.

1: Background and Purpose

In the state of Massachusetts, residential water use increases significantly in the summer, threatening sustainable water supplies and creating natural resource concerns. Organizations and individuals across the state have sought to find the cause of this issue and motivate behavior changes to fix it.

Foundational Research

Over the last several years, the Massachusetts Division of Ecological Restoration (DER), the Massachusetts Department of Environmental Protection (DEP), the Massachusetts Department of Conservation and Recreation (DCR), University of Massachusetts Donahue Institute, and Action Research have worked to address a primary driver of the spike in summer water usage and create a program to motivate voluntary behavior change to achieve summer water conservation. The program development utilized the community-based social marketing (CBSM) process. The full reports are available online.[6] One of the key elements of CBSM is that decisions about behavior selection and program design are driven by data, rather than assumptions. Therefore, the initial phases of this work sought to make data driven decisions on what behaviors are most important to target and how a program can best address motivating action.

Behavior Selection Research

To understand which behavior(s) were key to target to create significant reductions in summer water usage, we conducted a literature review and a resident survey. When selecting priority actions through the CBSM process, we consider four factors: impact, penetration, probability, and applicability. Through this research, we found that about half of residents in the towns already do not water or water minimally during the summer, suggesting there is already a good amount of the audience engaged in the priority action (current penetration), and potentially suggesting other water conservation behaviors could be a higher priority to target. However, the literature review showed that the amount of water used when watering regularly is much larger than other potential behaviors (impact). In addition, the survey research showed residents' have more reported willingness to act as compared to other outdoor water saving activities (probability). Finally, the survey research demonstrated that the number of lawns in Massachusetts was significant (applicability). When considering all of these factors reducing or stopping lawn watering was the clear priority target behavior.

Barrier and Benefit Research

A second survey was conducted to understand why Massachusetts residents continue to water their lawns in the summer and determined the behavior was related to a few primary factors. First, respondents underestimated how much water is used when they take this action, and therefore did not understand the impact watering was having on water resources. Second, respondents did not understand that grass can go dormant (e.g., light brown but still alive), rather than die, when watering is restricted, which can actually promote a healthier lawn. Finally, their motivation to change their watering habits was not high enough to spur action.

Program Design

Given these findings, a program was designed that addressed the misperceptions and increased motivation through social norms (e.g., more than half of your neighbors already do not water their lawns in the summer) and normative feedback on the individual household's water use (e.g., graphical

[6] https://www.mass.gov/service-details/water-conservation-pilot

comparison of the household's usage compared to their neighbors). Due to the focus on outdoor summer irrigation, households were selected for inclusion in the program based on the increase in water consumption between winter and summer. Based on seasonal conditions within the targeted region, winter water consumption represents a baseline for indoor usage, and the increase during summer represents the added usage largely associated with outdoor irrigation. The program targeted households that significantly increase their usage between winter and summer, which was used as a proxy for lawn watering.

The program consists of three elements:

- Program Announcement Postcard
- First Outreach (cover letter, educational flyer, normative feedback)
- Second Outreach (cover letter, educational flyer, normative feedback)

Households first received the program announcement postcard, which alerted them to the upcoming envelopes and encouraged opening rates of outreach envelopes. Then, at two time points during the summer (June and August), participating households were sent a cover letter, an educational flyer, and a normative feedback report. The cover letter explained the program and assured the household that the materials were from a legitimate source (the town or water supplier) and not a scam. The educational flyer corrected misperceptions about lawn watering and provided tips on how to water efficiently. The normative feedback report provided historical information about the individual household's water consumption, and a social comparison of their level of consumption to the median household and the average efficient household (lowest 30%) in their town. The reports were based on data from the year prior.

Pilot Testing – 2017 and 2018

The program was first piloted in 2017, where it included an in-person element which had challenges with implementation and scalability and was removed from the 2018 pilot. The 2018 pilot included two mailings that included a cover letter to establish message credibility, a flyer that corrected misperceptions and gave tips on how to water efficiently if one chooses to water, and a normative feedback sheet that compared the household's water use in the previous summer to their neighbors. The pilot saw successful water usage reductions in the towns of Concord, Hingham, and West Springfield, with the average pilot household reducing their summer water usage by 14% (39 gallons/day) as compared to control households, and saw average water use reductions of 25% (128 gallons/day)in one of the pilot towns, for those households who increased their water use by the largest amount in the summer.

Implementation and Scalability - 2019

In 2019, the team sought to expand on the successful 2018 pilot program. A primary goal of the expanded implementation was to develop and test a scalable and sustainable summer water conservation program, building on the success of the previous pilots. To achieve this goal, DEP contracted with Action Research to develop an easy-to-implement program tool kit, and then to test this tool kit in several towns across Massachusetts. This report summarizes the results from the implementation in six towns: Easton, Concord, Hanover, Hingham, West Springfield, and Westford. Of these towns, three (Concord, Hingham, West Springfield) had participated in the 2018 pilot, and they again implemented the program in the summer of 2019. The remaining three towns (Easton, Westford, Hanover) were new to implement the program. The program materials are available in Appendix A.

Toolkit

The toolkit was designed for towns to implement the program with minimal or no external assistance, depending on their resources. The toolkit included instructions for completing each program activity, as well as listing the skills, training, and software necessary to complete the activity. During 2019, the toolkit was either used or reviewed for feedback by all six suppliers, as well as DEP, DER, and the AC, and the feedback from all groups has been incorporated throughout. The toolkit includes a frequently asked questions (FAQs) section based on feedback from all pilot suppliers, a summary of the results of the foundational research and the 2018 pilot, and background on the social science research that is employed throughout the toolkit.

The toolkit included a manual that provided the steps to complete each program activity, with images where possible and relevant. Templates were provided for the educational flyer and the program announcement postcard to allow for customization with the location name and a local contact. In addition, templates and software were provided to facilitate data processing, selection of high summer water consumption households, and to generate the individual feedback graphs. A copy of the manual is available in https://www.mass.gov/service-details/water-conservation-research-and-pilot-projects, which includes screenshots of the additional pieces.

2: Methodology

The selections below summarize the sample selection, data quality, and average consumption for the participating towns.

Sample Selection

In the three towns that had participated in the previous pilot (Concord, Hingham represented by Aquarion, and West Springfield), 200 of the previous randomly selected treatment households and 200 of the previous randomly selected control households were used again in 2019. Originally, based on the water usage increase from winter to summer, all households in each town 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. 600 households (300 treatment and 300 control) were selected for each town, 200 from each of the *medium-low, medium-high,* and *high* quartiles. However, the results showed that those with the *medium-low* quartile did not have a significant reduction in summer water use as an effect of the program and were removed from the 2019 pilot, leaving 200 treatment and 200 control households in each town that had implemented the program in 2018.

In the three towns that were new to the program in 2019 (Westford, Easton, Hanover), 300 treatment and 300 control households were randomly selected from the top 30% of households, based on their increase in usage from winter to summer in 2018. The selection criteria were determined based on the results from the 2018 pilot, where the most significant decreases in summer water use were seen in the households that increased their usage in the summer by the largest amount.

Data Quality

The majority of towns collected their water consumption data quarterly, with the exception of Concord, which collected every two months. The specific months that constituted a quarter varied between towns and used both centrum cubic feet (CCF) and gallons. For consistency of analysis, for each account, the consumption data were converted into gallons, divided across the billing period, and then aggregated into the quarterly consumption months that are listed in the table below. Water consumption was available from October 2017 through September 2019, for a total of 8 quarterly consumption points. For analytic purposes, these eight timepoints were labeled time1 – time8 (see Table 3).

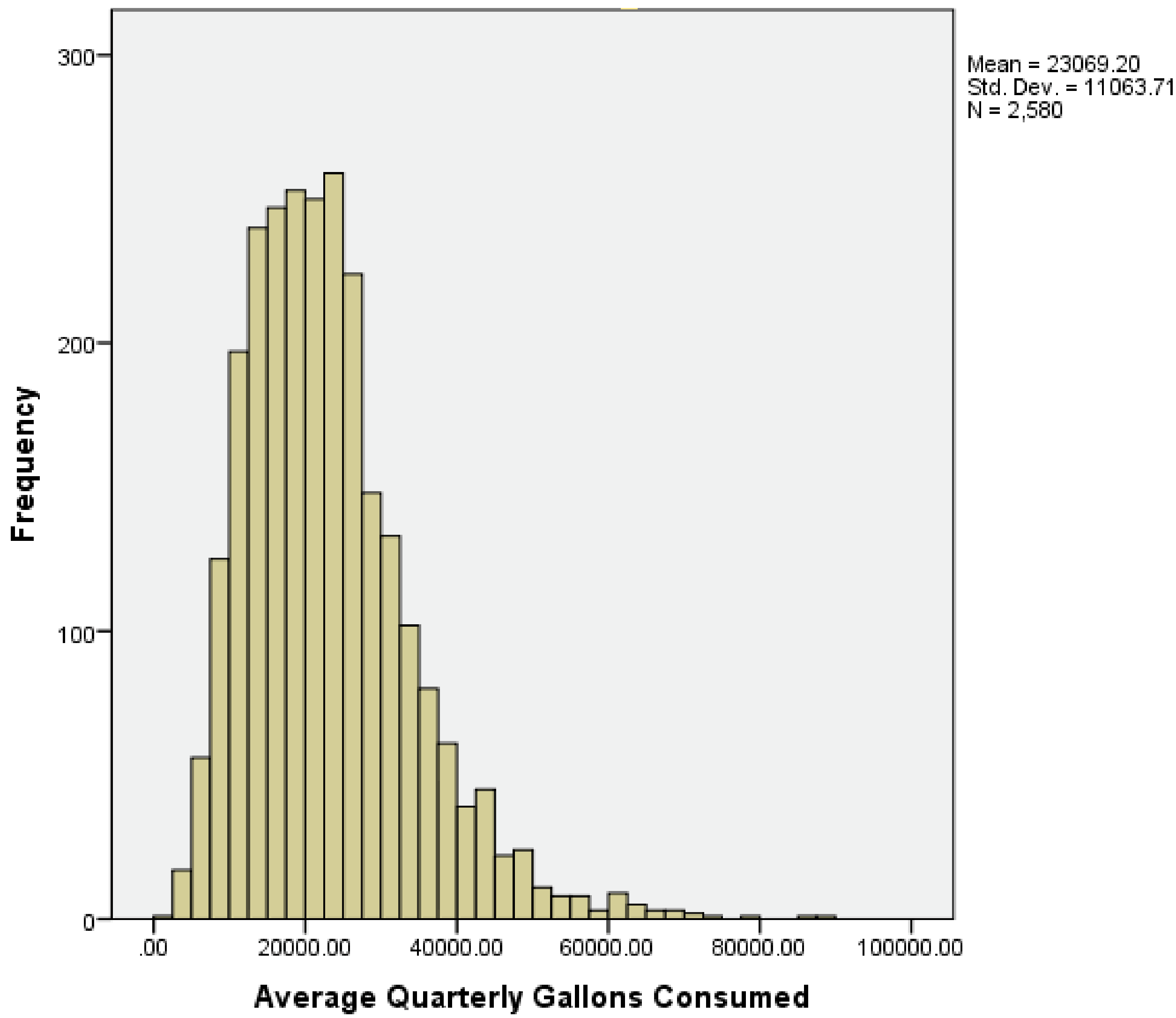
Table 3: Timepoint Labels

Label	Months
Time 1 (Q4_2017)	October – December, 2017
Time 2 (Q1_2018)	January – March, 2018
Time 3 (Q2_2018)	April – June, 2018
Time 4 (Q3_2018)	July – September, 2018
Time 5 (Q4_2018)	October – December, 2018
Time 6 (Q1_2019)	January – March, 2019
Time 7 (Q2_2019)	April – June, 2019
Time 8 (Q3_2019)	July – September, 2019

In total, there were 2,580 households included in the study. No data was provided by the town of Concord due to a change in their billing system, so this town was excluded from all subsequent analyses. The total sample size of 2,580 households was divided across the five towns: Easton (N=597), Hanover (N=599), Hingham (N=390), West Springfield (N=394), and Westford (N=600). The shapes of the distributions of water consumption per quarter were positively skewed, with most data falling towards the lower side of the scale and a few high outlier data points. To reduce the impact of outlier water consumption data on the results, the maximum water consumption value was capped at 100,000 gallons per quarter. Across the total of 20,640 data points, there were 201 instances of quarterly consumption that exceeded the 100,000 maximum, spread across 74 accounts. In addition, there were 23 instances of zero consumption. For analytic purposes, values greater than 100,000 were changed to 100,000 and instances of zero use were retained in the dataset.

The average quarterly consumption per household across all towns was 23,069 gallons (SD=11,064), which translates to ~256 gallons per household per day. A histogram of the average quarterly gallons consumed is shown in Figure 1.

Figure 1: Average Quarterly Gallons Consumed



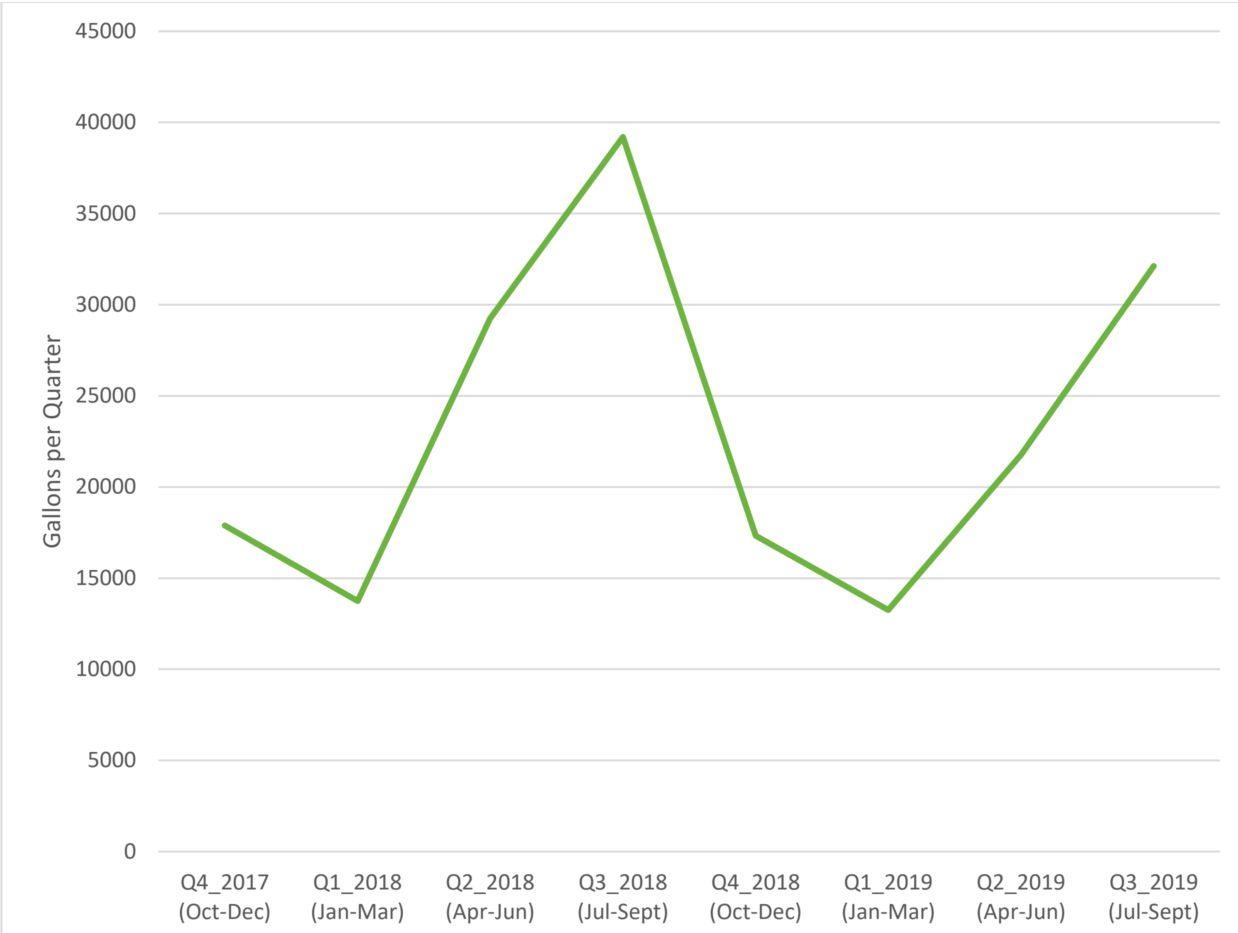
3: Results

The data were analyzed first for consumption patterns, then as a whole set (excluding Concord), then broken into specific research questions about the programs impact on the highest water consumers, those who were included in the 2018 pilot, and by town.

Seasonal Patterns of Water Use

Across the eight quarterly periods, water consumption was lowest in the winter and fall (Q4 and Q1), increasing in the spring (Q2), and peaking during the summer (Q3). Figure 2 illustrates this pattern across the five towns.

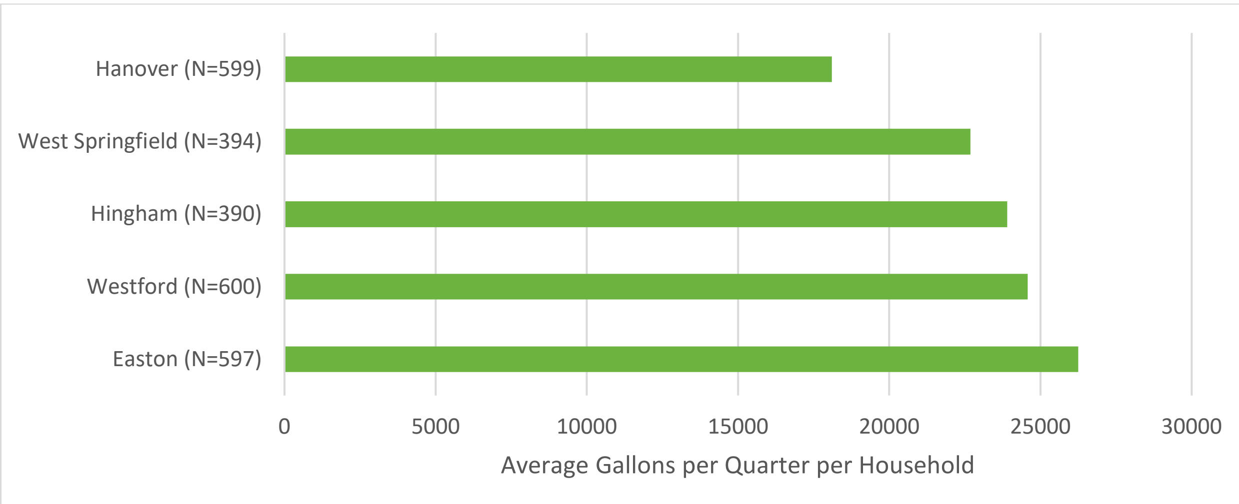
Figure 2: Quarterly Water Consumption Over Time Per Household



Water Consumption by Town

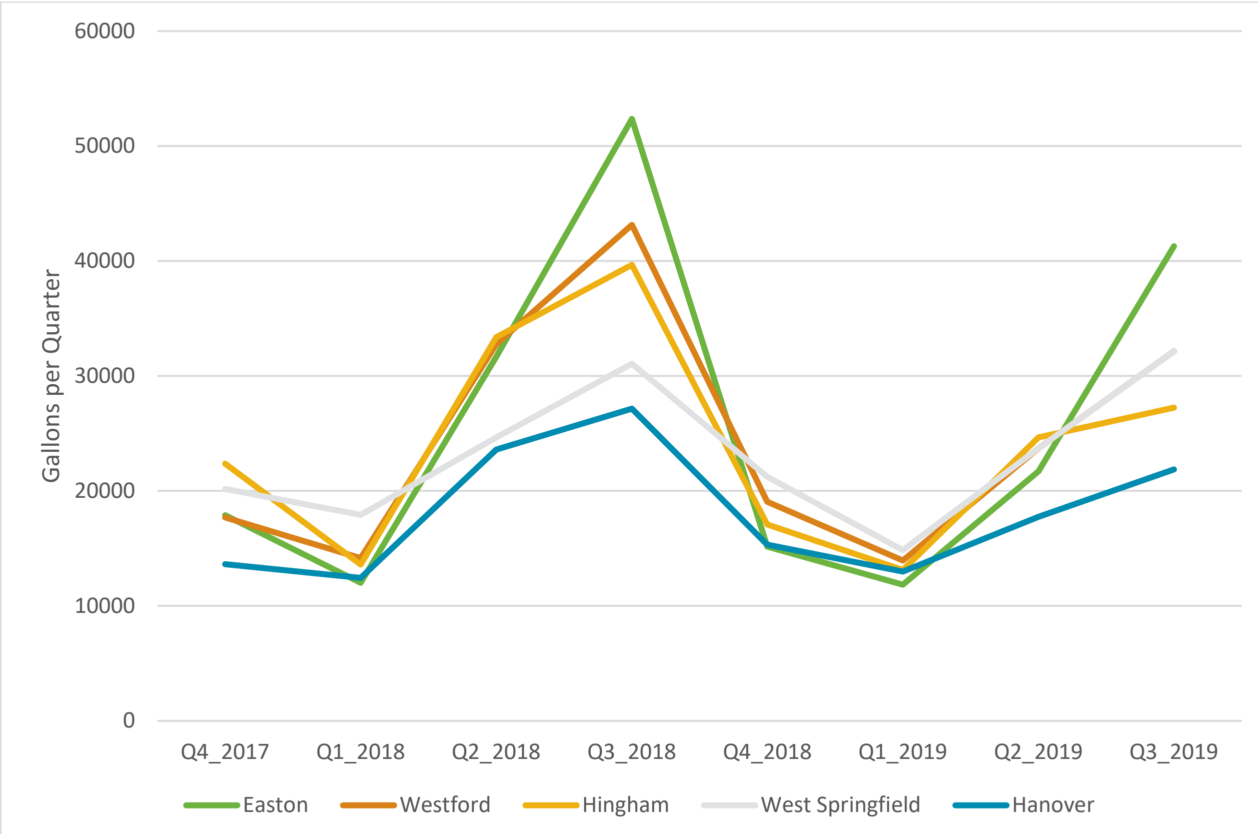
Complete and usable water consumption data was obtained for 2,580 households across five towns: Easton, Hanover, Hingham, West Springfield, and Westford. Water consumption was highest for Easton (average quarterly consumption of 26,244 gallons), followed by Westford (average consumption of 24,580), Hingham (23,895), West Springfield (22,682), and then Hanover (18,100). These analyses are based on average gallons consumed per account, per quarter.

Figure 3: Quarterly Water Consumption By Town



Each of the five towns showed similar seasonal patterns of consumption, with usage rising in the Spring, peaking in Summer, then dropping through the fall and Winter (Figure 4).

Figure 4: Water Consumption Over Time By Town



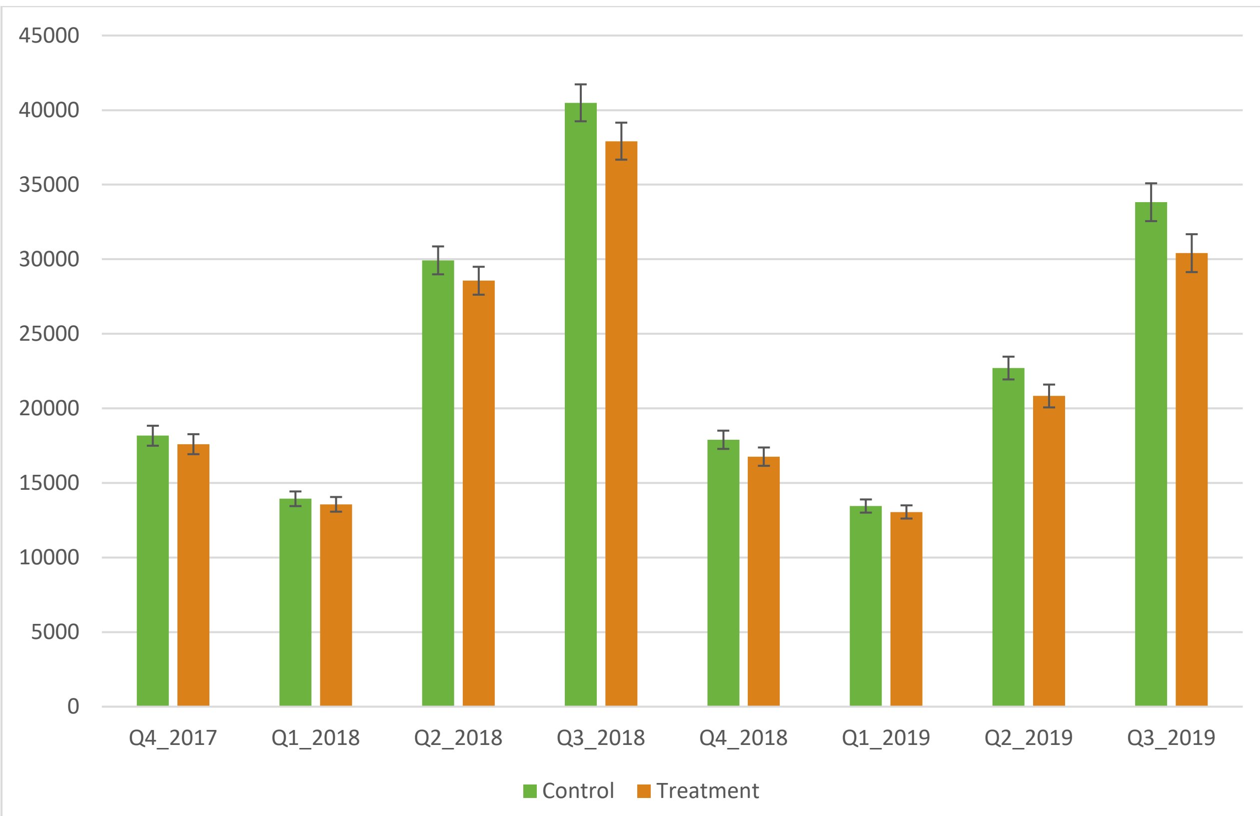
Evaluation question #1: Did water use in the treatment group differ from the control group for the implementation summer and over time?

To test the first evaluation question, a repeated measures ANOVA was conducted comparing water consumption over time for the treatment and control groups. Households in each of the five towns were randomly assigned to either treatment (N=1288: Easton 300, Hanover 299, Hingham 193, West Springfield 196, Westford 300) or control (N=1292: Easton 297, Hanover 300, Hingham 197, West Springfield 198, Westford 300). Treatment households received program materials in June and again in August. The control households received no materials and had no contact with the program.

This first analysis looks at all towns that provided data together, regardless of their previous participation in the program or not. Further analysis was conducted to differentiate the effects between the towns that were participating for the first time and towns that were participating for the second time in *Evaluation Questions 2* and *3*. Results showed a statistically significant interaction between time and treatment ($F(7,18046)=5.93$, $p<.001$), demonstrating that the program has a significant effect on water use. As shown in Figure 5, water consumption was relatively similar for households in the treatment and control in the months preceding the treatment. For interpretation, time represents the eight available quarters of data, from time=1 (Q4-2017), through time=8 (Q3-2019). Differences between the groups prior to Q3_2019 are discussed in greater depth in the section on *Evaluation Question 3, Evaluation Question 4,* and *Evaluation Question 5,* as the full group includes towns that received the program in the summer of 2018 and had persistent reductions in usage by the treatment group.

The treatment was conducted during the early (June) and mid-summer (August) of 2019 (Q2_2019 and Q3_2019). The comparison showed that in the quarter following the treatments (Q3_2019), households in the treatment group consumed significantly less water (average = 30,408) compared to households in the control (average = 33,824). In daily units, this is approximately 338 gallons per day during the summer, compared to 376 gallons per day for households in the control. This reduction is equal to 38 gallons per day and reflects an overall water savings rate of 10% in the summer of 2019.

Figure 5: Comparison of Usage Between Groups Over Time[7]



While the results shown in Figure 5 clearly indicate a statistically significant water savings effect associated with the summer outreach in 2019 (Q3_2019), the results also show water savings results from the summer of 2018 (Q3_2018), which are likely due to the treatment effects for the pilot program

[7] Note: Error bars represent 95% confidence intervals, based on the repeated measures ANOVA. Scores that fall outside of the 95% error bar confidence interval can be interpreted as significantly different. The key finding in the graph above is the differences in water consumption between treatment and control during summer of 2019 (Q3_2019). The graph shows treatment used 30,408 gallons compared to 33,824 for households in the control.

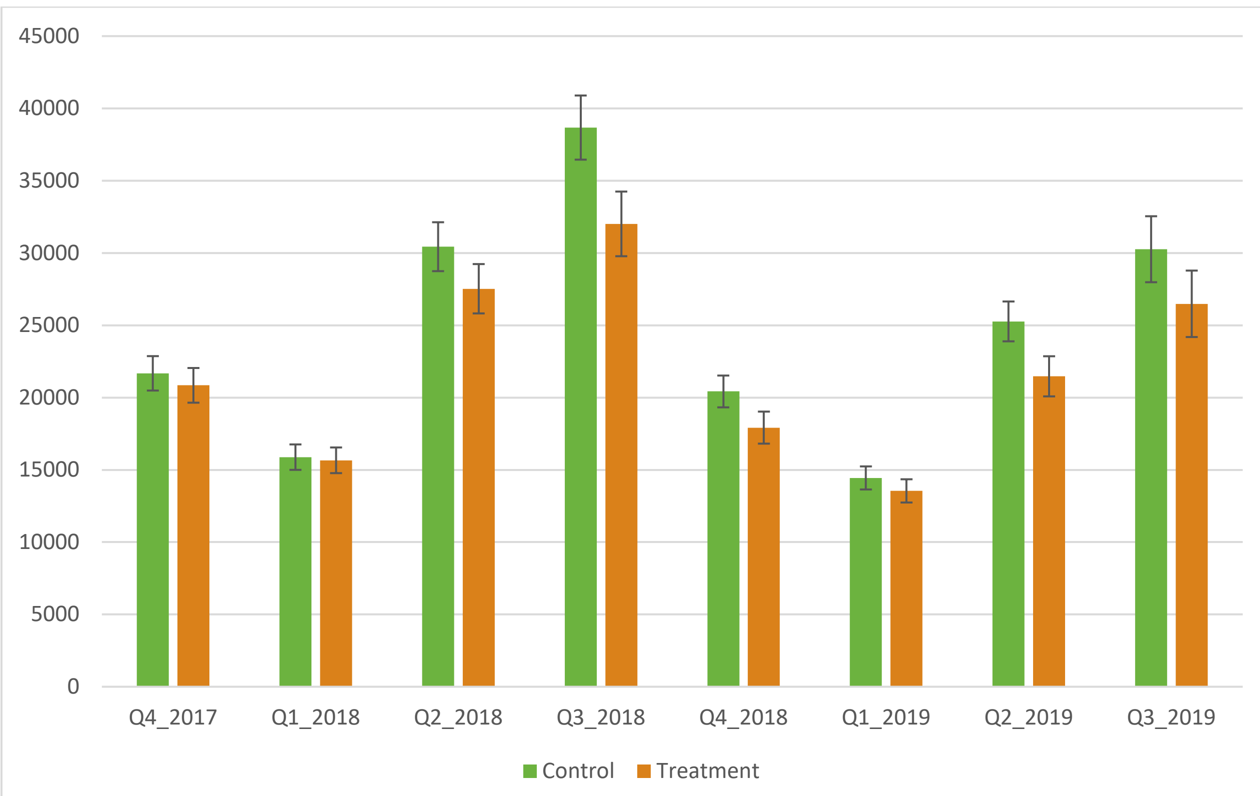
that was conducted in two of the towns during that year. To separate out and evaluate these different patterns, the results from each of the towns are presented separately in the sections below.

Evaluation question #2: Did the treatment have a differing effect for households that were part of the 2018 pilot?

In 2018, three of the towns participated in an initial pilot. The results from the pilot showed that the treatment resulted in reduced levels of water consumption. The overall savings rate in the summer of 2018 (Q3) was 14%, with stronger results for West Springfield (22%) and Hingham (14%) than for Concord (3%). Since these households had already seen similar communications to those developed for the toolkit, these three towns were analyzed separately.

The primary analysis conducted for evaluation question #1 was extended to include a code for each town as having participated in the previous 2018 pilot, or not. The results showed that the 3-way interaction of time, condition, and prior participation was statistically significant (p=.006), suggesting that the effect of the treatment varied by prior participation.

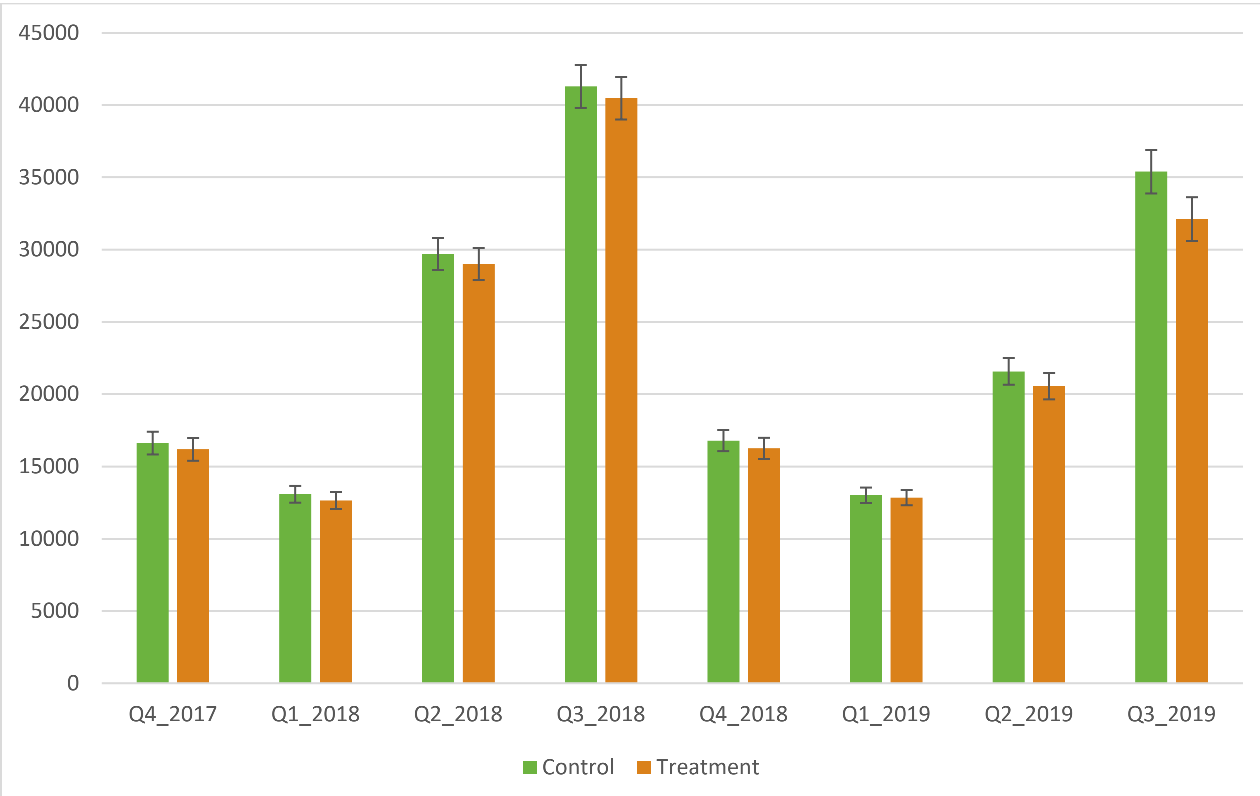
Figure 6: Towns with Prior Participation (2018): Water Savings



For the towns that were part of the previous 2018 pilot (Hingham, West Springfield), the results showed the prior water savings that occurred during Q2 and Q3 of the 2018 pilot. The results also showed continued savings in Q4_2018 and occurring again in Q2 and Q3 of 2019. This suggests that there may be lawn watering that continued into Q4 for the control group that was reduced by the program, and that the program continued to influence water savings in the next year.

In 2019, the water savings associated with the treatment group was 12% for towns that had received the program in 2018 as well as 2019. The quarterly water consumption for treatment households within towns that were part of the previous pilot was 26,486 gallons (294 gallons per day) in Q3_2019, whereas the control consumption was 30,261 gallons (336 gallons per day). This corresponds to a daily household reduction of 42 gallons per day.

Figure 7: Towns without Prior Participation: Water Savings



For the towns that were not part of the 2018 pilot (Easton, Hanover, Westford), the results showed no differences in water consumption during the summer of 2018. This is expected given that the homes did not receive differential communications about water conservation until the launch of the 2019 pilot in Q2 2019. The results also showed a significant water savings effect in Q3 of 2019, corresponding to the conservation communications. The water savings rate associated with the treatment program for households that were not included in the previous pilot was 9% (36 gallons per day). The quarterly water consumption for treatment households within towns that were not part of the previous pilot was 32,105 gallons in Q3_2019, whereas the control consumption was 35,395. This corresponds to a daily household consumption rate of 357 gallons for treatment households and 393 gallons for control households, or 36 gallons per day less.

Evaluation question #3: Did households that consumed more total water show a larger or smaller reduction in water usage after receiving the program?

Additional analysis was also conducted to look at households by their total usage, rather than their summer to winter increase. Households in the three towns that were new to the program (Easton, Hanover, Westford) were divided into quartiles representing historical consumption, meaning they were divided into four equally sized groups based on the water consumption in 2018. By dividing into quartiles, the analysis can look at the differences of households in our sample that consume more (highest quartile) or less water (lowest quartile). For each of the four quartiles of households, a "change" value was calculated by subtracting the Q3_2018 water consumption from the Q3_2019 water consumption. The change value reflects the year-over-year difference in total summer water consumption. Negative change values indicate that less water was used in 2019, and positive change values indicate that more water was used in 2019. It is important to note that this analysis was only performed for towns that did not participate in the 2018 program; communities from 2018 already showed reduced levels of consumption due to previous participation, so direct comparisons of change are less meaningful.

As shown in Figure 8 and Table 4, all four quartiles showed less consumption in 2019 than 2018. However, the difference was especially pronounced for households in the top two quartiles, or those who consume the most water. For households in the bottom two quartiles, the level of change did not significantly differ between treatment and control households. However, for households that were in the top two quartiles of consumption during Q3_2018, those that received the outreach reduced their consumption significantly more than did households that were in the control condition, and saved between 3,890 gallons and 4,836 gallons more (Table 4). This shows that the majority of water savings occurred for households that were the highest consumers in the previous year.

Figure 8: Differences in Quarterly Water Consumption from 2018 to 2019, by 2018 Quartiles[8]

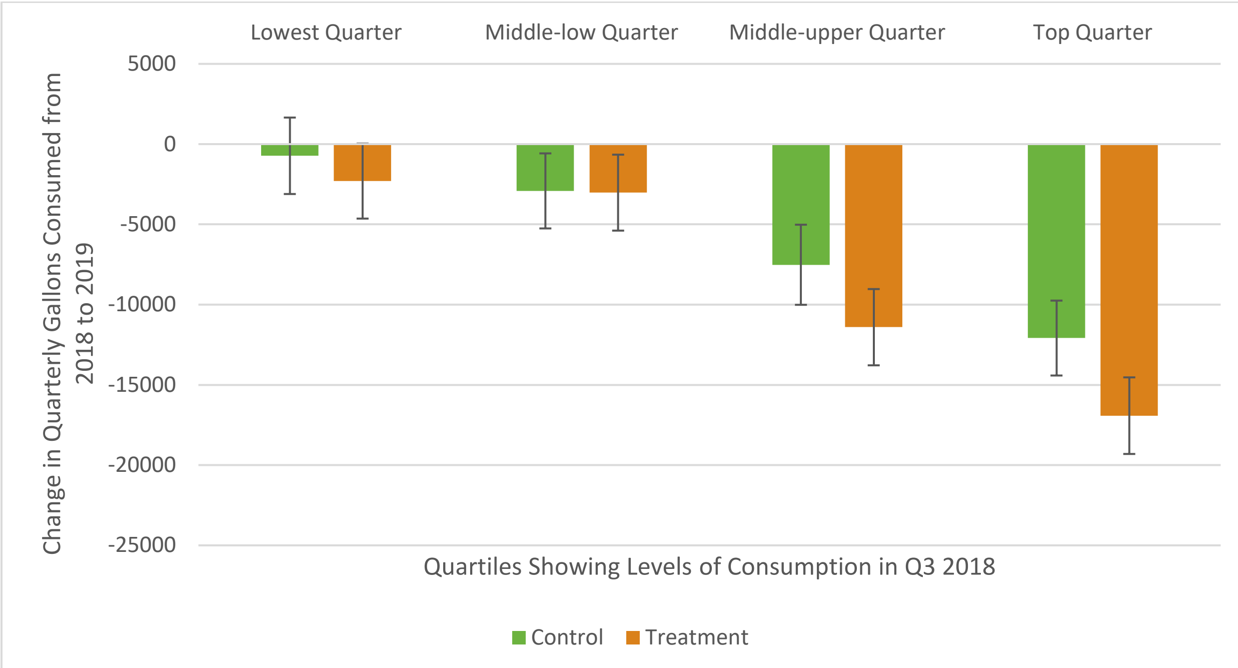


Table 4: Difference in Summer 2019 Quarterly Usage between Control and Treatment

Quartile	Average Difference in Gallons Consumed per Household (Negative values represent less usage by the treatment group)
Lowest Quarter	-1,579 gallons
Middle-low Quarter	-108 gallons
Middle-upper Quarter	-3,890 gallons*
Top Quarter	-4,836 gallons*

* Statistically significant difference at $p<.05$

Finally, the correlation between the change score from winter (Q1_2018) to summer (Q3_2018) and the summer water consumption (Q3_2018) was *r*=.92, which suggests that high summer water use alone is reflective of households that increase their usage from winter to summer. However, the HLHS program is already designed to select by the increase from winter to summer to focus specifically on households that are likely watering, and the inclusion of a full year's data to select audiences increases the ease for the program in accommodating a variety of metering schedules, so we do not recommend a program change based on this finding.

[8] Note: Error bars represent 95% confidence intervals, based on a 2X4 between-subjects ANOVA. Scores that fall outside of the 95% error bar confidence interval can be interpreted as significantly different.

Evaluation question #4: Did households with historically higher summer water usage compared to their winter usage, show a larger or smaller reduction in water usage?

For this analysis, the selected households were classified into quartiles, using the size of their historical increase from winter to summer. On average, households used 25,452 more gallons in the prior summer quarter (Q3_2018) than in the winter quarter (Q1_2018). An examination of the change scores revealed some negative values, which were retained in the analyses. In total, about 5% of the change scores were negative. The average winter (Q1_2018), summer (Q3_2018), and change scores are shown in Table 4.

Table 5: Average Household Usage (gallons) in Previous Year

	Winter	**Summer**	
	Q1_2018	Q3_2018	Change
Easton	12,008	52,363	40,355
Westford	14,162	43,147	28,985
Hingham*	13,617	39,669	26,052
West Springfield*	17,907	31,067	13,160
Hanover	12,441	27,160	14,719
TOTAL	**13,753**	**39,204**	**25,452**

*Implemented HLHS in 2018

There were 126 households in Hingham (N=46) and West Springfield (N=80) that showed a negative change score, indicating that, in 2018, these households used more water during the winter than the summer. Both of these towns were part of the prior year pilot and had been selected because of their increased summer usage in 2017. The same households were used in the 2019 implementation, rather than selecting new households. Both Hingham and West Springfield showed robust water conservation results for the 2018 pilot, which likely explains the observed negative change scores. With this caveat noted, the analyses proceeded to examine the program impact for low, medium-low, medium-high, and high change groups. The negative change households were included as part of the low change group.

The cutoffs for the quartiles for the change scores were:

- Bottom 25%: < 9,000 gallon increase
- Bottom 50%: < 20,916 gallon increase
- Top 50%: <37,923 gallon increase
- Top 75%: >=37,923 gallon increase

The quartile classification was conducted using the overall sample and resulted in 645 households in each quartile group. An inspection across the towns revealed some variability, with Easton and Westford showing the least number of low change values, compared to Hanover, Hingham, and West Springfield. This is likely the consequence of prior program exposure for Hingham and West Springfield. Hanover's results are discussed further in *Evaluation Question 4*, where the data is analyzed by town, but their low total usage and lack of change from the program suggests they may not have a significant population of households watering their lawns.

Table 6: Number of Households in each Winter to Summer Usage Increase by Town

Change Quartiles	Easton	Hanover	Hingham	West Springfield	Westford
Lowest Quarter	0	277	152	216	0
Middle-low Quarter	113	178	59	77	218
Middle-upper Quarter	205	104	63	49	224
Top Quarter	279	40	116	52	158

The "difference" value was calculated by subtracting the summer 2018 water consumption (Q3_2018) from the summer 2019 water consumption (Q3_2019), the same way it was calculated for target audience selection. The change value reflects the year-over-year difference in summer water consumption as compared to winter consumption. Negative difference values indicate that less water was used in 2019, and positive difference values indicate that more water was used in 2019.

Figure 9: Differences in Winter to Summer Water Consumption from 2018 to 2019, by Change Quartiles

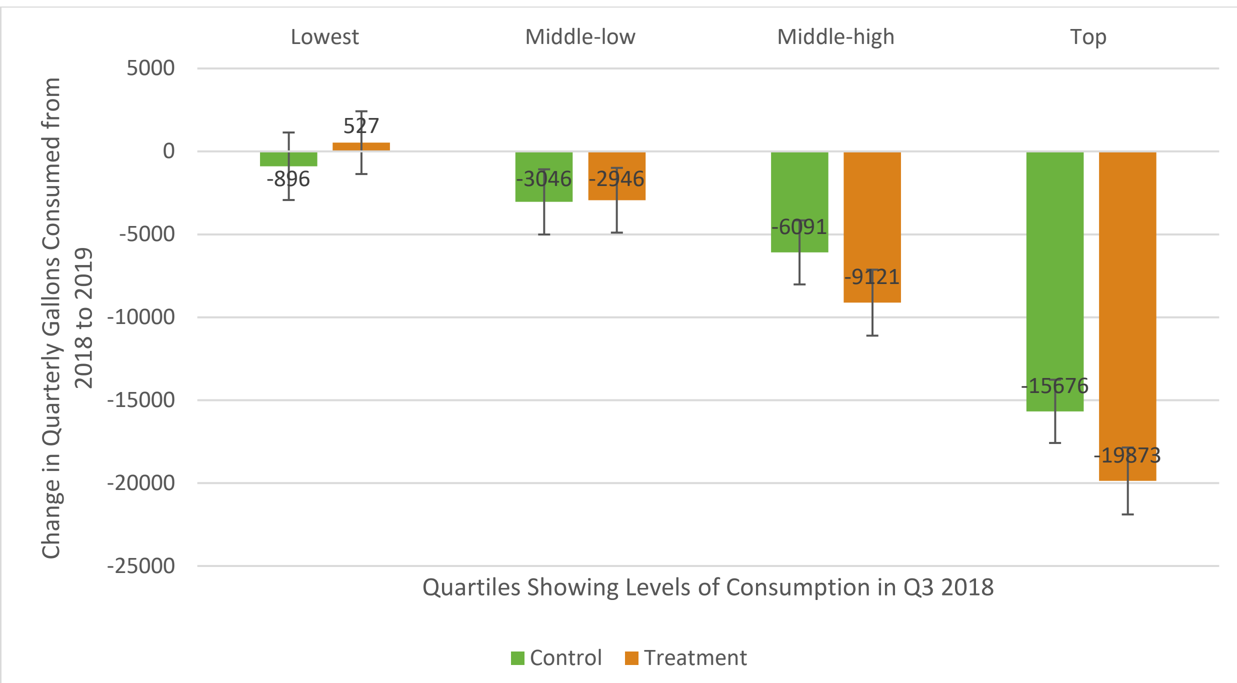


Table 7: Average Difference in Winter to Summer Gallons Consumed per Household

Quartile	Average Difference (Negative values represent less usage by the treatment)
Lowest Quarter	1,423 gallons
Middle-low Quarter	100 gallons
Middle-upper Quarter	-3,030 gallons*
Top Quarter	-4,197 gallons*

* Statistically significant difference at p<.05

The results shown in Figure 8 indicate that the program was most effective for households showing seasonal patterns with more water use in the summer than in the winter. For the first two quartiles, there was no difference between households in the treatment versus households in the control, but for quartiles 3 and 4, the treatment households used significantly less than the control households. The results suggest that targeting the top 15% of households, rather than top 30%, would maximize the efficiency of the outreach.

The same analysis by quartile was conducted within each town. For the new towns, there was a similar pattern of water savings in each, with the primary savings for the top two quartiles. For Hanover, the savings were primarily concentrated in the highest quartile, suggesting that while there were not overall savings, the highest users may still have seen a reduction – however, the sample size is small.

For the towns that had previously implemented, the pattern was less consistent, with some savings in each quartile. However, it's important to point out that these households had previously received the program in the summer of 2018, and as a result, their conservation rates are limited by the prior success of the program. Households that reduced their consumption in 2018, will find it difficult to produce even more conservation in 2019. However, they should be able to sustain their conservation rates, based on the continued water savings observed in the primary results (*Evaluation Question 1).* This suggests the importance of selecting a new audience each year.

Evaluation question #5: Did the treatment have a differing effect on residents in each town?

To test the second evaluation question, the primary analysis conducted for evaluation question #1 was extended to include *town* as an additional between-subjects variable in the ANOVA. The results showed that there were significant differences across the five towns ($F(4,2570)=49.69, p<.001$) with Easton using more water per quarter on average than Westford, which used more than Hingham, West Springfield, and finally Hanover (see Figure 3). The 3-way interaction of time x condition x town was also statistically significant ($p=.001$), suggesting that the effect of the treatment varied by town.

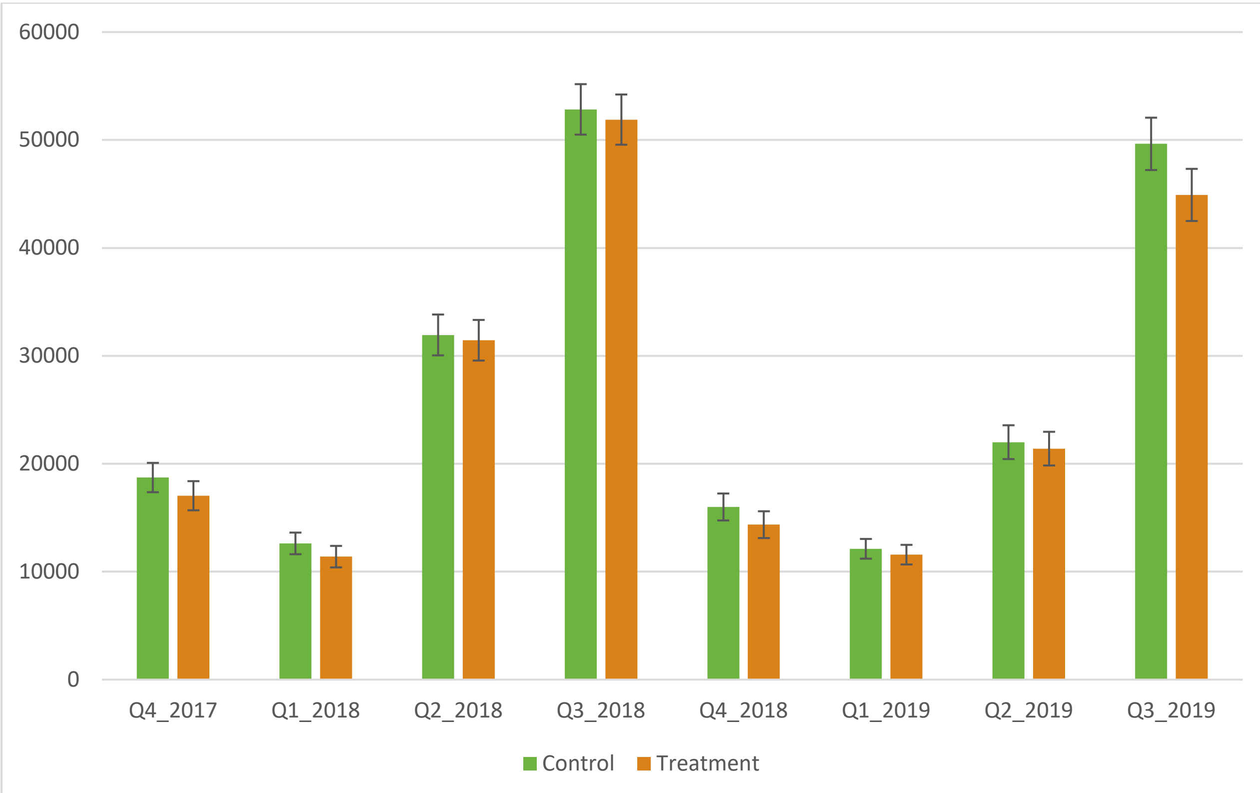
To further clarify the treatment effects, separate analyses were conducted for each of the five towns. These analyses followed the same time (with 8 time points) by treatment (treatment versus control) analysis, and corresponding graphs were created.

New Towns (No Program Implementation in 2018)

Easton

For Easton, the results showed that in the summer of 2019, the treatment households (44,913 gallons) used significantly less water than did households in the control condition (49,642 gallons). The results corresponded to a 10% water savings rate. Converted into units of gallons per day, in Q3_2019, treatment households used 499 gallons whereas control households used 552 gallons, or 53 gallons less per day. No other quarterly differences were found for Easton, suggesting that the difference was caused by the outreach communications. Because Easton was not included in the 2018 pilot, it's expected that the summer of 2018 would show no differences between households in the treatment or control.

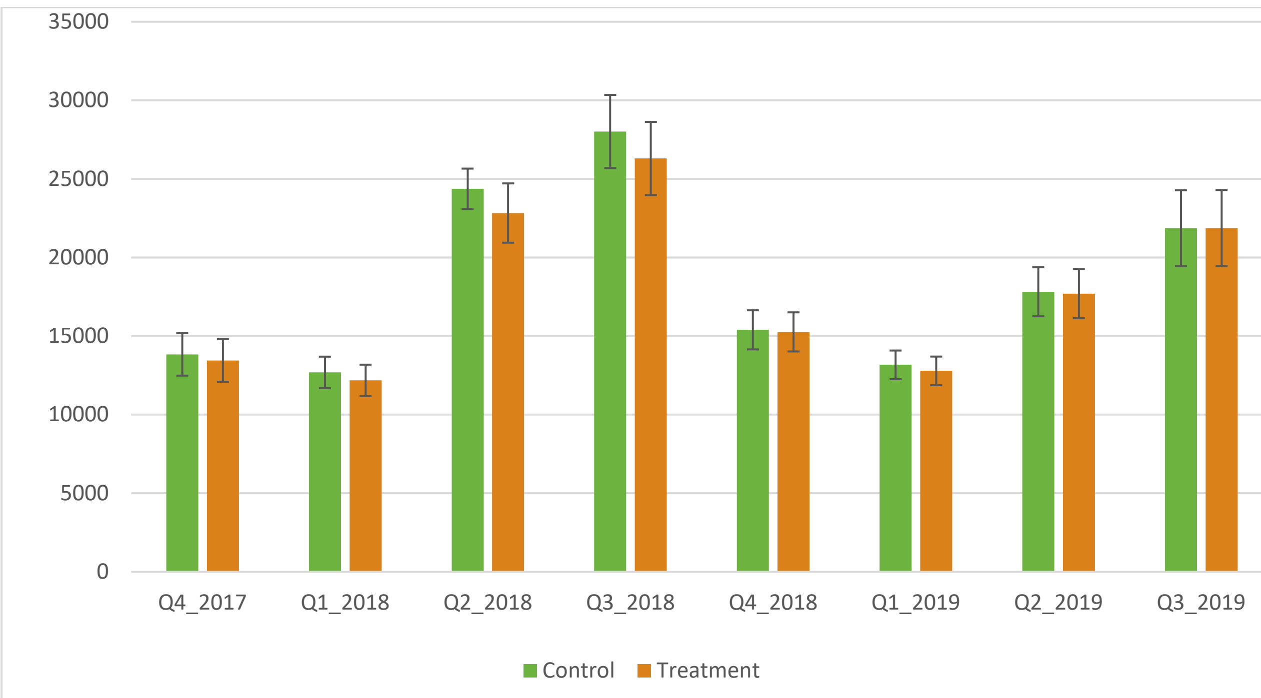
Figure 10: Easton Water Savings



Hanover

For Hanover, the results showed that in the summer of 2019, the treatment households did not differ significantly from households in the control condition. The results corresponded to a 0% water savings rate. Across all of the eight quarterly time periods, the treatment and control households did not differ significantly. The data was reviewed for errors, but none were found. The lack of water use reduction in Hanover may be related to their baseline low water consumption, as the lowest consuming community in the pilot group (see Figure 3). As referenced in *Evaluation Question 2* and found in the 2018 pilot, the program has the greatest impact on high water consumers, so if those who received the program are high consumers in the context of Hanover, but not in a greater context, they may not be influenced by the program. As discussed in *Evaluation Question 4,* Hanover did see reduced usage in the highest (top 7.5%) of their usages, suggesting that there was still an effect in that group.

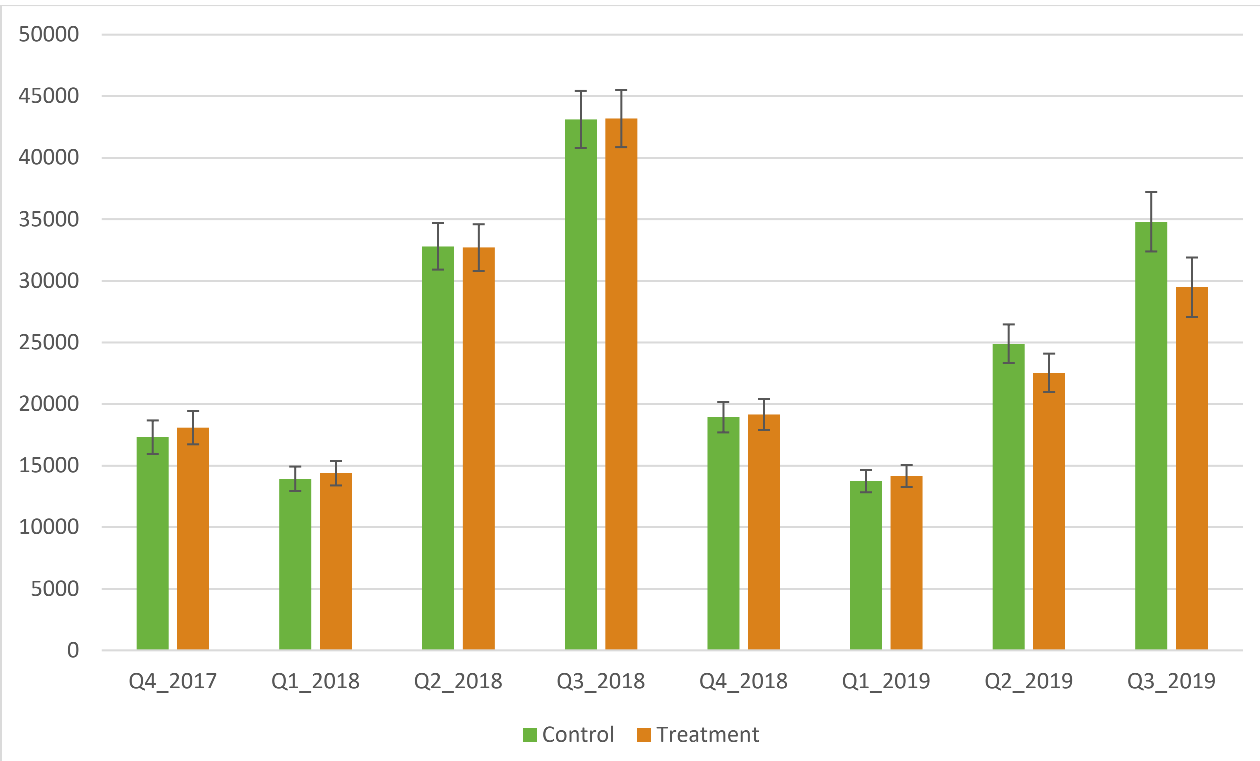
Figure 11: Hanover Water Savings



Westford

For Westford, the results showed that in the summer of 2019, the treatment households (29,488 gallons) used significantly less water than did households in the control condition (34,806 gallons). The results corresponded to a 15% water savings rate. Converted into units of daily gallons, in Q3_2019, treatment households used 328 gallons, whereas control households used 387 gallons, or 59 gallons per day less. In addition, there was a trend for Q2 toward water savings, suggesting that the June outreach may have had an early impact on water consumption. No other quarterly differences were found for Westford, suggesting that the difference was caused by the outreach communications. Because Westford was not included in the 2018 pilot, it's expected that the summer of 2018 would show no differences between households in the treatment or control.

Figure 12: Westford Water Savings

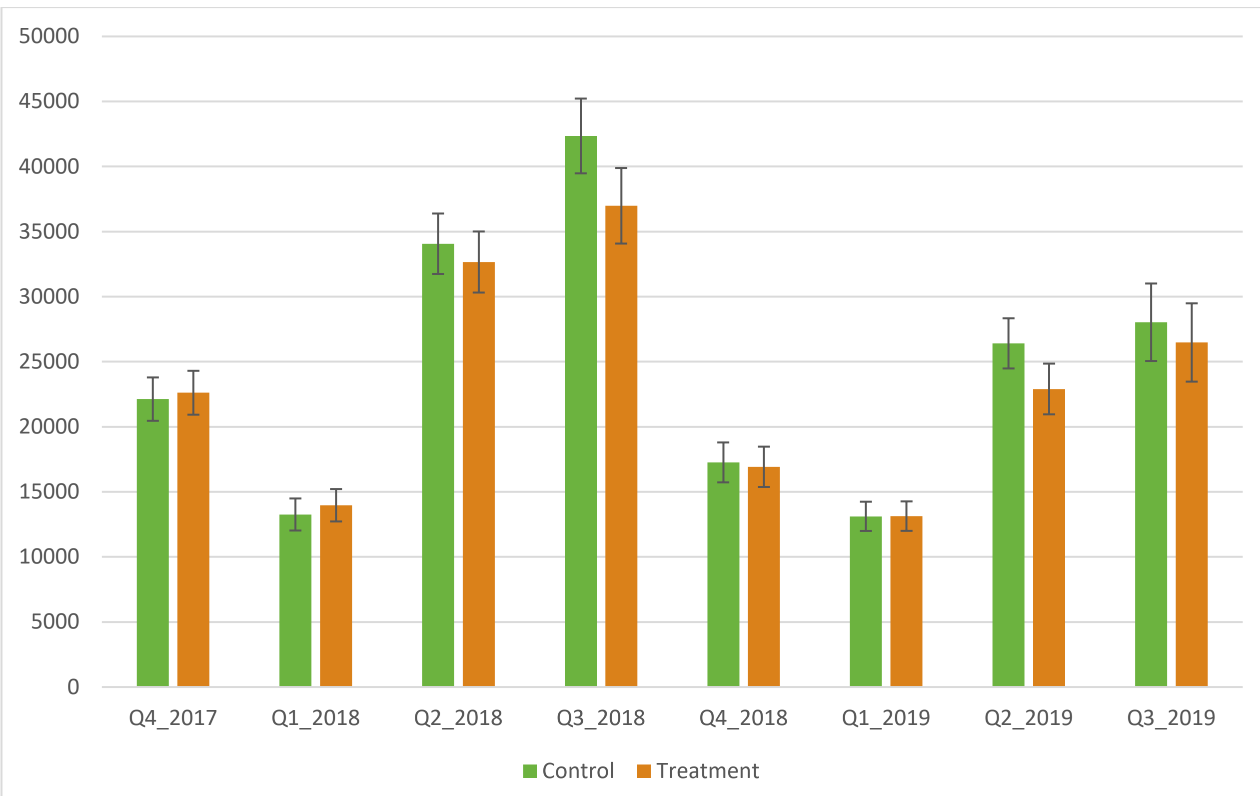


Original Towns (Program Implementation in 2018)

Hingham

For Hingham (represented by Aquarion Water Company), the results showed that in the summer of 2019, the treatment households (26,481 gallons) used less water than did households in the control condition (28,034 gallons), but the results were not statistically significant. The results corresponded to a 6% water savings rate. Converted into units of daily gallons, in Q3_2019, treatment households used 294 gallons, whereas control households used 312 gallons, or 18 gallons per day less. Hingham was part of the 2018 pilot program, and the results show the savings that were previously documented for that pilot in Q3 of 2018, and there was a difference in Q2_2019 showing water savings, suggesting that the 2018 outreach may have persisted, or the outreach may have an immediate effect on households that had received it previously. As discussed previously, it is unclear that, if the change is due to persistence in water savings from the 2018 implementation, if it is due to these households reducing or stopping lawn watering that was occurring year-round, if these changes represent spillover to other water conservation actions, or another explanation.

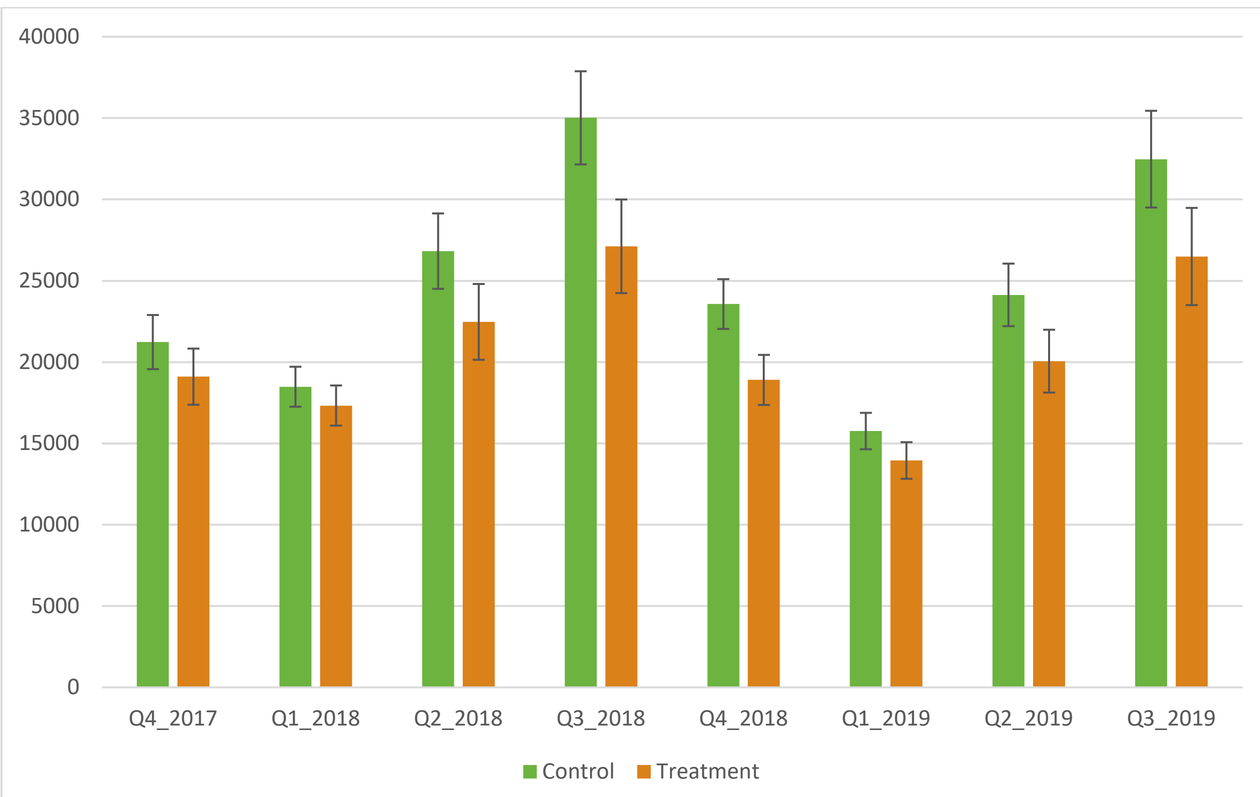
Figure 13: Hingham Water Savings



West Springfield

For West Springfield, the results showed that in the summer of 2019, the treatment households (26,492 gallons) used significantly less water than did households in the control condition (32,477 gallons). The results corresponded to an 18% water savings rate. Converted into units of daily gallons, in Q3_2019, treatment households used 294 gallons, whereas control households used 360 gallons, or 66 gallons per day less. In addition, there was a difference in Q2 showing water savings, suggesting that the June outreach may have had an early impact on water consumption. West Springfield was part of the 2018 pilot program, and the results show the savings that were previously documented for that pilot in 2018. In addition, the results suggest that savings produced from the 2018 pilot persisted through the winter and fall months. As discussed previously, it is unclear that, if the change is due to persistence in water savings from the 2018 implementation, if it is due to these households reducing or stopping lawn watering that was occurring year-round, if these changes represent spillover to other water conservation actions, or another explanation.

Figure 14: West Springfield Water Savings



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4: Recommendations and Future Considerations

Overall, the results from the 2019 pilot support that the *Healthy Lawn, Happy Summer* program is successful at reducing residential water consumption in the summer, with an overall water savings rate of 10%. In 2018, the savings rate was 14% between the treatment and control, demonstrating consistent savings year to year with program implementation. The water savings reported in *Evaluation Question 1, 2, 3,* and *4* are summarized below.

Table 8: Summary of 2019 Program Results

Evaluation Question	Comparison	Average Savings per Household	Estimated Gal Saved per Summer* per Household
1	Overall Treatment vs. Control	38 gal/day (10% savings)**	3,420 gallons
2	Towns that Implemented in 2018 Treatment vs. Control	42 gal/day (12% savings)**	3,780 gallons
2	Towns that Did not Implement in 2018 Treatment vs. Control	36 gal/day (9% savings)**	3,240 gallons
3	Towns that Did Not Implement in 2018, By Quartile of Total Summer Usage	**Medium-High Usage Quartile ***** 43 gal/day**	**Medium-High Usage Quartile ***** 3,890 gallons
		High Usage Quartile*** 54 gal/day**	**High Usage Quartile***** 4,836 gallons
4	All Towns, By Quartile of Winter to Summer Increase	**Medium-High Increase in Usage Quartile ***** 34 gal/day**	**Medium-High Increase in Usage Quartile ***** 3,030 gallons
		High Increase in Usage Quartile*** 47 gal/day**	**High Increase in Usage Quartile***** 4,197 gallons
5	By Water System Treatment vs. Control – Towns that Did not Implement in 2018	**Easton** 53 gal/day (10% savings)**	4,770 gallons
		Hanover 0 gal/day (0% savings)	-
		Westford 59 gal/day (15% savings)**	5,310 gallons
5	By Water System Treatment vs. Control – Towns that Did Implement in 2018	**Hingham (Aquarion)** 18 gal/day (6% savings)	1,620 gallons
		West Springfield 66 gal/day (18% savings)**	5,940 gallons

*"Summer" was considered 3 months (90 days), which assumes persistence through June, July, and August. Based the results, more persistent savings are likely expected.
**Statistical significance at p<.05
***The quartiles represent the low, medium-low, medium-high, and high users WITHIN the selected treatment households, which are already all high users, and within the top 30% of households that increase their usage from winter to summer.

As shown in Table 8, the results were positive, with either statistically significant savings or savings that were not significant but still suggest water savings. In addition, 90 days is used for the estimated gallons saved per summer (meaning, daily savings multiplied by 90) to allow for better comparison to 2018

(Table 6). However, with the potential persistence, and a watering season that likely lasts longer than 90 days, these numbers may be underestimated.

New Vs. Original Results

After the overall results, the analysis looked specifically at the savings by those towns who had originally implemented in 2018 and those towns who implemented in 2019. The results showed that the water savings were similar for these two groups, with both showing statistically significant savings. The original implementation had a slightly higher savings rate (12%) as compared to the new implementation (9%), which was shown to be a statistically significant difference ($p<.05$), suggesting there may be an increased effect with subsequent implementations. See section *Evaluation Question 2* for more information.

Total Summer Usage Quartile Results

This analysis looked at the new towns' households' total summer usage as compared to their baseline summer (2018) usage, comparing the low, medium-low, medium-high, and high quartiles[9] of users. These results demonstrated that the greatest savings were realized in the top half (medium-high and high) of the participating households, based on their total use. See section *Evaluation Question 3* for more information.

Winter to Summer Increase Quartile Results

This analysis looked at all towns' households' summer usage increase compared to winter, as compared to their baseline (2018) winter to summer increase usage, comparing the low, medium-low, medium-high, and high quartiles of users. These results also demonstrated that the greatest savings were realized in the top half (medium-high and high) of the participating households, based on their increase in summer as compared to winter. See section *Evaluation Question 4* for more information.

By Town Results

Finally, analysis was conducted by town. The largest savings were seen in West Springfield (18%) and Westford (15%), followed by Easton (10%). Hingham, represented by Aquarion, did not see statistically significant savings, but the results trended toward savings (6%).

Hanover did not see any change between the treatment and control, which may be attributed to their low consumption on the whole, given that, as shown in *Evaluation Question 3, 4,* and in the 2018 pilot, the highest water consumers show the most significant results from the implementation of *Healthy Lawn, Happy Summer*. See section *Evaluation Question 5* for more information.

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[9] A quartile is defined as each of four equal groups into which a population can be divided according to the distribution of values of a particular variable – meaning, within the treatment and control households, dividing into four equally sized groups based on either their total summer usage, or their increase from winter to summer.

2018 Pilot Results

Below is a table that summarizes the results of the 2018 pilot for comparison. Overall, the results reflect the savings from 2019, with small, expected variations. Similar patterns are observed, such as the highest users demonstrating the most savings, and differences in savings in different water systems, suggesting that individual locations will likely see differing results. Overall, however, these results demonstrate that the program has continued to motivate significant water savings.

Table 9: Summative 20198 Pilot 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 June, July, and August. Based the results, more persistent savings are likely expected.
**Statistical significance at $p<.05$

Feedback on the Toolkit

Hanover, Westford, and Hingham (Aquarion) implemented *Healthy Lawn, Happy Summer* in 2019 using the manual and templates developed by Action Research. Concord, Easton, and West Springfield's programs were created and mailed by Action Research. For all six towns, Action Research handled the data processing and generation of the feedback sheets, as the pilot was being run using experimental design (control group and treatment group) and required specific selection of households and more data analysis than would be required by a non-experimental implementation. However, several town staff and Advisory Council members tested the program with a sample dataset and confirmed that they were able to run it. The feedback from all toolkit pieces has been positive and suggests that the primary concern for implementation are two-fold: (1) obtaining, cleaning, and formatting water data from previous year; and (2) time to get materials together, given other responsibilities by supplier staff.

Data Processing Concerns

To address the first concern, a template and detailed instructions are provided for the data process in the toolkit, but ultimately cannot address all the specific challenges that one may encounter with the variety of databases and data collection systems.

Implementation Time Concerns

To address the second concern, the toolkit timeline was moved up to suggest staff prepare the program earlier in the year, as soon as they are sure they want to implement, when suppliers reported that they have more time than the spring and early summer. In addition, the manual was written with the intention of being clear enough that someone not familiar with water data, such as a student or intern, could help with implementation. Finally, a supplier could contract with an external printer to do the printing, assembly, and mailing, or a consultant such as Action Research to run the full program for them.

Recommendations

Based on the successful implementation of this program, we recommend that towns in Massachusetts that have concerns with their residential summer water consumption and have a significant amount of lawn irrigation implement the program. While there have been some negative responses from residents to the feedback sheets, suppliers reported that most of these interactions opened up conversations with these residents to figure out why they were selected for the outreach and assist them in reducing their consumption. Towns reported that they felt that these conversations would not have happened without the prompting of the outreach.

Based on the results by quartiles, we also recommend that the program be adjusted from selecting the top 30% of households to the top 15%, and that towns with resource restrictions may want to be even more limited (top 5%-7%).

Other Considerations for Future Implementation

Below are considerations that may change future implementations of the program.

- **Higher than Average Rainfall for Pilot Years:** The summer of 2019 received a higher than average amount of rain, with an average of 4.15 inches[10] per month between June through September. This average of 4.15 inches is relatively similar to the summer of 2018, which had 4.32 inches[11] per month between June through September. Given the higher rainfall both years, we would expect to see reduced lawn watering for all households. In a drier year, there may be even greater savings with the program, though the cover letters may need to be modified to address drought-specific concerns.
- **Implementation by Consultant in Pilot Years:** In 2018, the program was completely run by Action Research. In 2019, Action Research ran the full program for three towns, and ran the data processing and feedback sheet generation for all suppliers. Future implementation without a consultant may run into unforeseen challenges. We do not anticipate these challenges being significant, but still may occur, such as implementation on a different timeline. As these problems are addressed, they can be added to the FAQ section of the manual.
- **Alteration of Materials**: As part of the process of creating the toolkit, the program materials are now editable in multiple areas. The program was designed using foundational research and put together using best research and communication practices. The pieces were not tested

[10] https://usclimatedata.com/ for Boston, MA
[11] Ibid.

separately, nor were other versions of the materials tested. If the program materials are altered significantly from their current form, it may lead to different results.

Appendix A: Program Materials

Sample Completed Materials - Postcard

Dear Resident,

Within the next week, you will receive an envelope with materials on the new *Healthy Lawn, Happy Summer* campaign developed by West Springfield 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 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

MassDEP

Sample Completed Materials – First Cover Letter

TOWN OF WEST SPRINGFIELD

DEPARTMENT OF PUBLIC WORKS

26 CENTRAL STREET

SUITE 17

WEST SPRINGFIELD, MA 01089-2763

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

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

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

Dear Resident,

As summer approaches, the Town of West Springfield 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 call Jeff Auer at 413-263-3230 or email jauer@townofwestspringfield.org

Sincerely,

Robert J. Colson

Robert J. Colson
Director

Sample Completed Materials – Educational Flyer

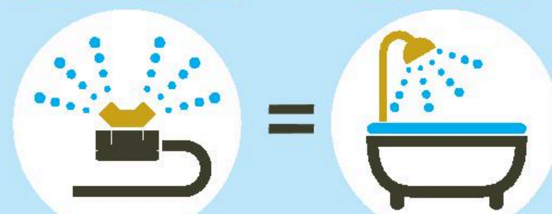
HEALTHY LAWN HAPPY SUMMER!

Each of us makes a big impact in West Springfield.

Reduce Lawn Watering

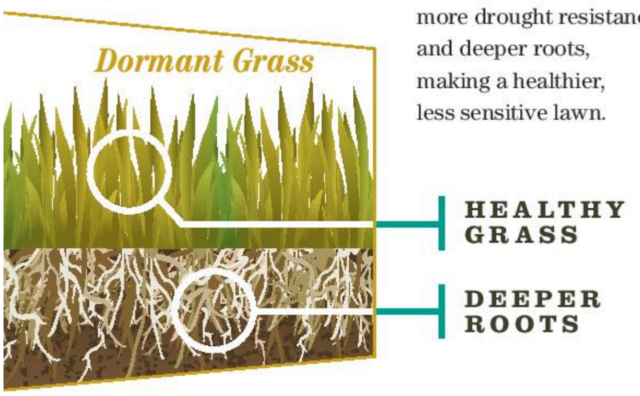
Eliminating or reducing summer lawn watering makes a big difference. West Springfield households that water their lawns in the summer use an average of 1,900 gallons a week. That's like running your shower for 12 hours!

The fact is, ***a West Springfield 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.



Water Only With Rain OR Water Wisely

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.



Half of West Springfield 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.***

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.
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.

MassDEP

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

Please visit this website for more information:
www.epa.gov/watersense/outdoors

Sample Completed Materials – Feedback Flyer

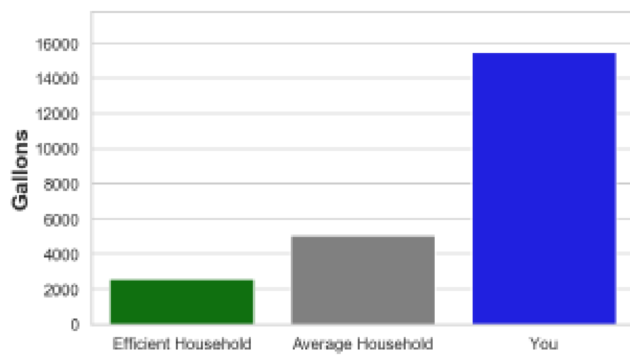
Join West Springfield Neighbors In Summer Water Savings!

How do you compare?

More than half of West Springfield 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 2018



During the summer of 2018, your household used **more water** than the average West Springfield 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 West Springfield's water resources while keeping our lawns healthy all summer.

MassDEP

Thank you for helping your community!

Please visit this website for more information: www.epa.gov/watersense/outdoors

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Sample Completed Materials – Second Cover Letter

TOWN OF WEST SPRINGFIELD

DEPARTMENT OF PUBLIC WORKS

26 CENTRAL STREET

SUITE 17

WEST SPRINGFIELD, MA 01089-2763

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

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

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

Dear Resident,

As summer approaches, the Town of West Springfield 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 call Jeff Auer at 413-263-3230 or email jauer@townofwestspringfield.org

Sincerely,

Robert J. Colson

Robert J. Colson
Director