Summer Water Conservation Community-Based Social Marketing Pilot Project

Massachusetts Division of Ecological Restoration

action RESEARCH

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Executive Summary

The goal of this pilot project was to reduce withdrawal of water from the Ipswich River watershed during the summer by motivating residents of the town of Wenham and Middleton to voluntarily conserve water.

Pilot Design

The pilot tested two strategies for motivating residents to stop or reduce summer lawn watering, as compared to a no-program control group.

The two programs were:

1. **Normative Feedback Strategy:** Participants received, through postal mail, a personalized feedback sheet comparing their water usage to that of their neighbors along with a motivational flyer (hereafter, Feedback group). Wenham received two flyers, given the availability of 2017 data from the May-July 2017 data during the summer, while Middleton residents only received one flyer with historical data.
2. **Commitment Strategy:** Participants received door-to-door delivery of a motivational flyer along with a request to commit to reducing their water usage (hereafter, Commitment group). In Wenham, the program was delivered by city staff, while in Middleton, the program was delivered by volunteers.

Sampling and Data

Both Wenham and Middleton provided the research team with household water-use data for 2016 along with the size of the household. The towns were treated as individual pilots, given differences in the implementation (e.g., number of feedback flyers), data collection (e.g., different quarter for data collection), and resources. For both towns, a list of available addresses was collapsed into a list of street names. Streets (as opposed to households) were used for random assignment to: (1) reduce the potential for cross-contamination of conditions, given the visibility of a door-to-door team and (2) increase the ease of implementation for the door-to-door team. High, medium, and low water-use streets were evenly spread between all three groups with blocked random assignment. A total of 125 households were assigned to each condition, per town. As the pilots were implemented by town, the data analysis was also conducted by town using two sources (1) metered water-use data and (2) a post-pilot mail survey.

Implementation and Data Challenges

During the implementation period, the door-to-door condition faced several unexpected challenges. In Wenham, the on-the-ground team's availability changed during the process, leaving implementation to a single town employee, and, despite his best efforts, only part of the address list was completed. While these interactions were positive, the sample size was small which was a challenge for statistical analyses and detecting changes (if they existed).

In Middleton, households were randomly assigned to each of the three conditions prior to the water data getting digitized; therefore, random assignment had to be re-run. Unfortunately, a miscommunication led to the initial, incorrect address list being given to the commitment field team. With the incorrect address list, the volunteer team visited and delivered the commitment program to

households that were assigned to all three groups (feedback, control, commitment), and led to households from each condition being removed from subsequent analyses.

During data analysis, the effect of extreme outliers (use outside 2.5 times the standard deviation) and drop outs (e.g., bad addresses, no water use during the pilot) led to a shift in distribution of users in each condition, creating control and treatment conditions that were significantly different from each other prior to the pilot. This change creates a challenge in data interpretation, as it is less clear if changes, or lack thereof, occur due to the program, or due to non-equivalence in participants between groups.

Results

As mentioned, two primary data sources were used for evaluation. Water-meter data were collected from all participating households. The post-pilot survey was sent to all households that received the correct program (e.g., not including households who did not receive the commitment program). The response rate for the survey was 44% in Wenham and 43% in Middleton. While the challenges faced in implementation meant that we were cautious in interpreting our data, this project provided useful conclusions and recommendations for others pursuing similar goals. It also shed light on program refinements that should be made before larger-scale implementation. Below, the top findings are listed.

1. The feedback group in both towns saw the largest decrease in gallons between 2016 and 2017.
2. The percent change between each group (feedback, commitment, and control) was approximately the same in Wenham.
3. The percent change in Middleton was slightly higher for the feedback group (11%) than the control (8%) or the commitment (1%), though the difference was not statistically significant.
4. In Wenham, the feedback group's median use went from being statistically higher than the control in 2016 to statistically the same in 2017.
5. While the changes in the feedback group were not statistically significantly different than the control group, they point to positive behavioral changes in the group that was consuming more water than the others, which are in line with the literature.
6. The commitment group, given the small sample size, unsurprisingly saw few changes.
7. Analysis of the survey data with the water-meter data showed that those who use more water in the summer:
    a. Rated the materials significantly more helpful for keeping their lawn healthy;
    b. Rated the materials significantly more helpful for saving water;
    c. Were significantly more likely to value a green lawn; and
    d. Self-reported watering their lawn more.

Ultimately, the results suggested that the feedback program experienced some success in influencing participants to reduce their water use. The ability to detect this success, or not, was moderated through either random chance of more households that water their lawns being assigned to that group, a negative side effect of the street level random assignment (where geographical factors may exert more influence), or an over-influence of extreme outliers. However, given the success experienced by other similar programs, and the trends of reduction despite these factors, we believe that the pilot showed that this kind of program can be successful. Below, we identified the lessons learned that will inform future pilots.

Lessons Learned

Overall, the biggest lessons that emerged from this pilot were a variety of potential challenges other organizations and towns may face when implementing behavior change work around lawn watering behavior and water conservation. Suggestions for addressing these challenges are listed below and discussed in more detailed in the report.

Study Design

1. Normative feedback is likely the most promising pathway to change behavior;
2. If possible, make household's feedback more recent and timely. For example, consider if automatic meter reading technology is feasible to introduce to the area;
3. Deliver the program earlier in the summer (May) to avoid materials arriving when summer habits may have already been established;
4. Deliver more than one communication for mailed materials, such as having a second mailing to the feedback group to increase engagement and recall;
5. Door-to-door teams may not be appropriate for this topic, location, and available resources;

Sampling and Data

6. Consider focusing primarily on medium to high water users, or better still, users with a high summer:winter water use ratio, to ensure the materials are given to households that water their lawns;
7. Given the data will include extreme usage outliers (as the usage is considered accurate), consider the distribution of sampled groups without them to ensure equivalency with dropouts;
8. Use a larger sample size to account for dropouts and high variability in data;
9. Conduct random sampling at a household level;
10. If possible, pilot test interventions in communities with more frequent data collection (e.g., monthly billing) to avoid over-reliance on one to two data points. If not possible, use communities with the same quarters to allow for a strong comparison of the same months;

Materials and Additional Research

11. Consider if there are important subgroups that have additional barriers (e.g., if the materials should address lawn service companies in greater detail);
12. Consider if materials should further address weather variables, such as if the summer has been rainy, specifically speak to the importance of still conserving;
13. Consider if materials should further address residents who value green lawns; and
14. Consider if additional programs should further address residents who use private wells (likely a program in and of itself, as the withdrawal from wells cannot be tracked and may be influenced by other factors.

Importance of Pilot Testing

Most importantly, the results of this pilot highlight the importance of small pilot programs. Programs may check all the boxes in planning, but still have unforeseen challenges when in the field, as was experienced in this pilot. The purpose of a pilot is to identify and address problems before launching a campaign throughout the community, county, or state. A pilot allows for the identification of problems and allows the organization to refine their strategy until it succeeds. While it is frustrating to not see the results we set out to achieve, it is better to revise a pilot rather than fix a larger project, where the problems would be much more difficult and expensive to fix. It is also critical to remember that many programs do not conduct in-depth evaluations, much less ones that focus on evaluating actual behavior change and miss the opportunity to correct course and improve.

Background and Purpose

The goal of this project was to reduce withdrawal of water from the Ipswich River watershed during the summer by motivating residents to conserve water. Historically, towns throughout the watershed have employed various information- and financial-based programs (e.g., general tip lists and fines) with varying success. However, water withdrawals must be further reduced, particularly in the face of additional development, to preserve the health of the river and ensure that enough water is available for all residents.

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. Community-based social marketing involves five steps:

1. Selecting which behaviors to target;
2. Identifying the barriers and benefits to 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), which included:

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

We developed a strategy table (Step 3) to link specific behavior change tools to address the top barriers and amplify the top benefits. The full report on this research, *Ipswich River Watershed Summer Water Conservation Actions: Community-based Social Marketing Benefit and Barrier Research*, is available

through the Division of Ecological Restoration website, as well as in several task summary memos, available upon request.[1]

With the range of strategies mapped out, the next step was to conduct a small-scale pilot (Step 4). A pilot allows an organization to learn if a program will work and how to improve it prior to full-scale implementation.

Pilot Study Methods

In the summer of 2017, the Massachusetts Division of Ecological Restoration (DER), the towns of Wenham and Middleton, and Action Research collaborated to develop and implement a pilot program to promote summer water conservation.

Outreach Design

Based on DER's goals and the foundational research, the pilot tested two strategies for motivating residents to stop or reduce summer lawn watering, as compared to a no-program control group.

The two programs were:

1. **Normative Feedback Strategy:** Participants received, through postal mail, a personalized feedback sheet comparing their water usage to that of their neighbors along with a motivational flyer (hereafter, Feedback group)
2. **Commitment Strategy:** Participants received door-to-door delivery of a motivational flyer along with a request to commit to reducing their water usage (hereafter, Commitment group).

The outreach was designed to utilize communication best practices[2], remove barriers to action, and employ behavioral strategies to motivate summer water conservation. Materials are listed by condition below, and images of the materials can be found in Appendices A - D. No materials were sent to the control group.

Outreach materials: Feedback group

1. Pre-notification postcard (designed to catch participants' attention and prompt them to watch their mail)
2. Outreach materials
    a. Cover letter
    b. Motivational flyer
    c. Feedback sheet with social norms
        i. Wenham: two rounds, delivered once in June and once in August
        ii. Middleton: one round, delivered in June

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

[2] For example, communication best practices include limiting the total amount of text, using simplified language, including compelling images, using colors that are easy to read, etc.

Outreach materials: Commitment group

1. Pre-notification postcard (designed to catch participants' attention and prompt them to be prepared for a visit)
2. Outreach materials
    a. Motivational flyer
    b. Commitment form
3. Tools for the on-the-ground outreach team
    a. Tracking sheet
    b. Script
    c. Training

Study Design

Both Wenham and Middleton provided the research team with household water data for 2016, along with information about household size. After reviewing the data, the team decided to frame each town as their own pilot for two reasons.

First, the quarters for data collection were different between towns (Table 1), leading to comparisons between disparate months if combined, a particularly significant issue for a behavior that is extremely tied to time of year and weather. In addition, Wenham's quarters aligned to allow for a second round of feedback related to water use that summer.

Second, the towns had differing availability of resources for on-the-ground implementation. The team discussed shifting the sample size to focus primarily on one town to increase the statistical power of the pilot, but ultimately each town's capacity to complete the in-person treatment and the team's desire to support both towns in their efforts to reduce water led to splitting the sample size evenly between both towns. As much as possible, elements of the pilots were kept consistent between towns.

Table 1: Summary of Town Attributes

Town Name	**Wenham**	**Middleton**
Collection	By Town	By Neighboring Town (Danvers)
Water Data Quarters	Feb-Apr; May-Jul; Aug-Oct; Nov-Jan	Jan-Mar; Apr-Jun; July-Sept; Oct-Dec
Data Sharing Format	Digital	Paper

Sampling

For both towns, a list of available addresses was collapsed into a list of street names. Streets (as opposed to households) were used to: (1) reduce the potential for cross-contamination of conditions, given the visibility of a door-to-door team and (2) increase the ease of implementation for the door-to-door team.

Wenham Sample Assignment

For Wenham, average household water usage (gallons) during the previous summer was calculated by street, using an average of total usage in the May–July 2016 and August–October 2016 quarters. Streets were then sorted by their mean summer water use, from the highest average water use to the lowest. Streets were next assigned to one of the two treatment groups or the control group, using a blocked randomization procedure to ensure even spread of high-, medium-, and low-water users across the groups. From there, the streets within each treatment or control group were randomly ordered to

ensure all streets from the pool in that group had an equal chance of being chosen. Addresses were pulled from the first street in random order, and so on, until 125 households had been selected per group, for a total of 375 households in the pilot. Table 2 shows the means by condition and quarter at time of sampling.

Table 2: Average (Mean) Quarterly Water Use (gallons) by Condition at Time of Sampling, Wenham

	Commitment	Feedback	Control
May - July 2016	25,904	26,552	22,600
Aug - Oct 2016	20,504	21,800	19,864

Middleton Sample Assignment

For Middleton, streets were first randomly selected, and an initial random assignment was conducted without water use data. The 2016 water data were then manually entered from the paper data sheets only for the selected streets to avoid manually entering the water data for the entire town. However, after the water data had been entered for the first iteration of random assignment, water use was unevenly distributed across the treatments and control group. Since uneven distributions would skew results, the original assignment was not used. Average household usage during the July–September quarter was calculated for selected streets, which were then sorted by mean summer water use.

As in Wenham, streets were then assigned to one of the treatment groups or the control group using a blocked random assignment to ensure an even spread of high-, medium-, and low-water users across the groups. From there, the streets within each treatment or control group were randomly ordered to ensure all streets from the pool in that group had an equal chance of being chosen. Addresses were pulled from the first street in random order, and so on, until 125 households had been selected per group, for a total of 375 households in the pilot. Table 3 shows the means by condition at time of sampling.

Table 3: Average (Mean) Household Water Use (gallons) by Condition and Quarter at Time of Sampling, Middleton

	Commitment	Feedback	Control
April - June 2016	22,911	22,268	26,169
July - Sept 2016	33,349	32,276	36,425

Data Collection

Data were collected through two methods. First, quarterly water bills were provided by each town from 2016 through the end of the summer of 2017. 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 (See Appendix E for materials). The survey was sent after the “summer” quarter had ended for Middleton (September) and after the summer watering season had generally ended for Wenham (October), as Wenham’s second “summer” quarter extends through October. The choice to send the survey after the water data were collected (Middleton) or after prime watering season (Wenham) was done deliberately to avoid priming the control group to their household’s outdoor water use and potentially leading to an unintentional effect.

Project Timeline

Table 4 summarizes the project timeline for implementation and evaluation.

Table 4: Implementation and Evaluation Timeline

Town	Wenham	Middleton
Feedback mailing	Early June; Early August	Mid-June
In-person implementation	Mid-June to early July	Late June to early July
Survey Round 1	Early October	Late September
Survey Round 2	Mid-October	Early October

Implementation Challenges – Commitment Condition

During the implementation period, the door-to-door condition faced several unexpected challenges. These challenges provided lessons learned for future implementation but did hinder the team's ability to analyze the data.

Wenham

In Wenham, the on-the-ground team's availability changed during the process, leaving implementation to a single town employee, and, despite his best efforts, only part of the address list was completed. While these interactions were positive, the sample size was small, which was a challenge for statistical analyses and detecting changes if they existed. Additionally, the implementer reported that while people were willing to open their doors and interact with him, they were quickly agreeing with him due to his position in the government, and not necessarily taking time to genuinely engage with the material.

Middleton

In Middleton, as mentioned in the sampling section, an initial round of random assignment was run, prior to the water data getting digitized. Unfortunately, a miscommunication led to the initial, incorrect address list being given to the commitment field team. The initial list had households that, in the final set-up, were assigned to all three conditions, rather than only those that had been assigned to the commitment condition. With the incorrect address list, the team visited and delivered the commitment program to households in all three groups: commitment, feedback, and control. This led to households from each treatment condition being removed from subsequent analyses: from the feedback group as they had received both programs; from the commitment group since they did not receive the program as they were not on the initial, incorrect address list; and from the control group since they received the program but did not receive a pre-notification postcard. Given the mix-up, the random assignment was compromised, so the residents in each group were not necessarily comparable. However, the on-the-ground team did succeed at reaching residents, and reported positive interactions, despite the complications.

Results and Discussion

As the pilots were implemented by town, the data analysis was also conducted by town. Water-use data were collected, and there was a self-reported post-pilot mail survey. Results are reported below. Given the implementation challenges noted above, the analysis primarily focuses on the control and feedback groups in Wenham, but also includes several exploratory analyses to better understand the effect of the program, as well as critical target audience traits. Analyses were all conducted by condition, except for exploratory analyses linking various survey responses with water use data.

Wenham Water Data

The primary metric of evaluation was water usage, with the primary summer water use behavior being lawn watering. All groups began with 125 households randomly assigned to condition as described in the "Sampling" section. During implementation, the commitment group had 67 households removed due to the inability to complete the program, as previously discussed. Prior to analysis, the water data were reviewed and households reporting "0" water use for an entire pilot quarter (3 months) were removed, as they either had moved or had a problematic recording (Table 5).

Table 5: Final Sample Size for Wenham Pilot

Condition	# Removed for "0" water use	# Removed for Other Errors	Remaining Sample
Commitment	5	67 (not visited)	53
Feedback	8	3 (post office returns)	114
Control	1	1 (bad address)	123

Scatterplots and Boxplots

The data were then mapped in scatterplot graphs for each condition, comparing the summer quarters of 2016 to 2017 (Figure 1–3). A linear change line was included to demonstrate the comparative usage. Households above the line increased their water usage in 2017, while households below decreased usage. Scatterplot graphs for each summer quarter, by condition, are available in Appendix F.

Figure 1: Wenham Commitment Condition, 2016 vs. 2017 Summer Usage

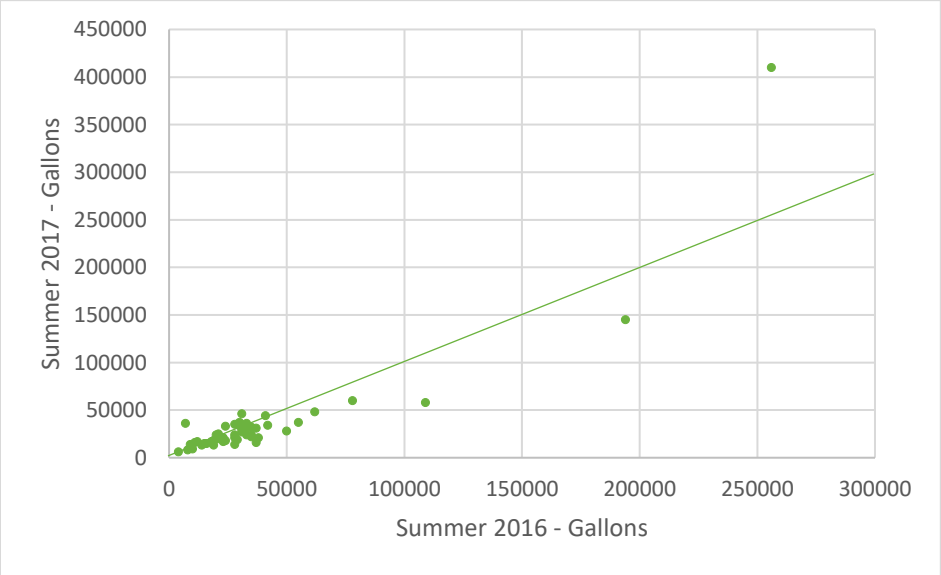


Figure 2: Wenham Feedback Condition, 2016 vs. 2017 Summer Usage

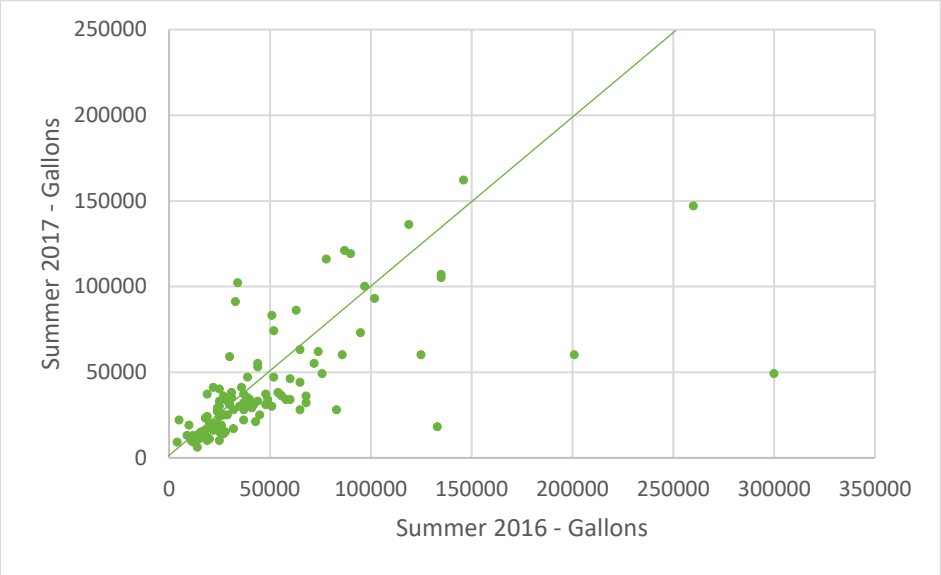
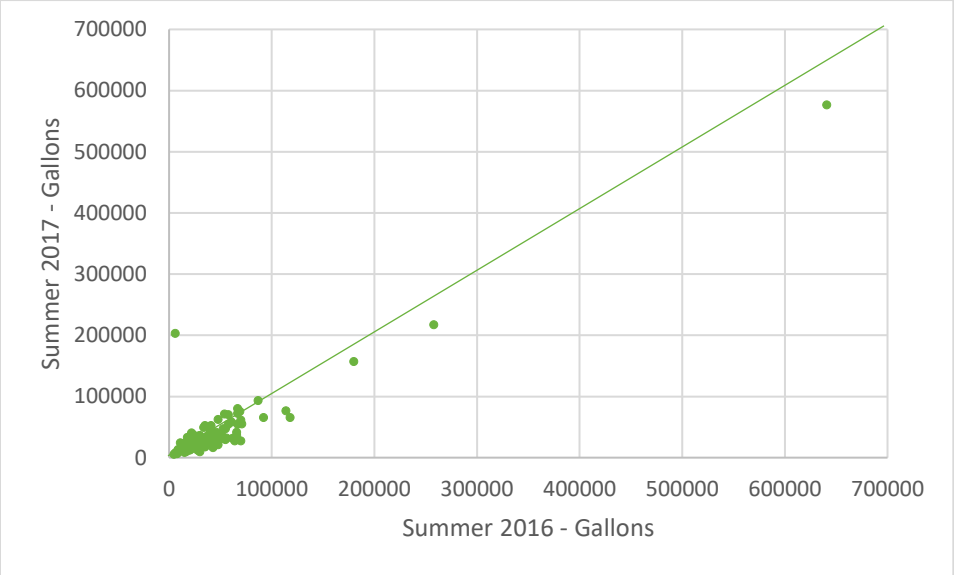


Figure 3: Wenham Control Condition, 2016 vs. 2017 Summer Usage



As shown in Figures 1 – 3, there were several high use outliers in the pilot dataset. High-use outliers were kept in the pilot as high-water users comprise a large proportion of total water use and their high readings are believed to be accurate (as opposed to an issue with the water meter). However, when reviewing the final distribution of households, the control group and the treatment groups appeared to have very different patterns of usage. To further illustrate the usage, box-and-whisker plots were created for each group (Figure 4–6).

Figure 4: Wenham Commitment Condition, 2016 & 2017 Summer Usage by Quartile

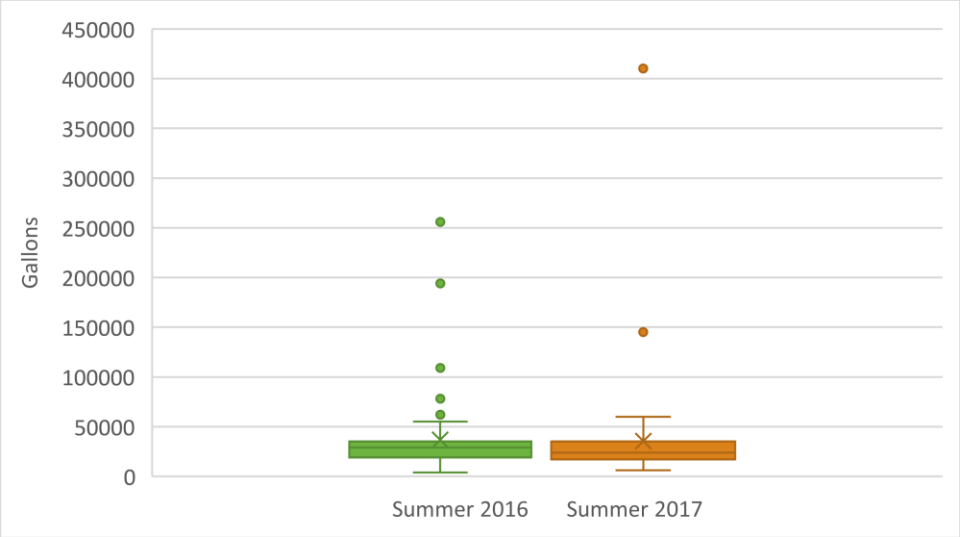


Figure 5: Wenham Feedback Condition, 2016 & 2017 Summer Usage by Quartile

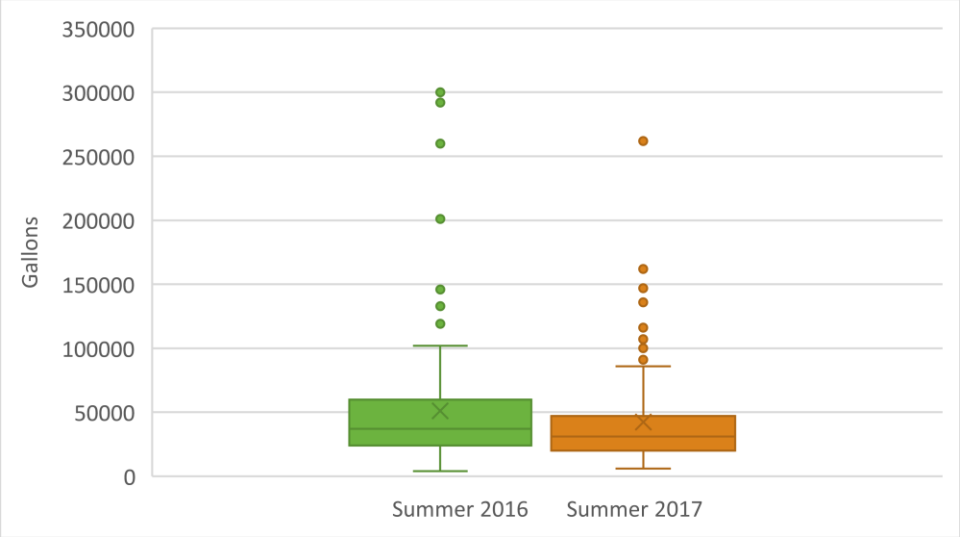
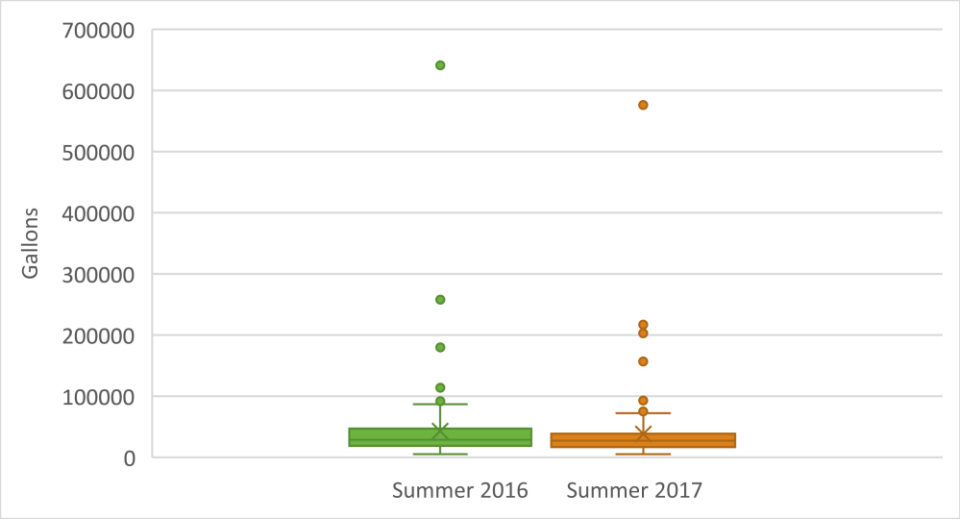


Figure 6: Wenham Control Condition, 2016 & 2017 Summer Usage by Quartile



Given the wide variability of the data, addresses with excessive change between years and addresses that were determined to be new owners (per advising from the Wenham Water Department), were removed from the analysis (Table 6). Specifically, excessive change was defined as households who had change between summers greater than 2.5 times the standard deviation. This excessive usage could be due to a variety of factors, from a water leak to excessive lawn watering on a large property and large pool filling without best practices for saving water (e.g., watering in the morning to prevent evaporation).

Table 6: Second Round of Removal for Usage and Ownership - Wenham

Condition	# Removed for extreme usage	# Removed for new ownership	Remaining Sample
Commitment	3	4	46
Feedback	3	4	104
Control	9	3	111

Analysis of Summer Quarters

Using the remaining households, we then reviewed the distribution and means for both summer quarters, as compared to the combined July and October quarter mean (hereafter, the quarters combined are referred to as the "Summer" mean). As the summer quarters combined revealed similar and simpler data, we combined the quarters for the analysis. We then calculated the mean water usage for the summer of 2016 and the summer of 2017 for all conditions (Table 7).

Table 7: Mean Usage (gallons) - Wenham

	Mean Usage Summer 2016	Mean Usage Summer 2017
Commitment	29,304	25,543
Feedback	43,826[a]	38,490[b]
Control	33,189[a]	29,072[b]

[a]$p<0.05$ [b]$p<0.05$

Given households that were removed, the composition of each group was significantly altered from the time of sampling. Based on the current distribution of users and significantly different means in the summer prior to the pilot, the remaining control households appeared to be significantly different from the feedback group before the pilot. Therefore, the feedback and the control would not be considered a strong comparison group. The comparison could be obscured by confounding variables that, typically, would be expected to be controlled by the random assignment. The three groups are presented in the rest of this analysis to show a comparison, without a true control group. As such, the change experienced by the feedback group cannot be attributed to the program, as the group was statistically higher than the control prior to the pilot.

Median Water Use

We then calculated the median use for all conditions, as the median is less affected by extreme use (Table 8).

Table 8: Median Usage (gallons) - Wenham

	Median Usage Summer 2016	Median Usage Summer 2017
Commitment	29,000	24,000
Feedback	37,000*	30,500
Control	29,000*	25,000

*p<0.05

We used a Mood's Median test to test the control group versus the commitment group and the control group versus the feedback group to determine if the medians were also significantly different. The median for the feedback group was statistically higher than the control in the summer of 2016, but in the summer of 2017, the medians were statistically the same across all groups. Given the differences in the spread and mean of the control group, as discussed previously, the movement from statistically higher to statistically the same as the control cannot be attributed directly to the program but does indicate positive change in the feedback group.

Water Use Change Over Time

We then calculated the total change and the percent change between the summer of 2016 and the summer of 2017 (Table 9). The total and percentage change were calculated at the group level (mean) to reduce the effect individual variation had on the total usage as a group.

Table 9: Average Total and Percentage Change in Group Water Use - Wenham

	Summer 2017-Summer 2016 Total Change in Usage (gallons)	Summer 2017-Summer 2016 Percent Change in Usage
Commitment	-3,761	-13%
Feedback	-5,336	-11%
Control	-4,117	-12%

Although the feedback group showed the largest gross reduction from 2016 to 2017, this group also started with a higher average water use than commitment or control groups. Ultimately, each group significantly reduced their usage as compared to their usage in the previous year, but no group significantly reduced more than others.

Wenham Survey Data

In the analyses below, all survey respondents were included, except in the case of the exploratory analyses that link water data to the survey results.

All participating households were sent a survey to assess their attitudes, behaviors, and perceptions of the materials received. The households were also asked if they remembered receiving materials, and if so, how they received them. This provided verification to see if respondents correctly remembered receiving the materials through the correct channels for their group. The commitment group was included in the analysis below, but it is important to note that statistical tests could not be run due to the small sample size. Surveys were only sent to members of the commitment group who received the program. The response rate for Wenham was 44% overall (Table 10).

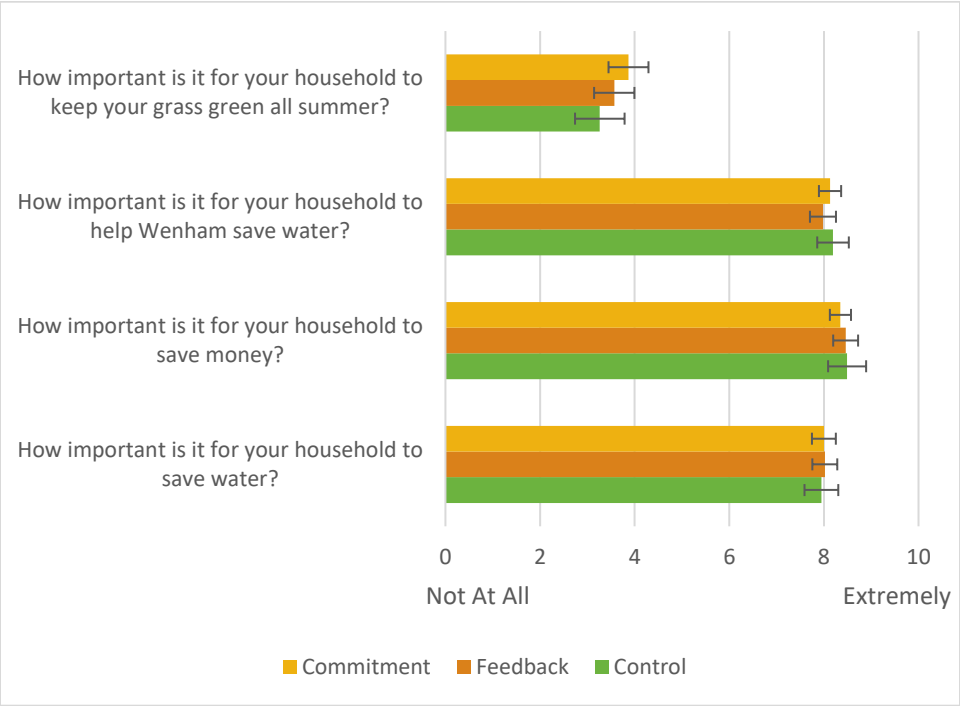
Table 10: Survey Response - Wenham

Conditions	Number of survey respondents	Response Rate
Commitment	23	40%
Feedback	51	42%
Control	58	47%

Conservation Attitudes

First, households were asked about their attitudes around lawns, saving water, and saving money, ranking the level of importance of four items on a 0 to 10 scale, where 0 was not at all important and 10 was extremely important.

Figure 7: Conservation Attitudes - Wenham



All three conditions shared high agreement that saving water and money were important, while keeping grass green was not very important.

Exploratory Analysis – Importance of a Green Lawn

Exploratory analyses comparing residents who rated a green lawn as not at all important (0-3) to those who rated it medium to highly important (4-10) found a statistically higher average water use in both the summer of 2016 and the summer of 2017 for those who value a green lawn (Table 11).

Table 11: Importance of a Green Lawn and Water Use (gallons) - Wenham

	Average Water Use Summer 2016	Average Water Use Summer 2017
Low (N=69)	29,797[a]	26,797[b]
Medium to high (N=46)	39,174[a]	35,152[b]

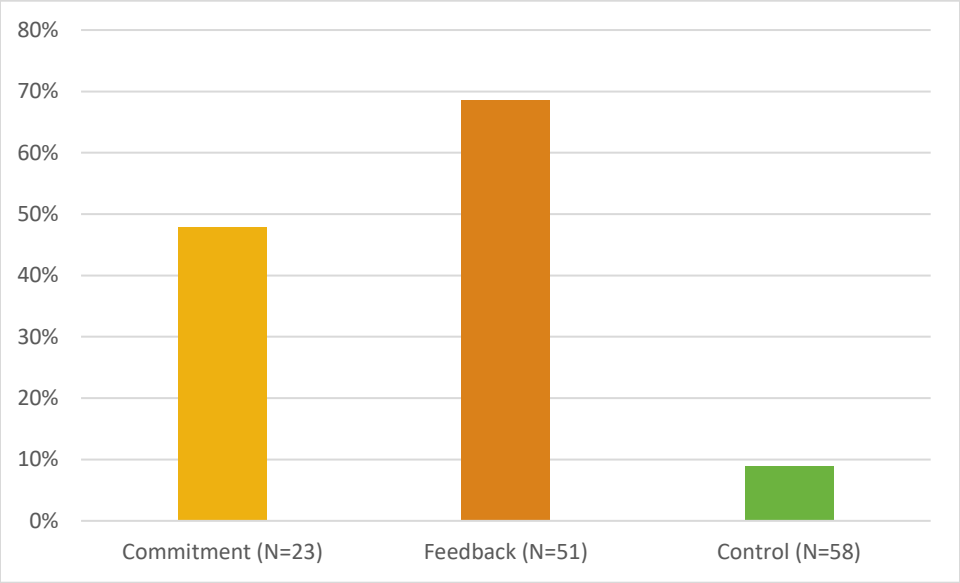
[a]p<0.05 [b]p<0.05

These findings indicate that those high water users may feel particularly strongly about green lawns, and potentially that their lawns would die without summer watering. It may also signal that certain users feel a strong social norm to keep their lawn green, or they may simply like the aesthetics.

Program Materials

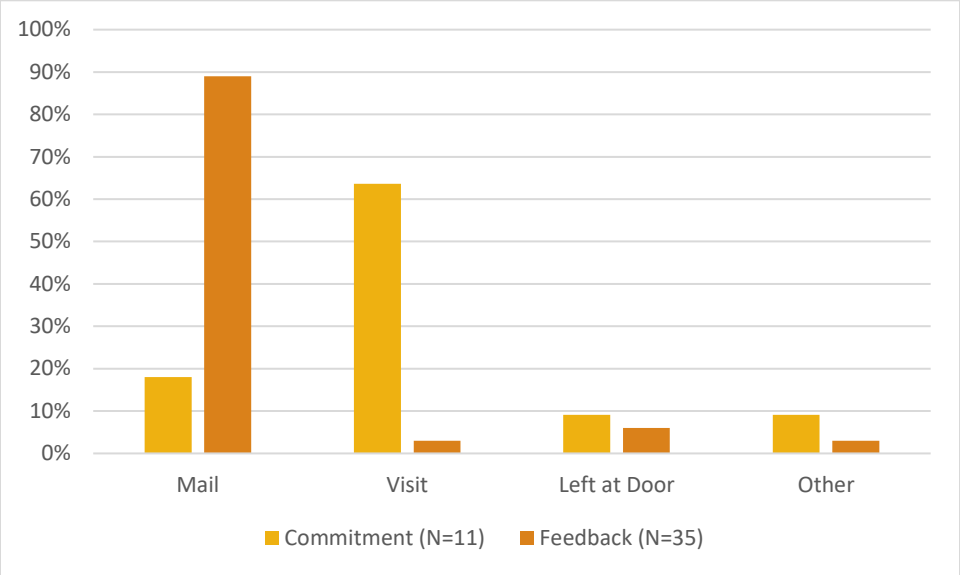
Next, the participants were asked if they remembered receiving the program materials. The majority of the feedback group recalled receiving the program, while only half of the commitment group did (Figure 8). The low recall in the commitment group can be have several possible explanations: (1) the individual filling out the survey was not the individual who spoke to the implementer; (2) the time lag between implementation (June) and the survey (October) and; and (3) the full materials did not go through message testing to test how engaging they were with the target audience.

Figure 8: Recall Receiving Program Materials - Wenham



Next, those who remembered receiving the materials were asked how they were delivered (Commitment = 11, Feedback = 35). For the feedback group, they should have received the materials through the mail, while the commitment group should have received materials through a visit (Figure 9).

Figure 9: Channel for Material Delivery - Wenham

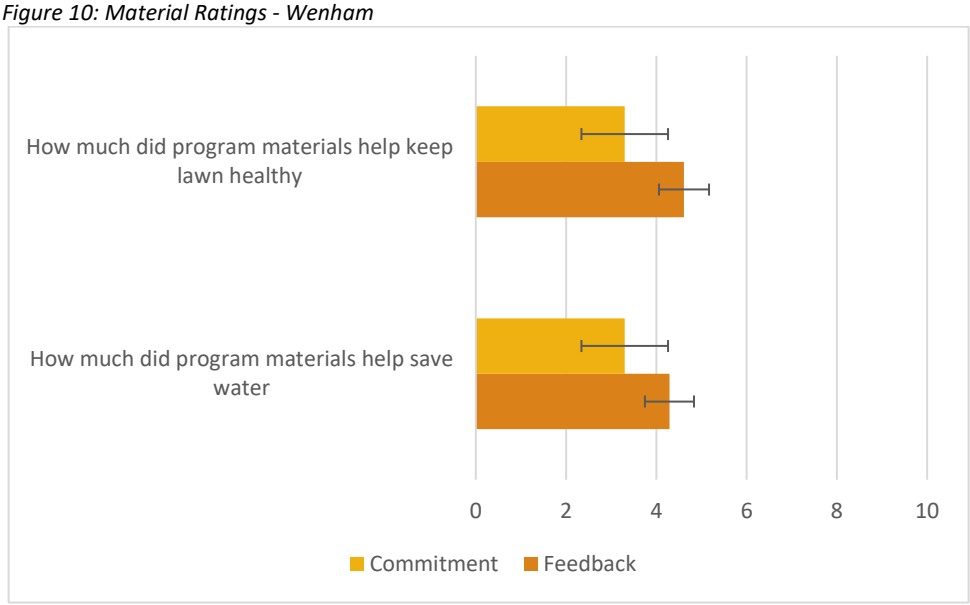


Most households in the treatment groups reported receiving the materials through the expected channel, though the commitment group showed more confusion about where the materials had come from (Figure 9). This lower level of recall was likely due to the longer time lag between the commitment delivery (early in the summer) and the mail delivery (June and August), as well as the potential that the individual filling out the survey was not the person who spoke to the in-person implementer.

Material Ratings

Participants were then asked to rate how helpful the materials were for keeping their lawn healthy and saving water (Figure 10).

Figure 10: Material Ratings - Wenham



Both groups rated the materials in the low-to-mid range of usefulness, with the feedback group rating them more positively than the commitment group, though the difference was not statistically

significant. The lower ratings may have been due to the number of residents who reported already not watering during the summer, which was tested in the exploratory analysis.

Exploratory Analysis - Materials

Exploratory analyses comparing households who rated the materials as not very helpful for either metric (0-3) and those who rated the materials medium to high helpful for either metric (4-10) found that those who rated the materials as more helpful were statistically more likely to use more summer water in the summer of 2016 and the summer of 2017 (Table 12 and Table 13). Overall, this finding suggested that households that were higher consumers of water were more likely to find our materials helpful for keeping their lawn healthy and saving water, and that the lower ratings overall may be related to the fact that many households already did not water their lawns.

Table 12: Helpfulness of Materials for Keeping Lawn Healthy and Water Use (gallons) - Wenham

	Average Water Use Summer 2016	Average Water Use Summer 2017
Low helpfulness (N = 18)	22,944[a]	22,056[b]
Medium to high (N=21)	48,857[a]	42,333[b]

[a]p<0.05 [b]p<0.05

Table 13: Helpfulness of Materials for Saving Water and Water Use (gallons) - Wenham

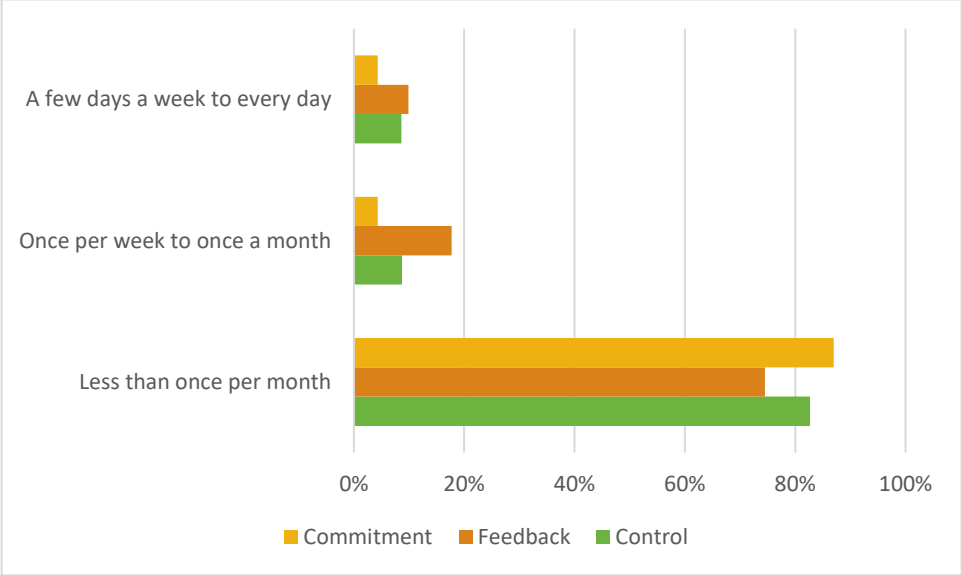
	Average Water Use Summer 2016	Average Water Use Summer 2017
Low helpfulness (N = 17)	27,118[a]	24,235[b]
Medium to high (N = 22)	44,455[a]	39,727[b]

[a]p<0.05 [b]p<0.05

Self-Reported Behavior

Finally, respondents were asked how often they watered during the summer (Figure 11).

Figure 11: Self-reported Lawn Watering Frequency - Wenham



Overall, the majority of all groups reported watered very infrequently, with the feedback group having the highest percentage of households who watered in the mid-range of frequency during the summer. However, without a pre-pilot survey, it is unclear if the households already watered more frequently

prior to assignment to the group, but it may support the theory that the final feedback group ended up with significantly more households that already watered in the summer.

Exploratory Analyses – Self-reported Behavior

Exploratory analyses looking at those who reported watering rarely or never in the summer (less than once per month to never) compared to those who reported watering more frequently (once per month or more) showed that households that self-reported watering more used statistically significantly more water during the summer of 2016 and the summer of 2017 (Table 14). Overall, this suggests that households accurately identified their own watering behavior. The finding also suggests that the households that reported watering during the summer in 2017 also watered during the summer in 2016, though the difference is slightly larger in 2017, where the low to no watering group reduced by 4,424 gallons, while the medium to high watering group only reduced by 2,737 gallons.

Table 14: Self-reported Watering Behavior and Water Use (gallons) - Wenham

	Average Water Use Summer 2016	**Average Water Use Summer 2017**
Low to no watering (N = 99)	30,000[a]	25,576[b]
Medium to high watering (N = 22)	50,000[a]	47,263[b]

[a]p<0.01 [b]p<0.01

Survey comments

While the survey comments were not coded and analyzed specifically, one particular theme in the comments suggested an additional unaddressed barrier. Users who relied on private well water were intentionally removed from the sample, as their water use could not be monitored and evaluated. Despite the fact that well users were specifically excluded, a few households still mentioned private well water, and alluded to the ability to use it without the same consideration of "saving water." This speaks to a potential misperception that wells do not draw from the same water supply, and therefore do not need to be conserved. One comment is shown below as an example; all comments are listed in Appendix G.

"Want to be able to use irrigation system. Should be able to use well water at owner's discretion."
"I wonder why homes with sprinkler systems don't have to dig a well…"

Middleton Water Data

As discussed previously, the random assignment in Middleton was compromised, creating a challenge for the data analysis. However, we still completed analysis to determine what patterns, if any, existed. As noted previously, the primary metric of evaluation was water usage. All groups began with 125 households randomly assigned. The outreach team was given an incorrect address list, requiring numerous households to be removed from analysis. In addition, the water data were pre-processed and households reporting "0" water use for an entire pilot quarter (3 months) were removed, as they either had moved or had a problematic recording (Table 15).

Table 15: Final Sample Size for Middleton Pilot

Condition	# Removed for "0" water use	# Added/Removed for Other Errors	Remaining Sample
Commitment	14	13 addresses **added** (households with private wells – no water data available, but included for survey) 24 addresses from control group **added** (but did not receive pre-notification) 106 addresses **removed** (not on list given to group) 1 address refused materials, **removed**	41
Feedback	8	15 addresses received commitment, **removed** 2 post office returns, **removed**	100
Control	6	45 addresses **removed,** received some interaction from implementation team* 8 bad addresses (duplication, returned), **removed**	68

* All 45 control group addresses that received some interaction from the implementation team were removed from the control group. Of those 45 addresses, 24 received an in-person visit; these were added to the commitment group. The remaining 21 addresses had materials left at their door (not an intentional part of the campaign, but done by some volunteers), hence they were dropped from subsequent analyses.

Scatterplots and Boxplots

As with Wenham, to visualize the data, the data were mapped in scatterplot graphs for each condition, comparing the summer quarters of 2016 to 2017 (Figure 12–14). A linear change line was included to demonstrate the comparative usage. Households above the line increased their water usage in 2017, while households below the line decreased usage. Scatterplot graphs for each quarter are available in Appendix F.

Figure 12: Middleton Commitment Condition, 2016 vs. 2017 Summer Usage

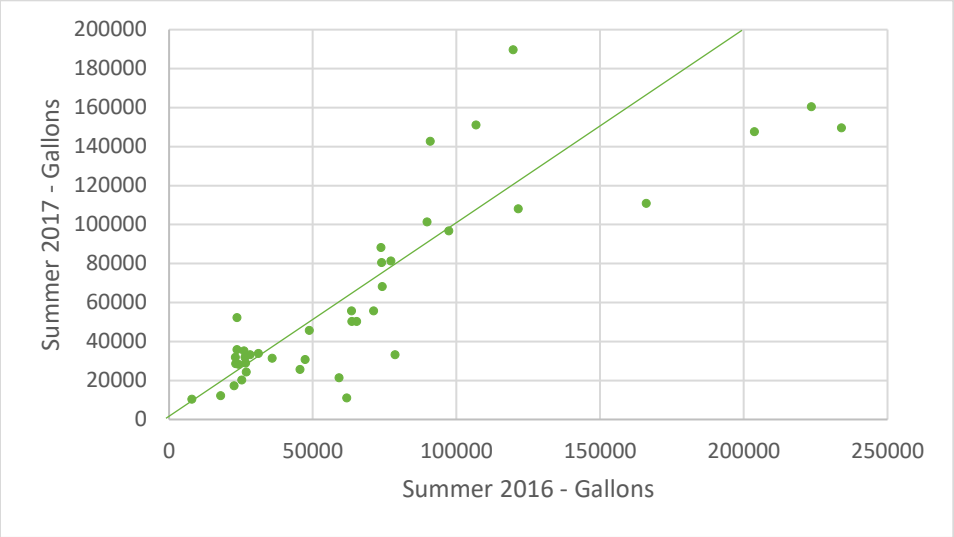


Figure 13: Middleton Feedback Condition, 2016 vs. 2017 Summer Usage

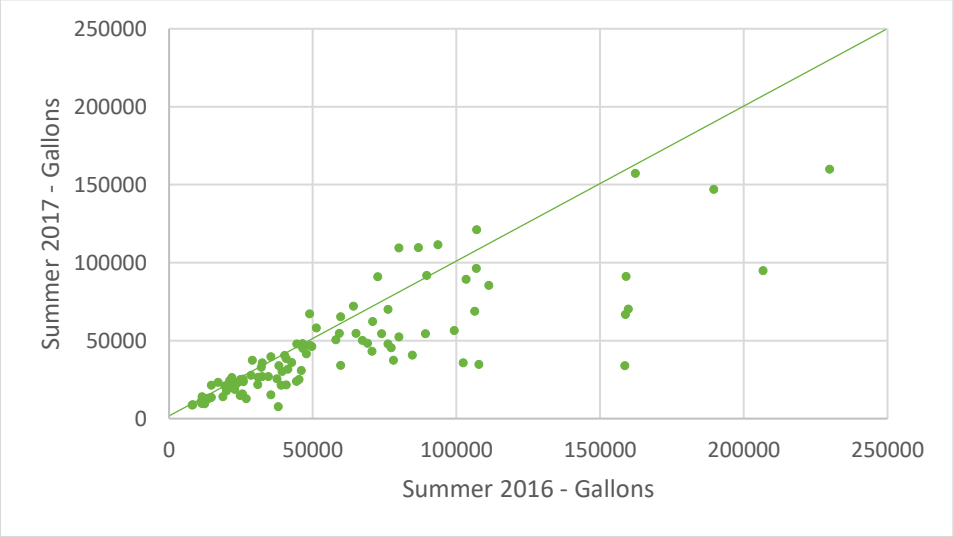
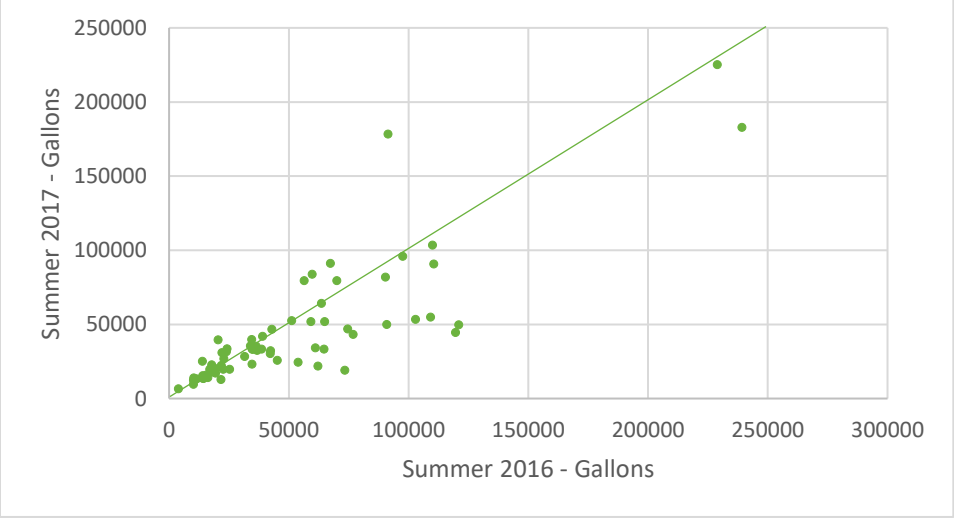


Figure 14: Middleton Control Condition, 2016 vs. 2017 Summer Usage



As discussed previously, in consideration of the in-person, visible implementation, random assignment was conducted by street in usage, and then the list of streets was randomly assigned to participation. Outliers were kept in the pilot as the high users comprise a large proportion of total water use and the readings are believed to be accurate. However, the final distribution of households showed that each of the control group and the treatment groups appeared to have very different patterns of usage. To further illustrate the usage, box-and-whisker plots were created for each group (Figure 15–17).

Figure 15: Middleton Commitment Condition, 2016 & 2017 Summer Usage by Quartile

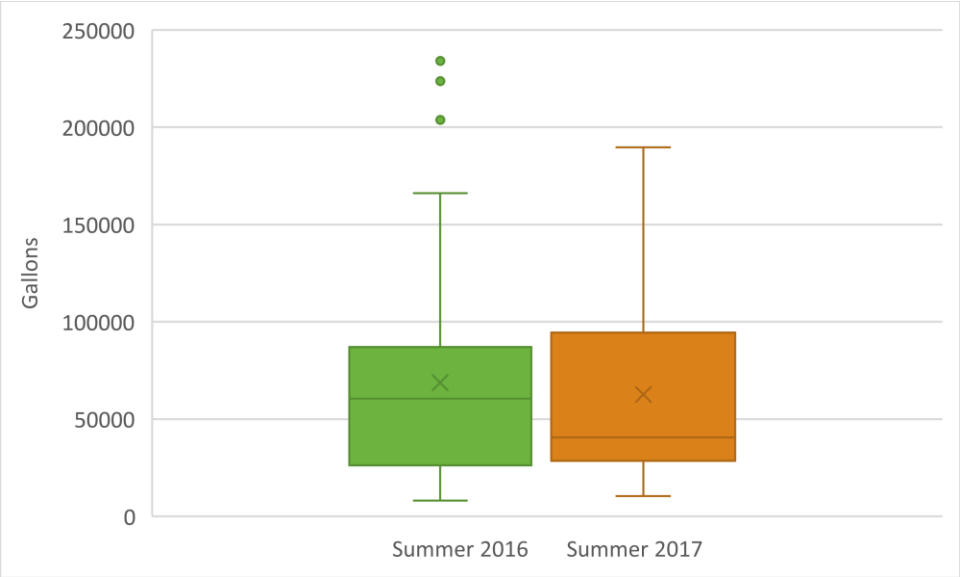


Figure 16: Middleton Feedback Condition, 2016 & 2017 Summer Usage by Quartile

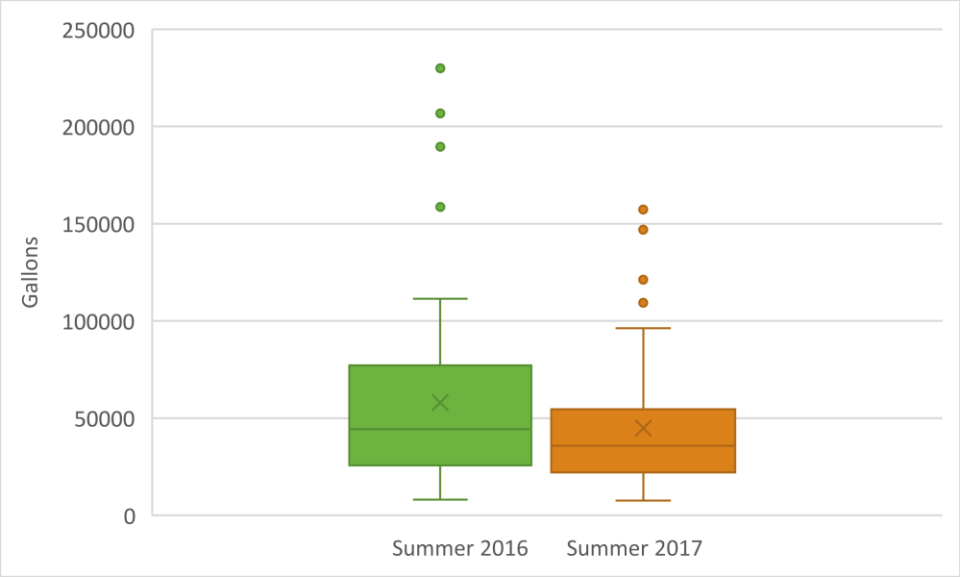
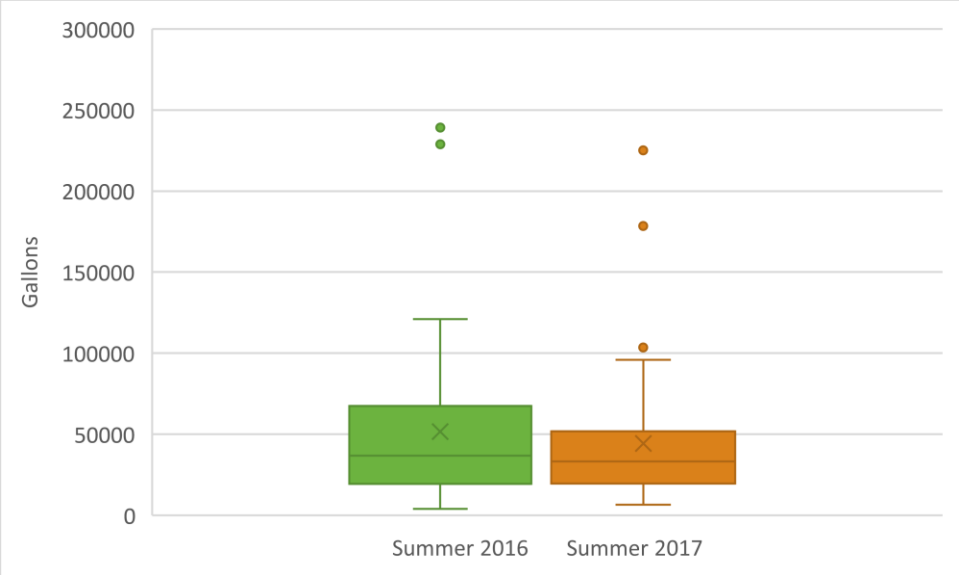


Figure 17: Middleton Control Condition, 2016 & 2017 Summer Usage by Quartile



Given the wide variability of the data, addresses with excessive change between years were removed from the analysis (Table 16). Specifically, excessive change was defined as households who had changed between summers greater than 2.5 times the standard deviation.

Table 16: Second Round of Removal for Extreme Usage - Middleton

Condition	# Removed for extreme usage	Remaining Sample
Commitment	1	40
Feedback	8	92
Control	3	65

Analysis of Summer Quarters

Next, we calculated the means and medians for the 2016 and 2017 July to September quarter, and the means and medians of the combined June and September quarters (hereafter, referred to as the "Summer quarters"). Given the timing of the summer quarters in Middleton, analysis focused on both the combined summer metric and the September quarter. The program was implemented only during the September quarter, and July, August, and September are the priority months for watering, so looking at that quarter alone can provide insight that neither of the quarters alone in Wenham could provide. However, the summer quarters combined can also provide some insight into the entire watering time period, and to provide consistency with Wenham's analysis (Table 17).

Table 17: Mean Usage (gallons) - Middleton

	Mean Usage July - Sept 2016	Mean Usage July - Sept 2017	Mean Usage Summer 2016	Mean Usage Summer 2017
Commitment	35,775	35,476	63,247	59,352*
Feedback	28,270	25,260	49,162	42,295
Control	27,902	25,548	48,096	41,726*

* $p<0.05$

No significant differences were found for the feedback group between summer 2016 and summer 2017. Given the challenges with random assignment, it is difficult to say if a lack of change is due to the program, or due to uncontrolled confounding variables, as neither treatment group was statistically different from the control. In the combined summer quarters, the commitment group's usage was statistically higher than the control group, but given the challenges with random assignment and the lack of a statistical difference in the September quarter, the difference is not likely attributable to the program.

Median Water Use

Next, we calculated the medians for the 2016 and 2017 September quarter, and the medians of the 2016 and 2017 combined summer quarters (Table 18).

Table 18: Median Usage(gallons) - Middleton

	Median Usage July - Sept 2016	Median Usage July - Sept 2017	Median Usage Summer 2016	Median Usage Summer 2017
Commitment	24,059	19,660	54,014	35,362
Feedback	22,440	16,588	40,857	33,993
Control	17,465	14,873	34,986	32,165

For the medians, we used a Mood's Median test to test the control group versus the commitment group and the control group versus the feedback group if the medians were also significantly different, but no statistical differences were found.

Water Use Change Over Time

Next, we calculated the total mean change and the percent change between the July to September quarter of 2016 and the July to September quarter of 2017, as well as the summer of 2016 and the summer of 2017 (Table 19). The gross difference and percentage change were calculated at the group level (mean) to reduce the effect individual variation had on the total usage as a group.

Table 19: Average Total and Percentage Change in Group Water Use - Middleton

	July to Sept 2017- July to Sept 2016		Summer 2017- Summer 2016	
	Difference in Usage (gallons)	% Change in Usage	Difference in Usage (gallons)	% Change in Usage
Commitment	-299	-1%	-3,895	-6%
Feedback	-3,010	-11%	-6,867	-14%
Control	-2,354	-8%	-6,370	-13%

The feedback group showed the largest gross reduction and percent change from 2016 to 2017, for both the July to September quarter and the Summer quarters, while the commitment group had the lowest. Again, given the compromise of the random assignment, particularly for the control group, the changes cannot be attributed to the program – however, given that the feedback group still had 92 households and did see an 11% or 14% drop, depending on the quarter, is positive, and slightly higher than other groups. Similarly, for the gross change, while all groups decreased between 2016 to 2017, the feedback group did decrease by more gallons than the others (657 gallons less than the control in September, and 497 gallons less than the control over the summer).

The complete lack of change in the commitment group (-1% for September and -6% for the summer) could be a signal that the in-person communication channel is not appropriate for the area, the random

assignment/different composition challenges, or how some households did not receive a pre-notification about the program.

Middleton Survey Data

As noted in the Wenham survey section, all participating households were sent a survey to assess their attitudes, behaviors, and perceptions of the materials received. The households were also asked if they remembered receiving materials, and if so, how they received them. This provided a verification check to see if respondents remembered receiving the materials through the correct channels for their group. The commitment group was included in the analysis below, but it is important to note that statistical tests were not run due to the small sample size. Surveys were only sent to members of the commitment group who received the program. The survey response rate for Middleton was 43% overall, and the response by condition is below (Table 20).

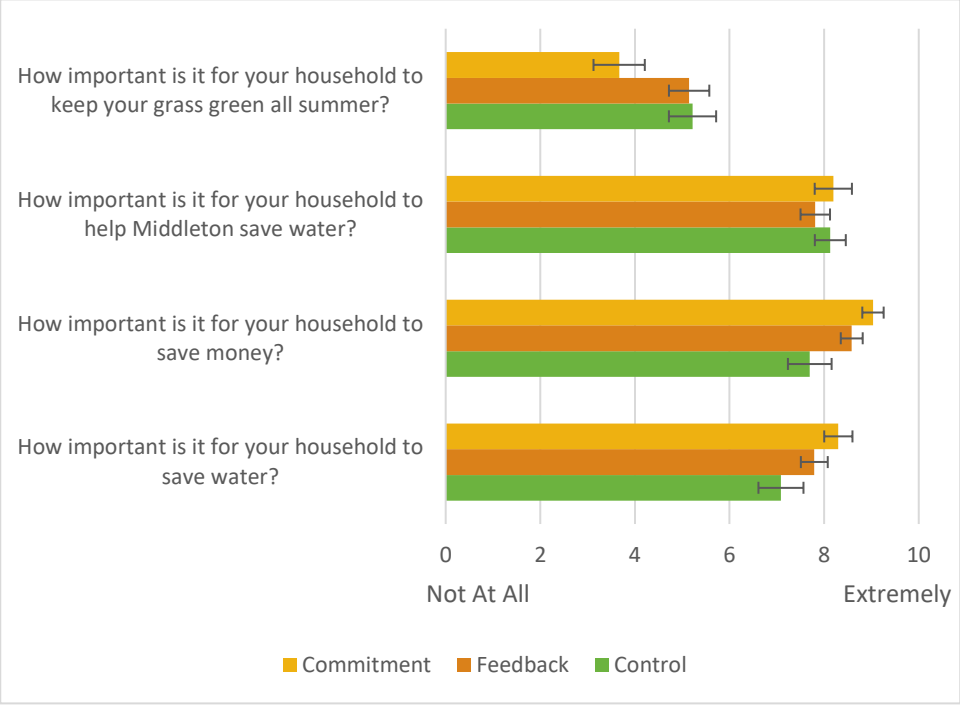
Table 20: Survey Response - Middleton

Condition	Number of survey respondents	Response Rate
Commitment	23	42%
Feedback	47	44%
Control	30	42%

Conservation Attitudes

First, households were asked about their attitudes around saving water and lawns, ranking the level of importance of four items on a 0 to 10 scale, where 0 was not at all important and 10 was extremely important (Figure 18).

Figure 18: Conservation Attitudes - Middleton



Overall, the results for the importance of saving water for Middleton were consistent among groups, but the control group rated the importance of saving money and saving water in their households slightly lower than the commitment or feedback groups. Interestingly, the commitment group rated the importance of a green lawn lower than the feedback and control groups. Given the compromise of the random assignment, however, it is harder to determine if the difference is due to the condition or to uncontrolled variables that would be assumed equal in a random assignment context (e.g., income, age, education).

Exploratory Analysis – Importance of a Green Lawn

Exploratory analyses comparing residents who rated a green lawn as not at all important (0-3) to those who rated it medium to highly important (4-10) found a statistically different average water use in both the September quarter and summer of 2016 and the September quarter and the summer of 2017 (Table 21).

Table 21: Importance of a Green Lawn and Water Use (gallons)- Middleton

	Average Water Use Sept 2016	Average Water Use Sept 2017	Average Water Use Summer 2016	Average Water Use Summer 2017
Low importance (N=28)	16,833[a]	15,092[b]	32,381[c]	27,703[d]
Medium to high (N=62)	26,600[a]	25,763[b]	47,003[c]	41,732[d]

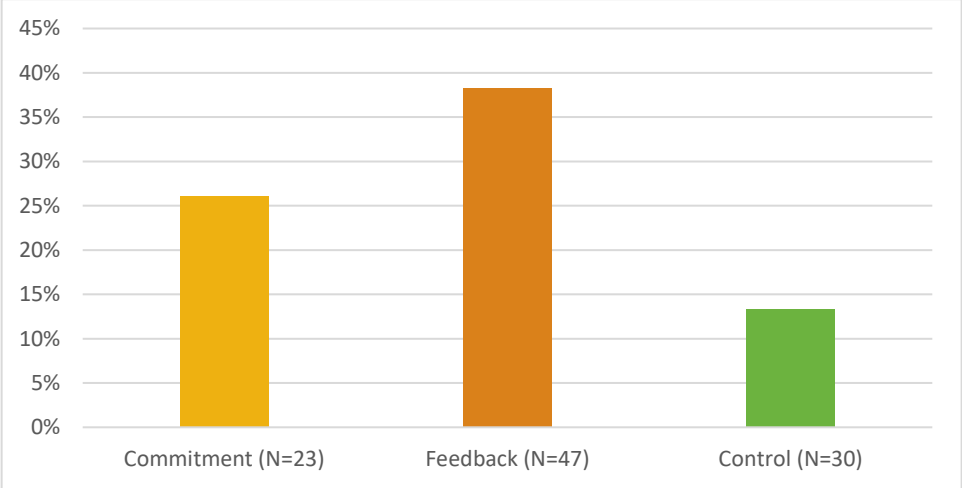
[a]p<0.01 [b]p<0.01 [c]p<0.01 [d]p<0.01

As noted with Wenham, the fact that higher water users rated a green lawn as important is not surprising and may reinforce the barrier that residents may believe their lawn will die if not watered throughout the summer. It may also signal that certain users feel a strong social norm to keep their lawn green or they may simply like the aesthetics.

Program Materials

Next, the participants were asked if they remembered receiving the program materials (Figure 19).

Figure 19: Recall Receiving Program Materials - Middleton

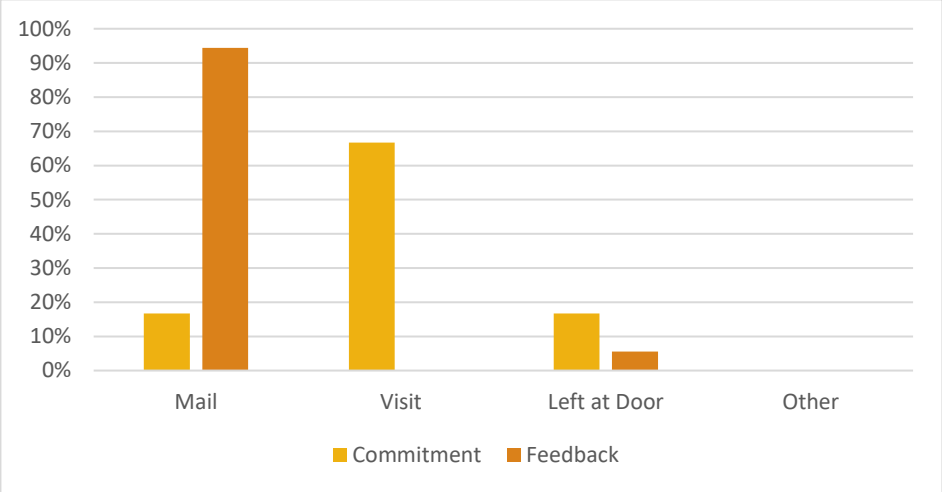


Less than half of both treatment groups remembered receiving the materials. Given the small number of respondents that remembered receiving materials, this creates a challenge for interpreting program results. This is likely due to a combination of factors, including the single delivery of the feedback

information, the potential for a different person filling out the survey than the person who interacted with the materials, the time lag between the program delivery, and potentially a lack of engagement with the materials.

Those who remembered receiving the materials were asked how they were delivered (Feedback = 18, Commitment = 6). For the feedback group, they should have received the materials through the mail, while the commitment group should have received materials through a visit. Most households in the treatment groups reported receiving the materials through the expected channel, though the commitment group showed more confusion about where the materials had come from (Figure 20).

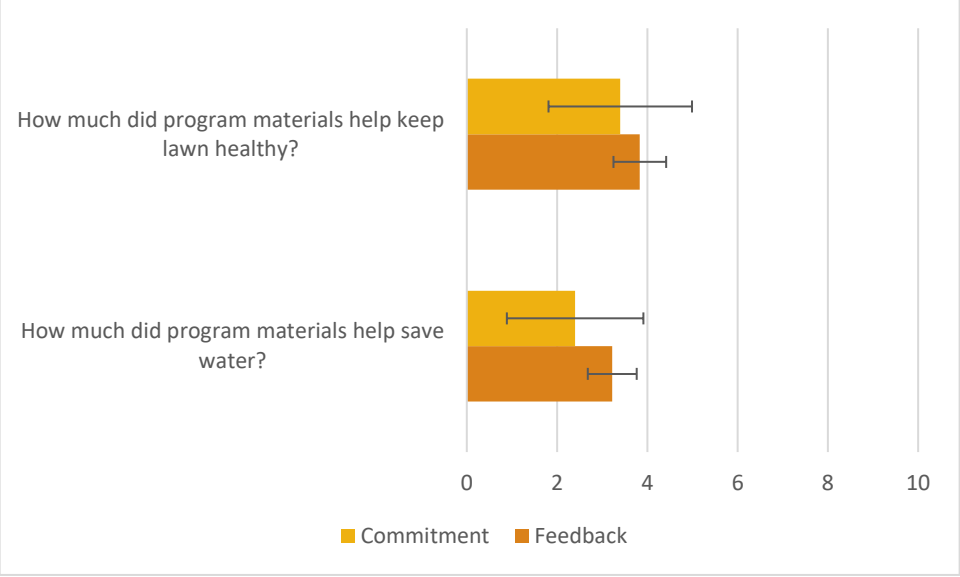
Figure 20: Channel for Program Material Delivery - Middleton



Material Ratings

Participants were then asked to rate how useful the materials were for keeping their lawn healthy and saving water. Both groups rated the materials in the low range of usefulness, with the feedback group rating them slightly more positively than the commitment group (Figure 21).

Figure 21: Material Ratings - Middleton



Exploratory Analysis - Materials

Exploratory analyses comparing households who rated the materials as not very helpful for either metric (0-3) and those who rated the materials medium to high helpful for either metric (4-10) found no statistical differences. A lack of a statistically significant difference was not surprising, given the small sample size.

Table 22: Helpfulness of Materials for Keeping Lawn Healthy and Water Use (gallons) - Middleton

	Average Water Use July – Sept 2016	Average Water Use July – Sept 2017	Average Water Use Summer 2016	Average Water Use Summer 2017
Low helpfulness (N = 15)	31,520	36,165	42,536	38,095
Medium to high (N=10)	27,930	23,655	38,631	28,268

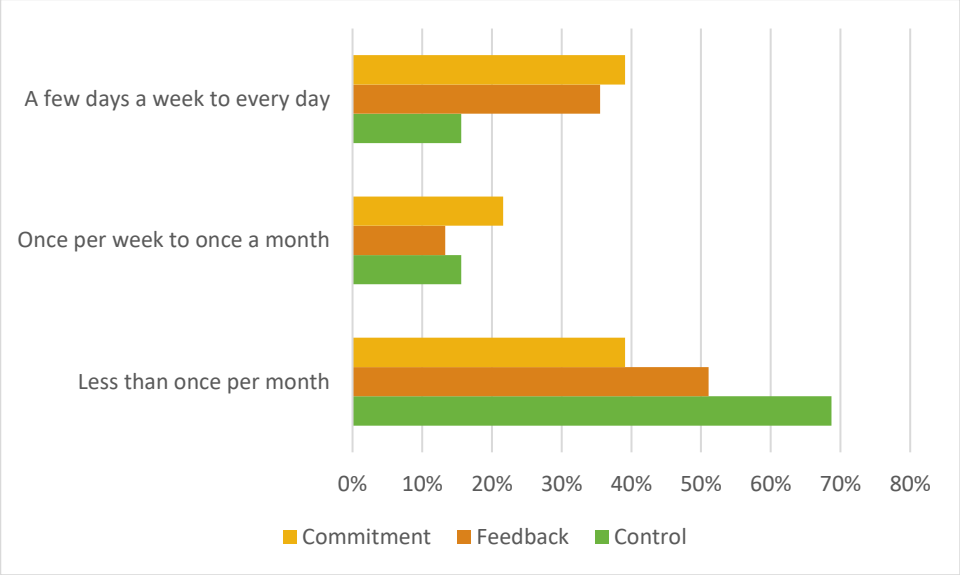
Table 23: Helpfulness of Materials for Saving Water and Water Use (gallons) - Middleton

	Average Water Use July – Sept 2016	Average Water Use July – Sept 2017	Average Water Use Summer 2016	Average Water Use Summer 2017
Low helpfulness (N = 11)	27,915	32,695	45,185	38,138
Medium to high (N = 14)	31,542	22,604	32,704	23,290

Self-Reported Behavior

Finally, respondents were asked how often they watered during the summer (Figure 22).

Figure 22: Self-reported Lawn Watering Frequency - Middleton



For both the feedback and the commitment group, about one-third of the respondents reported watering a few days each week. By contrast, more households in the control group responded that they never watered their lawn this past summer. As with the previous results, we cannot attribute differences to the program, but the difference in self-reported behavior may suggest that the groups did not have an equal spread of those who watered frequently in the summer and those who do not.

Exploratory Analyses – Self-reported Behavior

Exploratory analyses looking at those who reported watering rarely or never in the summer (less than once per month to never) compared to those who reported watering more frequently (once per month

or more) showed that households that reported watering did use statistically significantly more water than those household who did not report watering (Table 24). Overall, households accurately identified their own watering behavior and households that reported watering more in 2017 also watered more in 2016.

Table 24: Self-reported Watering Behavior and Water Use (gallons)- Middleton

	Average Water Use July - Sept 2016	**Average Water Use July - Sept 2017**	**Average Water Use Summer 2016**	**Average Water Use Summer 2017**
Low to no watering (N = 48)	14,563[a]	11,830[b]	27,633[c]	23,318[d]
Medium to high (N = 43)	33,457[a]	34,171[b]	58,824[c]	52,953[d]

[a]p<0.01 [b]p<0.01 [c]p<0.01 [d]p<0.01

Survey comments

While the survey comments were not coded and analyzed specifically, one particular theme in the comments suggested the same unaddressed barrier as Wenham, that all well water users may not understand that their well water should also be conserved, be it their own water or believing that well users do not conserve water. Two survey comments are shown below as examples; all comments are listed in Appendix G.

"We have well water and a septic system, so we are a mostly closed loop of the water cycle. We try to conserve water but do not let it rule our lives."

"People who have wells take from the same aquifer or water source, but still drains the water and should be under the same rules."

Conclusions

Below we discuss the overall conclusions and summative findings from the results. While the challenges faced in implementation meant that we needed to be cautious in interpreting our data, this project provided useful conclusions and recommendations for others pursuing similar goals. It also shed light on program refinements that should be made before larger-scale implementation.

Water Data – Initial Positive Findings

While the control group in Wenham was not similar enough to the feedback group to attribute changes to our program, we did see promising results for the feedback group, which was consistent with the literature around using feedback to change behavior, particularly in water conservation.

Wenham

In Wenham, the feedback group did have the largest decrease by total use (5,336 gallons) from summer 2016 to 2017, and while the median usage was significantly higher than the control in 2016, the median usage was statistically the same as the control in 2017. Given the strong correlation between those who self-reported watering their lawn more and those who used more water in the summer, it is possible that the final sample of the feedback group ultimately had a greater number of households that watered their lawn more prior to the program. If that is true, then the feedback group having an equal reduction in water usage to the control would be a positive finding. For the commitment group, no real change was seen, and ultimately the implementation channel may not be appropriate for the area.

Middleton

In Middleton, the feedback group's average total usage was statistically the same as the control, both in 2016 and 2017. However, the feedback group saw the largest reduction in 2017: 3,010 gallons less as compared to the September quarter in 2016, for a percentage change of 11% from 2016 to 2017. By comparison, the control group saw only a 2,354 gallon, or 8%, drop, and the commitment group reduced by only 299 gallons, or 1% from 2016 to 2017. While the difference between groups was not statistically different, a greater indication of a decrease in water use is still a positive finding.

Weather Variables and Program Timing

As summer watering is a very seasonal- and weather-based behavior, the context of either a rainier or a drier summer season had an obvious effect. The reduction we observed in all groups in water use between 2016 and 2017 was likely related to the fact that the 2017 summer was wetter overall, so there was less reason for people to water.

However, there was still both a higher amount of water used in the summer than the winter and self-reported lawn watering from the survey. This finding speaks to the misperception of how much water grass needs to stay alive, as while 2016 was dry enough that there may have been a point where watering was needed, 2017 had fairly sufficient rainfall. Given the increased rain in 2017, the reaction to the outreach may have also been impacted by the perceived importance of saving water in the local area, as compared to a more severe drought year.

In addition, our outreach was not deployed until June. Given that May had a good number of rainy days, this timing may not have had a huge effect, but we would recommend that future programs seek to reach the audience at the start of the typical outdoor watering season (May).

Material Ratings – Number of Communications

Given the literature around behavior change and normative feedback, we believe that the lower success and recall of the materials in Middleton resulted from only one delivery of normative feedback, as opposed to Wenham's two deliveries.[3] A single letter can be more easily lost, while the second letter may have helped reinforce the program.

In addition, due to the timing of the water data collection quarters and the program launch, Middleton was also only provided a single historical feedback graph, comparing their usage to their neighbors last year, which may not have been as compelling. Unfortunately, given different water use collection quarters across the state, the provision of feedback on water use during the same summer is not possible until updated water collection technology is installed (e.g., automatic meter reading), but it is still important to note the contextual challenge.

Finally, it is likely that the lower success and recall of the feedback group materials in Middleton was also due in part to the compromised random assignment.

Material Ratings – Higher Water Users

While the materials were rated on the low to medium level of helpfulness overall, those who used more water in the summer were significantly more likely to rate our materials as helpful. This suggests that the lower rating may be related to the fact that water usage is more concentrated in a smaller proportion of the total population. Therefore, the many households who already do not water their lawn would, understandably, not find too much useful information in our materials, as they were already taking the desired actions.

Water Use, Attitudes, and Importance of Green Lawns

In this audience, the value placed on green lawns was significantly linked to the level of summer watering. While some correlation was expected, the level of additional average water usage in those who value green lawns ranged from 8,355 gallons more (Wenham's 2017 summer) to 14,622 gallons (Middleton's 2016 summer). In part, this increased usage is likely related to the misperception that grass is dying if it is not green.

The difference also suggests that there could be a strong social norm or aesthetic preference toward green grass in some sub-populations, despite the overall importance of green grass being rated fairly low (less than a 4 in Wenham, and a 5 or less in Middleton). Given the high importance ratings of saving water, ranking close to an 8 in all groups in both towns, we believe that these residents may still not believe that their lawn watering uses a significant amount of water.

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[3] Selected citations on the effectiveness of multiple deliveries of feedback interventions. (1) Action Research. (2017). Motivating Energy Savings in Apartment Buildings Without Financial Incentives: Long Term Persistence. Accepted for presentation at the Behavior, Energy, and Climate Change conference (BECC), Oct 15-18.

(2) Darby, S. (2006). The Effectiveness of Feedback on Energy Consumption: A Review for DEFRA of the Literature on Metering, Billing, and Direct Displays. Energy Change Institute, University of Oxford.

(3) Van Houwlingen, J.H. and Van Raaij, W. (1989). The Effect of Goal-Setting and Daily Electronic Feedback on In-Home Energy Use. J. of Consumer Research 16:1, 98-105. 4

Door-to-Door Implementation

Overall, the results from the water data, the low program recall, and the experience of the implementation teams suggests that door-to-door implementation may not be appropriate for this topic, location, and available resources. The implementation teams worked hard, but through no fault of their own, it seems it is not a good match for this region. If other programs do want to employ a door-to-door program, we recommend using a volunteer or other non-governmental group. While there is no hard data to support a difference in efficacy, given the implementation challenges, the non-governmental group in Middleton reported that their message was received, and were able to commit more manpower to get the message out there, while the governmental implementer in Wenham reported that people were quickly agreeing with him due to his position, rather than taking the time to engage with the message.

Private Well Water Users

This project solely focused on households that draw water from the municipal water supply, as we cannot evaluate the water use of households on private well water. However, in the comments, some households referenced using well water without limitation, which may be a barrier that should be further explored. While the use from wells cannot be tracked, it does still affect the total water available in the area.

Lessons Learned

Overall, the biggest lessons that emerged from this pilot were a variety of potential challenges other organizations and towns may face when implementing behavior change work around lawn watering behavior and water conservation. Suggestions for addressing these challenges are listed below:

Study Design

1. Normative feedback is likely the most promising pathway to change behavior;
2. If possible, make household's feedback more recent and timely. For example, consider if automatic meter reading technology is feasible to introduce to the area;
3. Deliver the program earlier in the summer (May) to avoid materials arriving when summer habits may have already been established;
4. Deliver more than one communication for mailed materials, such as having a second mailing to the feedback group to increase engagement and recall;
5. Door-to-door teams may not be appropriate for this topic, location, and available resources;

Sampling and Data

6. Consider focusing primarily on medium to high water users, or better still, users with a high summer:winter water use ratio;
7. Given the data will include extreme usage outliers (as the usage is considered accurate), consider the distribution of sampled groups without them to ensure equivalency with dropouts;
8. Use a larger sample size to account for dropouts and high variability in data;
9. Conduct random sampling at a household level;
10. If possible, pilot test interventions in communities with more frequent data collection (e.g., monthly billing) to avoid over-reliance on one to two data points. If not possible, use communities with the same quarters to allow for comparison of the same months;

Materials and Additional Research

11. Consider if there are important subgroups that have additional barriers;

12. Consider if materials should further address weather variables, such as if the summer has been rainy, specifically speak to the importance of still conserving;
13. Consider if materials should further address residents who value green lawns; and
14. Consider if additional programs should further address residents who use private wells.

Importance of Pilot Testing

Most importantly, the results of this pilot highlight the importance of small pilot programs. Programs may check all the boxes in planning, but still have unforeseen challenges when in the field, as was experienced in this pilot. The purpose of a pilot is to identify and address problems before launching a campaign throughout the community, county, or state. A pilot allows for the identification of problems and allows the organization to refine their strategy until it succeeds. While it is frustrating to not see the results we set out to achieve, it is better to revise a pilot rather than fix a larger project, where the problems would be much more difficult and expensive to fix. It is also critical to remember that many programs do not conduct in-depth evaluations, much less ones that focus on evaluating actual behavior change and miss the opportunity to correct course and improve.

Next Steps and Recommendations

Based on the positive trends in the normative feedback group, we suggest the following next steps to further flush out what elements of the program were successful, what needs improvement, and if there were any unaddressed barriers to action.

Sample Design – Household vs. Street

The population within the towns had significant variability by location, which demonstrates the need for strict random sampling that specifically mixes neighborhood geography (i.e., assignment at the household level instead of the street). After initial random sampling, treatment and control groups should be compared to ensure that household water use means, medians, and distributions are statistically similar prior to finalization of the sample. Despite our successful use of street-level randomization in other pilots, including pilots focused on water conservation, this method seems to not be appropriate for this topics in this region. For example, streets with newer development may have installed irrigation during construction, rather than older homes that would need to seek out installation. In addition, certain areas may have a stronger social norm around green lawns, which is a very visible signal of watering. Our recommendation is that if a pilot in this region seeks to implement a visually noticeable condition, random assignment should still be completed at a household level, and the control could be considered a minimal contact, rather than a no-contact control. Alternatively, neighborhood sections could be matched for average usage and distribution of water users, based on several years of data, and then assigned to group.

Distribution of Water Users – Quartiles

During the data analysis, the project team discussed splitting the households by quartiles and reviewing the top 10% and top 5% of users. While this would likely have been possible if the Middleton and Wenham samples were combined, the small size of each condition split by town did not allow for meaningful comparisons. A small sample size can be compared descriptively, but given the small number of households, we cannot speak to how representative each group is of the larger community or town population. For future pilots, we recommend a larger sample size to ensure that we have a sufficient number of households in each quartile to allow for statistically meaningful quartile analysis.

Distribution of Water Users– Additional Data

For any water conservation pilot's random assignment in this region, we recommend that the segmentation of users by water usage includes data from at least two to three years and considers if the user is a generally higher user, particularly in the summer. We would also suggest that any households that have moved in that last year are excluded from the sample. In addition, as possible, the period of record should include wetter and drier summers to allow for sampling to be done with a better understanding of the population. Finally, in respect to capturing primarily households who do water in the summer, we recommend considering if the stratified sampling should stratify based on the households' summer:winter water use ratios as opposed to overall use.

Distribution of Water Users– Outliers

After sampling, the median, mean, and distribution of groups should be further examined to ensure similarity. If extreme high users are included, as they were in this pilot, the median, mean, and distribution should be examined with and without them to ensure the distribution of users is reliable and similar without these outliers, as necessary.

Additional Research – Message Testing

Based on the positive trends and behavior change literature, we do believe that the normative feedback program would be successful in promoting reduced lawn watering. Ultimately, the normative feedback program does need additional testing with a larger sample size to demonstrate its efficacy. The trends showed that feedback households conserved water as compared to their previous consumption, despite the various challenges in implementation, and potentially despite having more households that regularly water their lawns in the summer.

However, the results indicate it is worth the time to conduct additional message testing, particularly if using these materials in other regions with differing demographics. The outreach materials could be tested in additional communities through focus groups or intercept interviews to gather feedback and ensure the messages are clear and engaging.

Additional Research - Barriers

In addition, congruent with the community-based social marketing approach, when we do not experience the expected level of success, we also look back at our process to determine where we may need additional information to strengthen our pilot – did we select the best strategies? Did we target the best audience(s) or action(s)? Did we address all barriers?

In this case, the timing of peak water use and the amount of water that one needs to water a lawn suggest that these were the correct barriers and audiences. Therefore, it may be that we did not fully address the barriers to lawn watering behaviors, such as not fully convincing residents they can skip watering without their grass dying. There may also be barriers that were not strategically addressed, such as specific subpopulation norms around the aesthetics of a green lawn.

Further testing could also focus on gathering more information on barriers and benefits on very specific lawn watering behaviors, such as letting grass grow long or watering early in the morning, to ensure that barriers to alternative behaviors have been sufficiently addressed. For example, the foundational research focused on the general population, but barriers may be different in the high-water user population, such as a greater dependence on lawn services. Given the number of respondents

throughout our work that reported little to no summer lawn watering, a focus on these high-water users may be the strongest approach. This research could be completed along with the message testing described in the previous paragraph, such as in focus groups or intercept interviews.

Appendix A: Feedback Outreach Material - Wenham

Below are images and text of each of the materials designed for the pilot, first for Wenham and then Middleton.

Pre-notification Postcard : Feedback, Wenham

Introducing *Healthy Lawn, Happy Summer*

Dear Resident,

Within the next few weeks, you will receive an envelope with materials on the town's new *Healthy Lawn, Happy Summer* campaign. 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 Wenham to save water for themselves and their communities while keeping their lawns healthy all summer.

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

Sincerely,

Erik G Mansfield, Superintendent
Wenham Water Department

emansfield@wenhamma.gov
(978)468-5520 x6

Division of Ecological Restoration
Invested in Nature and Community

TOWN OF WENHAM
ENON
INCORPORATED SEPT 7, 1643
MASSACHUSETTS

Cover letter: Wenham

WATER DEPARTMENT
91 GRAPEVINE RD.
WENHAM, MA 01984

Erik G Mansfield
Superintendent

Telephone: (978) 468-5520 x6
Fax: (978) 468-1009

Dear Resident,
As summer approaches, the Town of Wenham is working with the Massachusetts Division of Ecological Restoration to support our residents in saving water and money while keeping their lawns healthy. As a community, we have a limited amount of water, even in years when we receive rain, and we need to conserve that resource to make sure there is enough for all. By watering more efficiently, or not at all, residents can still maintain a healthy lawn while conserving water.

We know that our residents are already taking action to save water. In a 2016 survey of households here in Wenham, more than half of residents 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. We developed *Healthy Lawn, Happy Summer* to help residents keep their lawns healthy in summer while saving water at the same time. Our materials are included with this cover letter.

If you have any questions, please call (978)468-5520 x6 or email emansfield@wenhamma.gov.
Sincerely,

Erik G Mansfield
Superintendent, Wenham Water Department

Flyer: Wenham

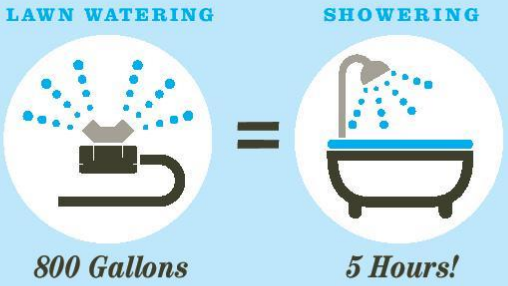
HEALTHY LAWN HAPPY SUMMER

Each of us makes a big impact in Wenham.

Reduce Lawn Watering

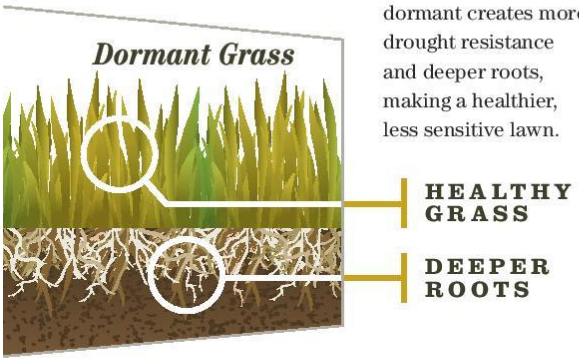
Eliminating or reducing summer lawn watering makes a big difference. Massachusetts households that water their lawns in the summer use up to 800 gallons a week. That's like running your shower for 5 hours!

The fact is, ***a Wenham 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.



Keep It Natural

We get an average of 4 inches of rain per summer month, enough for healthy summer lawns. ***Lawns need, at most, an inch of water a week to stay healthy.*** Sometimes healthy grass goes dormant. Dormant grass is not dead and will go back to green. Going dormant creates more drought resistance and deeper roots, making a healthier, less sensitive lawn.



More than half of Wenham 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.***

Save Water & Keep Your Lawn Healthy All Summer

During a Wenham summer, a healthy lawn will likely not need irrigation. However, if you must water your lawn, ***follow the tips below*** to water without waste.

1. Let grass grow long to stay healthy.
2. Water early in the morning to avoid water loss.
3. Water infrequently to encourage deep roots.
4. Water by hand, as automatic irrigation uses twice as much water.
5. If you have a lawn care crew, communicate to them that saving water is a priority and share this flyer.

Division of Ecological Restoration
Invested in Nature and Community

TOWN OF WENHAM MASSACHUSETTS INCORPORATED SEPT 1, 1643

Save water and money

for yourself & your community by watering your lawn wisely or not at all: no more than one inch per week of rain and watering.

www.wenhamma.gov/waterconservation

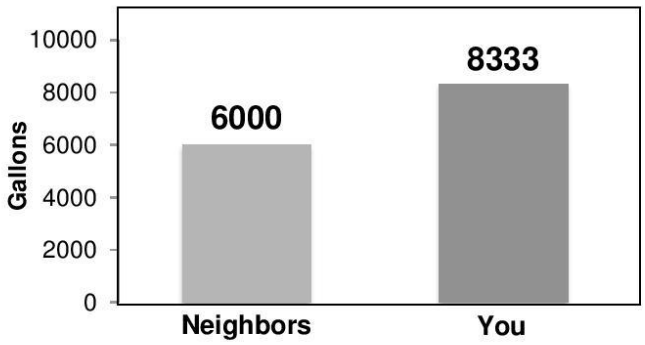
Feedback Sheets: Wenham

Join Wenham Neighbors In Summer Water Savings!

How do you compare?

More than half of Wenham residents—including Town Hall—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 (May-July 2016)



During May, June, and July 2016, your household used

more water

than the average similar-sized Wenham household.

Your household has some 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 Wenham's water resources while keeping our lawns healthy all summer.

Division of Ecological Restoration

Invested in Nature and Community

Thank you for helping your community!

www.wenhamma.gov/waterconservation

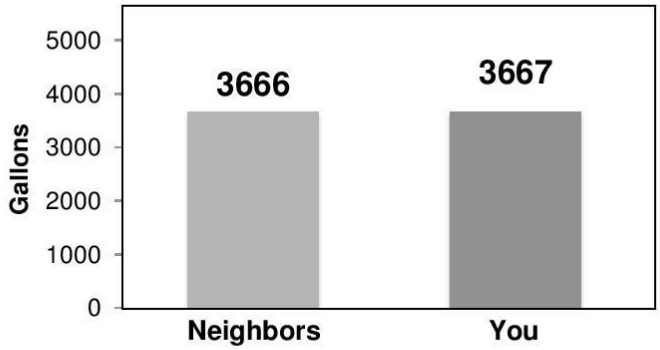
1148

Join Wenham Neighbors
In Summer Water Savings!

How do you compare?

More than half of Wenham residents—including Town Hall—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 (May-July 2016)



During May, June, and July 2016, your household used

the same

as the average similar-sized Wenham household.

Your household is doing great, but can save more with your water usage.

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

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

Division of Ecological Restoration

Invested in Nature and Community

Thank you for helping your community!

www.wenhamma.gov/waterconservation

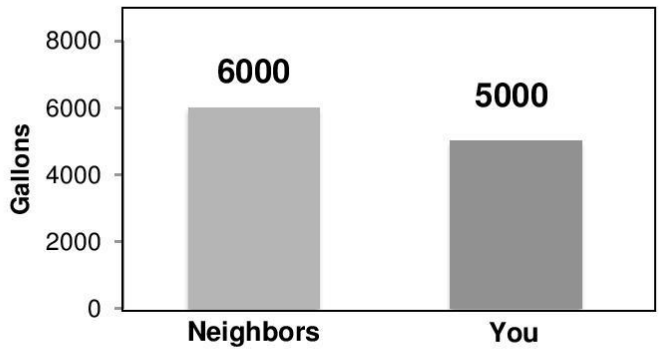
1194

Join Wenham Neighbors In Summer Water Savings!

How do you compare?

More than half of Wenham residents—including Town Hall—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 (May-July 2016)



During May, June, and July 2016, your household used

less water

than the average similar-sized Wenham household.

Your household is doing a good job regarding your water usage.

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

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

Division of Ecological Restoration

Invested in Nature and Community

Thank you for helping your community!

www.wenhamma.gov/waterconservation

1130

Appendix B: Commitment Outreach Material -Wenham

Pre-notification Postcard: Commitment, Wenham

Introducing *Healthy Lawn, Happy Summer*

Dear Resident,

Within the next few weeks, an ambassador from the Wenham Water Department or Water Commission will come to your home to talk about the town's new *Healthy Lawn, Happy Summer* campaign. It will include tips on how to conserve water in the summer months and a chance to be part of a community effort.

Healthy Lawn, Happy Summer encourages those who live in Wenham to save water for themselves and their communities while keeping their lawns healthy all summer.

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

Sincerely,

Erik G Mansfield, Superintendent
Wenham Water Department

emansfield@wenhamma.gov
(978)468-5520 x6

Division of Ecological Restoration
Invested in Nature and Community

Flyer: Wenham

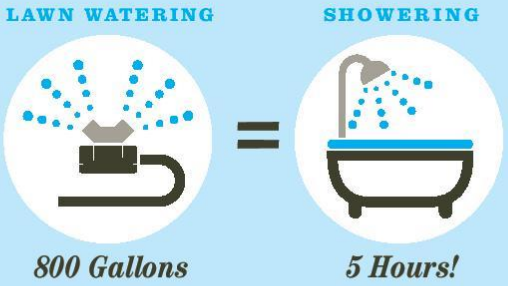
HEALTHY LAWN HAPPY SUMMER

Each of us makes a big impact in Wenham.

Reduce Lawn Watering

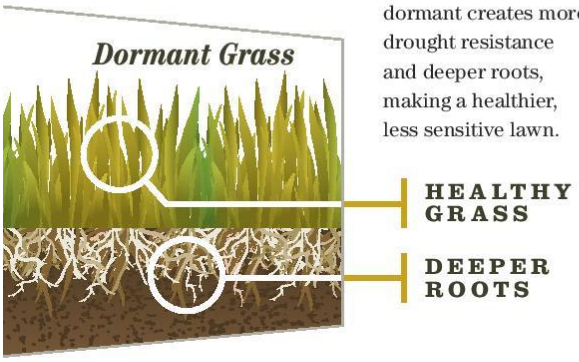
Eliminating or reducing summer lawn watering makes a big difference. Massachusetts households that water their lawns in the summer use up to 800 gallons a week. That's like running your shower for 5 hours!

The fact is, ***a Wenham 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.



Keep It Natural

We get an average of 4 inches of rain per summer month, enough for healthy summer lawns. ***Lawns need, at most, an inch of water a week to stay healthy.*** Sometimes healthy grass goes dormant. Dormant grass is not dead and will go back to green. Going dormant creates more drought resistance and deeper roots, making a healthier, less sensitive lawn.



More than half of Wenham 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.***

Save Water & Keep Your Lawn Healthy All Summer

During a Wenham summer, a healthy lawn will likely not need irrigation. However, if you must water your lawn, ***follow the tips below*** to water without waste.

1. Let grass grow long to stay healthy.
2. Water early in the morning to avoid water loss.
3. Water infrequently to encourage deep roots.
4. Water by hand, as automatic irrigation uses twice as much water.
5. If you have a lawn care crew, communicate to them that saving water is a priority and share this flyer.

Division of Ecological Restoration
Invested in Nature and Community

TOWN OF WENHAM MASSACHUSETTS INCORPORATED SEPT 1, 1643

Save water and money

for yourself & your community by watering your lawn wisely or not at all: no more than one inch per week of rain and watering.

www.wenhamma.gov/waterconservation

Script for Door-to-Door Implementation: Wenham

Wenham Door-to-Door Script

Hi,

My name is _____ and this is _____. We're here on behalf of the Town of Wenham Water Department. We are visiting your neighborhood today to talk to residents about our new effort to help you save water and money while keeping your lawns healthy all summer.

Are you aware of the water restrictions in place for this summer?

- IF YES: Great! To help you stay within the restrictions, we are handing out this flyer that shows you how to conserve water while keeping your lawn heathy. I'll quickly show you what is included in the flyer.
- IF NO: Okay, this summer the restrictions are at mandatory water conservation. No sprinklers are allowed between the hours of 9am and 5pm, hand watering is allowed. The mandatory water conservation is in effect from May 1 to September 30 and includes private wells. You can visit the town website, www.wenhamma.gov, for more information. To help you stay within the restrictions, we are handing out this flyer that shows you how to conserve water while keeping your lawn heathy. I'll quickly show you what is included in the flyer.

FLYER OUTLINE

- First, we have a section on the impact of not watering your lawn. A study from the University of Massachusetts extension service found that a Massachusetts resident who waters their lawn in the summer uses up to 800 gallons a week, which is the same as running your shower for five hours. We want to let everyone know that your lawn doesn't need that much water to stay healthy all summer, and in fact, overwatering can lead to problems like pests, disease, and drought.
- We're encouraging residents to keep it natural, as we get an average of four inches a rain a month during the summer, which is enough for most lawns, as they only need an inch a week. We want to let you know that when you rely on rain, you may see your grass go dormant, going to a yellow or brown color, but it will go back to green in the next rain. Letting it go dormant can create stronger grass that is more resistant to drought and has deeper roots.
- If you look out this summer, you'll see a lot of other lawns going dormant—more than half of resident have told us that they already let their lawn go dormant.
- As we've said, your lawn shouldn't need water during the summer, but if you find that you need to water your lawn, we have tips here to water without waste.

Do you have any questions? [IF NEEDED, PROVIDE IRWA INFO SHEET OR DIRECT TO RESOURCES]

Along with this flyer, we are asking residents to commit to water wisely or not at all this summer. In a 2016 survey, we learned that the majority of Wenham residents had already reduced or eliminated lawn watering in the summer. Would you be willing to join your neighbors by committing to do the same? [SHOW SHEET WITH OTHER NAMES]

IF YES: Great, you can sign your name here to show your commitment [GIVE SHEET]

- Thank you for signing!
- To encourage others to commit, we would like to publicize those who have signed by including their names on the town website. Would you be willing to have your name included in this list?
    - [IF YES] Great! Please put your preferred name on the sheet next to your signature.
    - [IF NO] No problem.
- Would you be comfortable with us contacting you later in the summer to see how watering wisely or not all went for you?
    - [IF YES] Great! Please put your name and preferred mode of contact on this sheet.
    - [IF NO] No problem.

IF NO: Ok, do you not want to sign because you are not interested or because you already only water your lawn wisely or not at all? [NOTE ANSWER]

- [IF NOT INTERESTED] Okay, no problem.
- [IF ALREADY ACTING] That's great to hear! We would still appreciate you signing the sheet to show your support and help us motivate other residents when they see how many others have committed.

Thank you for your time. [END]

FAQ Sheet for Door-to-Door: Wenham

In-Person Outreach FAQ

- **Who are you?**
  - I am/we are from the Town of Wenham.
  - I am/we are here on behalf of the water department.
  - I am/we are not selling anything.
- **How long will this take?**
  - We have a flyer and a quick request to sign a sheet. This should not take more than 5 to 10 minutes.
- **Where did you get the references?**
  - The 800 gallons was from a study conducted by the University of Massachusetts Extension Service. Similar numbers have been shown by the EPA and other groups interested in water usage.
  - The comparison of lawn watering to 5 hours running your shower was calculated using the standard flow of a showerhead, as regulated by Massachusetts plumbing code.
- **Are we currently in a drought? Didn't we just get a lot of rain?**
  - We have had a rainy start to summer, and are not currently in a drought. However, in previous years, even when we have gotten a fair amount of rain, our rivers have still ended up dangerously low during the summer. Therefore, even when we are not in a drought, it is important to conserve.
- **I can pay for the higher water rates. Why do I need to conserve?**
  - Even if you can pay for higher rates, we, as a community, have a limited amount of water to go around. We can only safely provide a certain amount of water to each household, and have to comply with state permits that limit the amount of water our town can use. We need to make sure there is enough water for everyone, and that there continues to be enough water for our community and environment in the future.
- **I have a well, so why does conserving water matter for me? I'm not on the town's supply.**
  - Even though you are not on a metered water connection, the water you use from your well still comes from our communal supply. Water throughout the region is connected, and whether from the town pipes or wells, needs to be conserved to ensure there is enough for all.
- **Who is paying for this outreach?**
  - This study is funded by the Massachusetts Division of Ecological Restoration and our town.
- **What are you doing with the names on the commitment sheet?**
  - We will be sharing them on either the town website or social media.
- **Where can I get more information?**
  - Please contact Erik G Mansfield, Superintendent, Wenham Water Department at emansfield@wenhamma.gov or (978)468-5520 x6. The contact number is on the cover letter and the flyer as well.

Commitment Sheet: Wenham

During the summer, I, _____, am joining my neighbors in committing to watering wisely or not at all.

Signature	Print Your Name As You Want It To Appear Online	Preferred Mode of Contact (email/phone)

Appendix C: Feedback Outreach Materials - Middleton

Pre-notification Postcard: Feedback, Middleton

Introducing *Healthy Lawn, Happy Summer*

Dear Resident,

Within the next few weeks, you will receive an envelope with materials on the town's new *Healthy Lawn, Happy Summer* campaign. 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 Middleton to save water for themselves and their communities while keeping their lawns healthy all summer.

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

Sincerely,

Bob LaBossiere
Superintendent of Public Works

bob.LaBossiere@middletonma.gov
(978)777-0407

Division of Ecological Restoration

Invested in Nature and Community

TOWN OF MIDDLETON, MASSACHUSETTS • FOUNDED IN 1728 •

Cover letter: Middleton

Dear Resident,

As summer approaches, the Town of Middleton is working with the Massachusetts Division of Ecological Restoration to support our residents in saving water and money while keeping their lawns healthy. As a community, we have a limited amount of water, even in years when we receive rain, and we need to conserve that resource to make sure there is enough for all. By watering more efficiently, or not at all, residents can still maintain a healthy lawn while conserving water.

We know that our residents are already taking action to save water. In a 2016 survey of local households, the majority of residents 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. We developed *Healthy Lawn, Happy Summer* to help residents keep their lawns healthy in summer while saving water at the same time. Our materials are included with this cover letter.

If you have any questions, please call (978)777-0407 or email bob.LaBossiere@middletonma.gov.

Sincerely,

Bob LaBossiere
Superintendent of Public Works

Flyer: Middleton

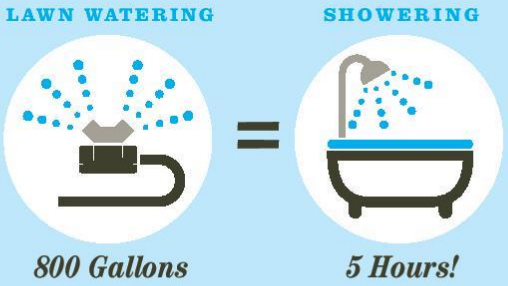
HEALTHY LAWN HAPPY SUMMER

Each of us makes a big impact in Middleton.

Reduce Lawn Watering

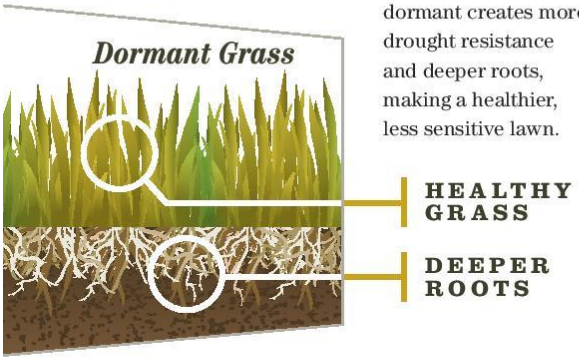
Eliminating or reducing summer lawn watering makes a big difference. Massachusetts households that water their lawns in the summer use up to 800 gallons a week. That's like running your shower for 5 hours!

The fact is, ***a Middleton 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.



Keep It Natural

We get an average of 4 inches of rain per summer month, enough for healthy summer lawns. ***Lawns need, at most, an inch of water a week to stay healthy.*** Sometimes healthy grass goes dormant. Dormant grass is not dead and will go back to green. Going dormant creates more drought resistance and deeper roots, making a healthier, less sensitive lawn.



More than half of Middleton 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.***

Save Water & Keep Your Lawn Healthy All Summer

During a Middleton summer, a healthy lawn will likely not need irrigation. However, if you must water your lawn, ***follow the tips below*** to water without waste.

1. Let grass grow long to stay healthy.
2. Water before 8am to avoid water loss.
3. Water infrequently to encourage deep roots.
4. Water by hand, as automatic irrigation uses twice as much water.
5. If you have a lawn care crew, communicate to them that saving water is a priority and share this flyer.

Division of Ecological Restoration
Invested in Nature and Community

Save water and money

for yourself & your community by watering your lawn wisely or not at all: no more than one inch per week of rain and watering.

Call Middleton Water Department for questions: (978) 777-0407

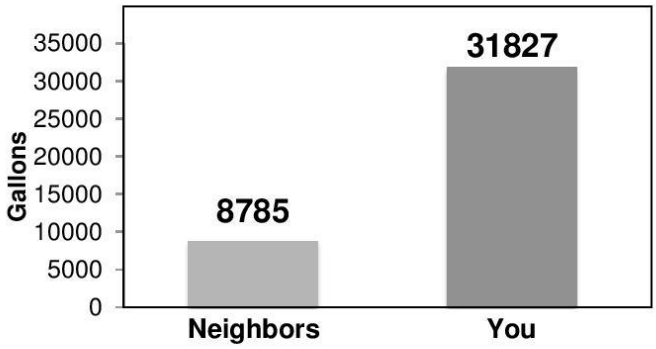
Feedback Sheets: Middleton

Join Middleton Neighbors In Summer Water Savings!

How do you compare?

More than half of Middleton 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 (July-September 2016)



During July, August, and September 2016, your household used

more water

than the average similar-sized Middleton household.

Your household has some 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 Middleton's water resources while keeping our lawns healthy all summer.

Division of Ecological Restoration

Invested in Nature and Community

Thank you for helping your community!

Call Middleton Water Department for questions: (978) 777-0407

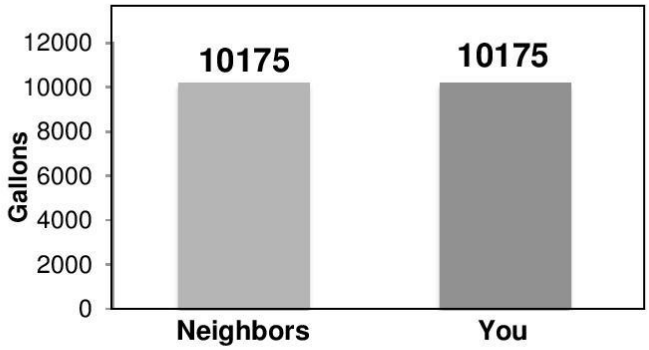
2126

Join Middleton Neighbors
In Summer Water Savings!

How do you compare?

More than half of Middleton 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 (July-September 2016)



During July, August, and September 2016, your household used

the same

as the average similar-sized Middleton household.

Your household is doing great, but can save more with your water usage.

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

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

Division of Ecological Restoration

Invested in Nature and Community

Thank you for helping your community!

Call Middleton Water Department for questions: (978) 777-0407

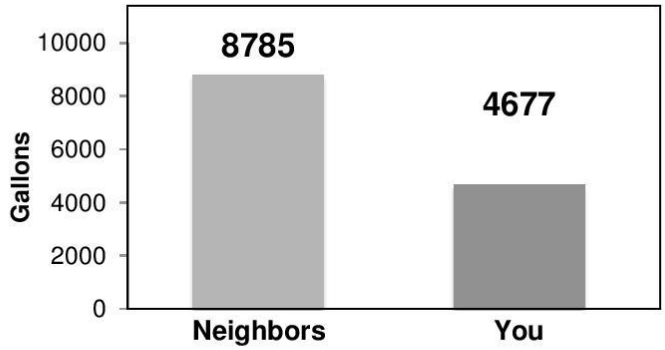
2174

Join Middleton Neighbors
In Summer Water Savings!

How do you compare?

More than half of Middleton 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 (July-September 2016)



During July, August, and September 2016, your household used

less water

than the average similar-sized Middleton household.

Your household is doing a good job when it comes to your water usage.

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

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

Division of Ecological Restoration

Invested in Nature and Community

Thank you for helping your community!

Call Middleton Water Department for questions: (978) 777-0407

2127

Appendix D: Commitment Outreach Materials - Middleton

Pre-notification Postcard: Commitment, Middleton

Introducing *Healthy Lawn, Happy Summer*

Dear Resident,

Within the next few weeks, an ambassador from the Middleton Water Department will come to your home to talk about the town's new *Healthy Lawn, Happy Summer* campaign. It will include tips on how to conserve water in the summer months and a chance to be part of a community effort.

Healthy Lawn, Happy Summer encourages those who live in Middleton to save water for themselves and their communities while keeping their lawns healthy all summer.

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

Sincerely,

Bob LaBossiere
Superintendent of Public Works

bob.LaBossiere@middletonma.gov
(978)777-0407

Division of Ecological Restoration

Invested in Nature and Community

TOWN OF MIDDLETON, MASSACHUSETTS • FOUNDED IN 1728 •

Flyer: Middleton

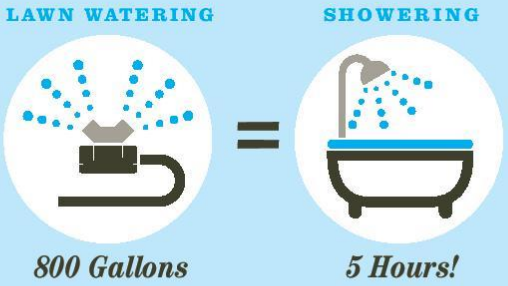
HEALTHY LAWN HAPPY SUMMER

Each of us makes a big impact in Middleton.

Reduce Lawn Watering

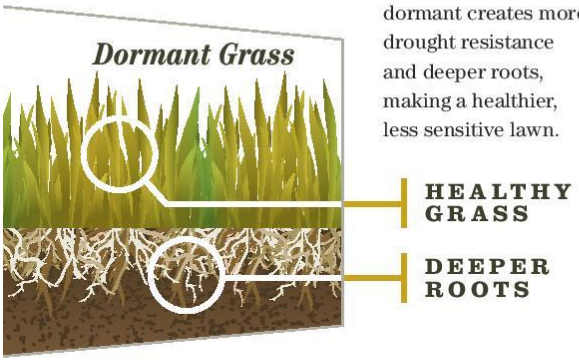
Eliminating or reducing summer lawn watering makes a big difference. Massachusetts households that water their lawns in the summer use up to 800 gallons a week. That's like running your shower for 5 hours!

The fact is, ***a Middleton 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.



Keep It Natural

We get an average of 4 inches of rain per summer month, enough for healthy summer lawns. ***Lawns need, at most, an inch of water a week to stay healthy.*** Sometimes healthy grass goes dormant. Dormant grass is not dead and will go back to green. Going dormant creates more drought resistance and deeper roots, making a healthier, less sensitive lawn.



More than half of Middleton 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.***

Save Water & Keep Your Lawn Healthy All Summer

During a Middleton summer, a healthy lawn will likely not need irrigation. However, if you must water your lawn, ***follow the tips below*** to water without waste.

1. Let grass grow long to stay healthy.
2. Water before 8am to avoid water loss.
3. Water infrequently to encourage deep roots.
4. Water by hand, as automatic irrigation uses twice as much water.
5. If you have a lawn care crew, communicate to them that saving water is a priority and share this flyer.

Division of Ecological Restoration
Invested in Nature and Community

Save water and money

for yourself & your community by watering your lawn wisely or not at all: no more than one inch per week of rain and watering.

Call Middleton Water Department for questions: (978) 777-0407

Script for Door-to-Door Implementation: Middleton

Middleton Door-to-Door Script

Hi,

My name is _____ and this is _____. We're here on behalf of the Town of Middleton Water Department. We are visiting your neighborhood today to talk to residents about our new effort to help you save water and money while keeping your lawns healthy all summer.

Are you aware of the water restrictions in place for this summer?

- IF YES: Great! To help you stay within the restrictions, we are handing out this flyer that shows you how to conserve water while keeping your lawn heathy. I'll quickly show you what is included in the flyer.
- IF NO: Okay, this summer the restrictions are at Level 3-Drought Conditions. Outdoor lawn & gardening are allowed three days a week, Tuesday, Thursday, and Saturday between the hours of 7pm and 8am. You can visit the town website, townofmiddleton.org, for more information. To help you stay within the restrictions, we are handing out this flyer that shows you how to conserve water while keeping your lawn heathy. I'll quickly show you what is included in the flyer.

FLYER OUTLINE

- First, we have a section on the impact of not watering your lawn. A study from the University of Massachusetts extension service found that a Massachusetts resident who waters their lawn in the summer uses up to 800 gallons a week, which is the same as running your shower for five hours. We want to let everyone know that your lawn doesn't need that much water to stay healthy all summer, and in fact, overwatering can lead to problems like pests, disease, and drought.
- We're encouraging residents to keep it natural, as we get an average of four inches a rain a month during the summer, which is enough for most lawns, as they only need an inch a week. We want to let you know that when you rely on rain, you may see your grass go dormant, going to a yellow or brown color, but it will go back to green in the next rain. Letting it go dormant can create stronger grass that is more resistant to drought and has deeper roots.
- If you look out this summer, you'll see a lot of other lawns going dormant—more than half of resident have told us that they already let their lawn go dormant.
- As we've said, your lawn shouldn't need water this summer, but if you find that you need to water your lawn, we have tips here to water without waste.

Do you have any questions? [IF NEEDED, PROVIDE IRWA INFO SHEET]

Along with this flyer, we are asking residents to commit to water wisely or not at all this summer. We know that the majority of local residents had already reduced or eliminated lawn watering in the summer. Would you be willing to join your neighbors by committing to do the same?

IF YES: Great, you can sign your name here to show your commitment [GIVE SHEET]

- Thank you for signing!
- To encourage others to commit, we would like to publicize those who have signed by including their names on the town website. Would you be willing to have your name included in this list?
    - [IF YES] Great! Please put your preferred name on the sheet next to your signature.
    - [IF NO] No problem.
- Would you be comfortable with us contacting you later in the summer to see how watering wisely or not all went for you?
    - [IF YES] Great! Please put your name and preferred mode of contact on this sheet.
    - [IF NO] No problem.

IF NO: Ok, do you not want to sign because you are not interested or because you already only water your lawn wisely or not at all? [NOTE ANSWER]

- [IF NOT INTERESTED] Okay, no problem.
- [IF ALREADY ACTING] That's great to hear! We would still appreciate you signing the sheet to show your support and help us motivate other residents when they see how many others have committed.

Thank you for your time. [END]

FAQ Sheet for Door-to-Door: Middleton

In-Person Outreach FAQ

- **Who are you?**
  - I am/we are from the Town of Middleton.
  - I am/we are here on behalf of the water department.
  - I am/we are not selling anything.
- **How long will this take?**
  - We have a flyer and a quick request to sign a sheet. This should not take more than 5 to 10 minutes.
- **Where did you get the references?**
  - The 800 gallons was from a study conducted by the University of Massachusetts Extension Service. Similar numbers have been shown by the EPA and other groups interested in water usage.
  - The comparison of lawn watering to 5 hours running your shower was calculated using the standard flow of a showerhead, as regulated by Massachusetts plumbing code.
- **Are we currently in a drought? Didn't we just get a lot of rain?**
  - We have had a rainy start to summer, and are not currently in a drought. However, in previous years, even when we have gotten a fair amount of rain, our rivers have still ended up overdrawn during the summer. Therefore, even when we are not in a drought, it is important to conserve.
- **I can pay for the higher water rates. Why do I need to conserve?**
  - Even if you can pay for higher rates, we, as a community, have a limited amount of water to go around. We can only safely provide a certain amount of water to each household, and have to comply with state permits that limit the amount of water our town can use. We need to make sure there is enough water for everyone, and that there continues to be enough water for our community and environment in the future.
- **I have a well, so why does conserving water matter for me? I'm not on the town's supply.**
  - Even though you are not on a metered water connection, the water you use from your well still comes from our communal supply. Water throughout the region is connected, and whether from the town pipes or wells, needs to be conserved to ensure there is enough for all.
- **Who is paying for this outreach?**
  - This study is funded by the Massachusetts Division of Ecological Restoration and our town.
- **What are you doing with the names on the commitment sheet?**
  - We will be sharing them on either the town website or social media.
- **Where can I get more information?**
  - Please contact Bob LaBossiere, Superintendent of Public Works at bob.LaBossiere@middletonma.gov or (978)777-0407.

Commitment Sheet: Middleton

During the summer, I, _____, am joining my neighbors in committing to watering wisely or not at all.

Signature	Print Your Name As You Want It To Appear Online	Preferred Mode of Contact (email/phone)

Appendix E – Post-pilot Survey

Pre-notification Postcard: Wenham

This postcard was delivered prior to the survey.

YOU WILL BE RECEIVING A SURVEY

Dear Resident,

Within the next few days you will be receiving a survey from the Town of Wenham and the Massachusetts Division of Ecological Restoration. **Your household is one of only 375 households being asked to take part in this important study.** Your assistance will help develop education and outreach services for the Town of Wenham.

If you have any questions, please call (978) 468-5520 x6 or email emansfield@wenhamma.gov.

We look forward to hearing from you.

Sincerely,

Erik G Mansfield

COMMONWEALTH OF MASSACHUSETTS
Division of Ecological Restoration

Postcard Survey: Side 1, Wenham

Dear Resident,

As part of our ongoing commitment to saving water, the Town of Wenham and the Massachusetts Division of Ecological Restoration 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 only 375 Wenham 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 call (978)468-5520 x6 or email emansfield@wenhamma.gov.

Erik G Mansfield
Superintendent, *Wenham Water Department*

please tear off and mail

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. help Wenham save water?		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?
□ Every day □ A few days/week □ Once/week
□ Every other week □ Once/month □ Once or twice/summer
□ Never □ Don't have grass

3. Did you receive materials about the ***Healthy Lawn, Happy Summer*** Campaign this summer? □ Yes □ No→SKIP TO #6

4. How did you receive those materials?
□ Mail □ Personal visit □ Left at door □ Other:_____

5. Using the scale, how much did the program materials…	Not at all										Extremely
a. help keep your lawn healthy?	0	1	2	3	4	5	6	7	8	9	10
b. help save water?	0	1	2	3	4	5	6	7	8	9	10

6. Please let us know if you have comments about summer water use:

Form #MA2017-A«ID_»

Division of Ecological Restoration
Attn: Kate Bentsen
251 Causeway Street, Suite 400
Boston, MA 02114

Division of Ecological Restoration
Attn: Kate Bentsen
251 Causeway Street, Suite 400
Boston, MA 02114

Postcard Survey: Side 2, Wenham

---------- *please tear off and mail* ----------

Division of Ecological Restoration
Attn: Kate Bentsen
251 Causeway Street, Suite 400
Boston, MA 02114

CURRENT RESIDENT
Address
WENHAM, MA 01984

Follow-Up Postcard: Wenham

This postcard was delivered between the first and second delivery of the postcard survey, for non-responders only.

HAVE YOU COMPLETED YOUR SURVEY?

Dear Resident,

You recently received a survey from a survey from the Town of Wenham and the Massachusetts Division of Ecological Restoration. 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 assistance will help develop education and outreach services for the Town of Wenham.

If you have any questions, please call (978) 468-5520 x6 or email emansfield@wenhamma.gov.

We look forward to hearing from you.

Sincerely,

Erik G Mansfield

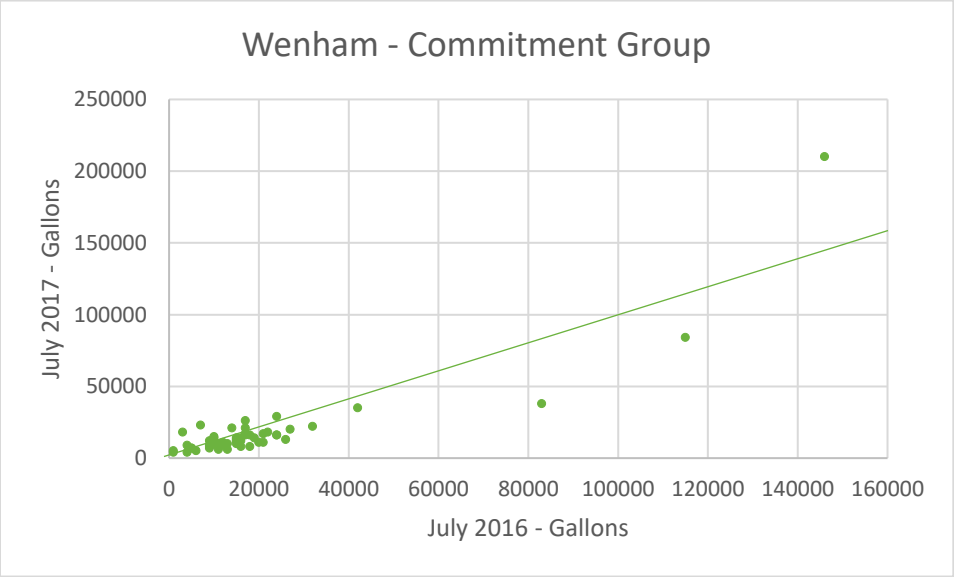
COMMONWEALTH OF MASSACHUSETTS
Division of Ecological Restoration

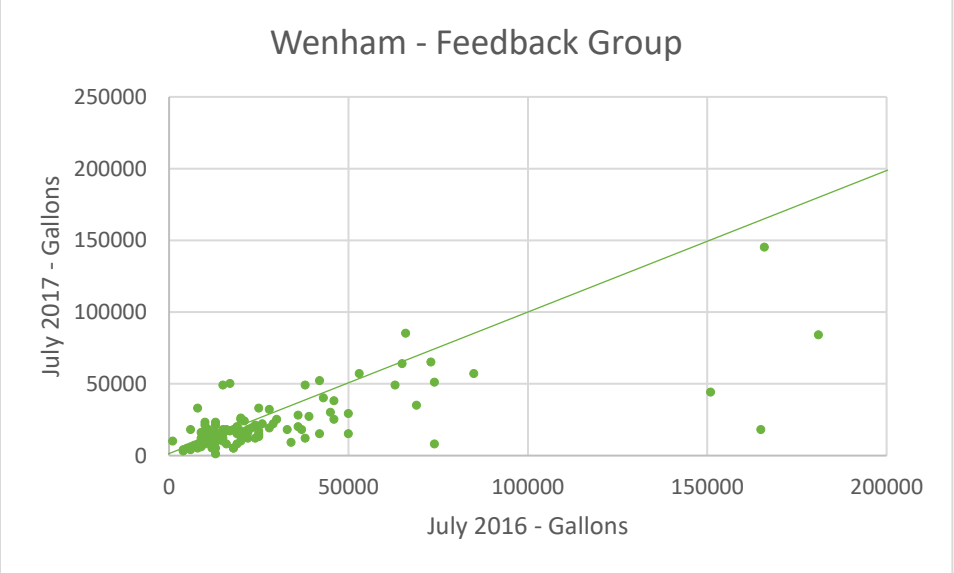
TOWN OF WENHAM
ENDOW
INCORPORATED SEPT 7 1643
MASSACHUSETTS

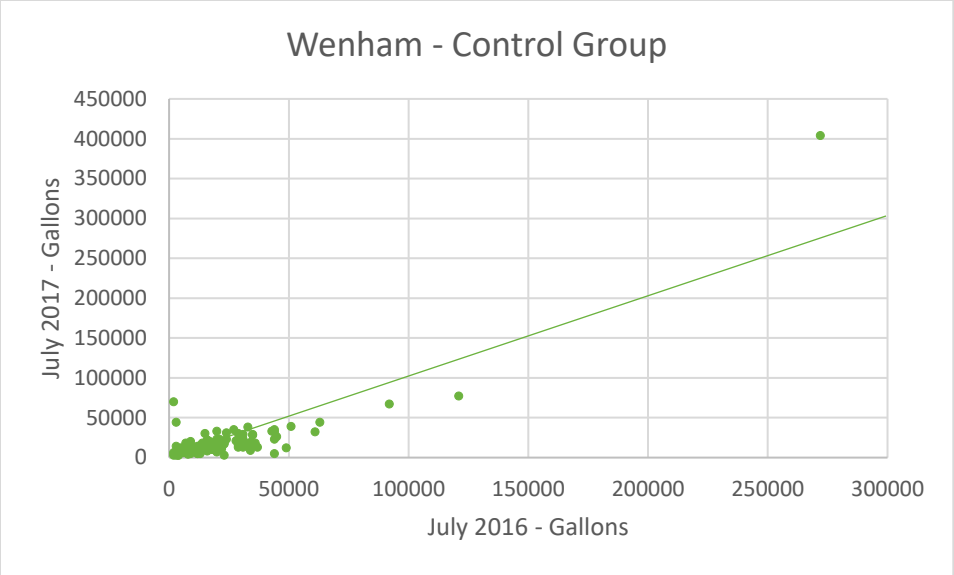
Appendix F: Scatterplot Graphs Per Condition

Graphs are split by quarter and conditions.

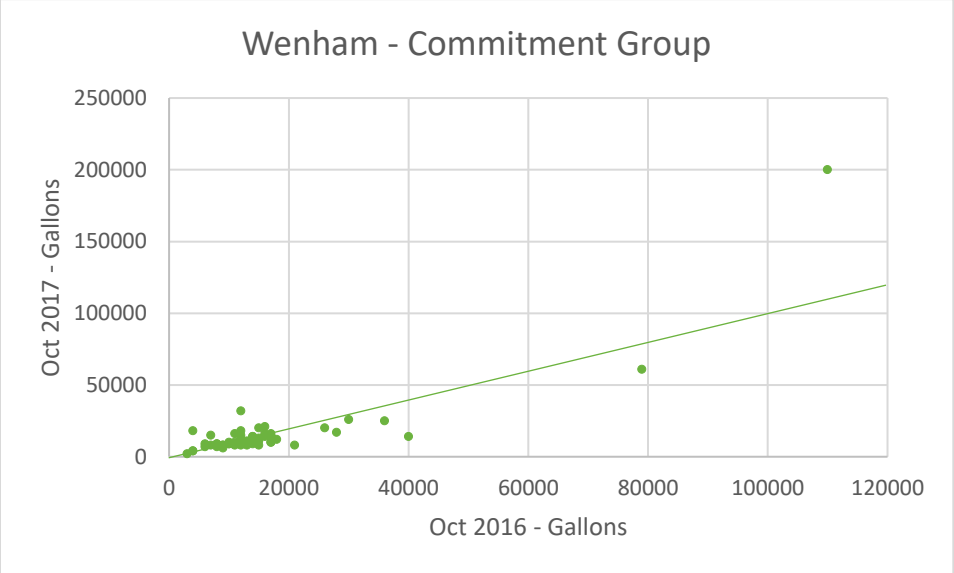
Wenham – July Quarters

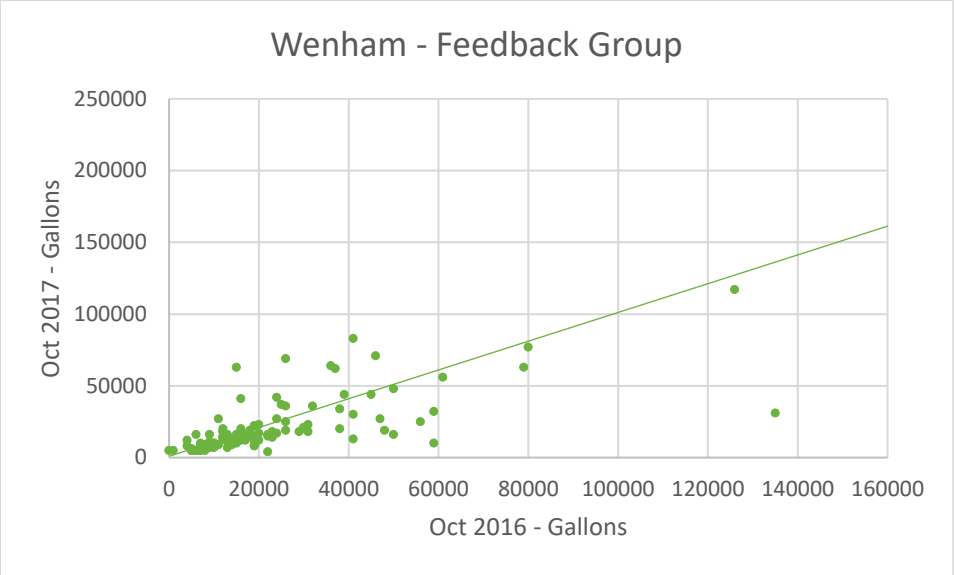






Wenham – October Quarters




Wenham - Feedback Group
Oct 2017 - Gallons
250000
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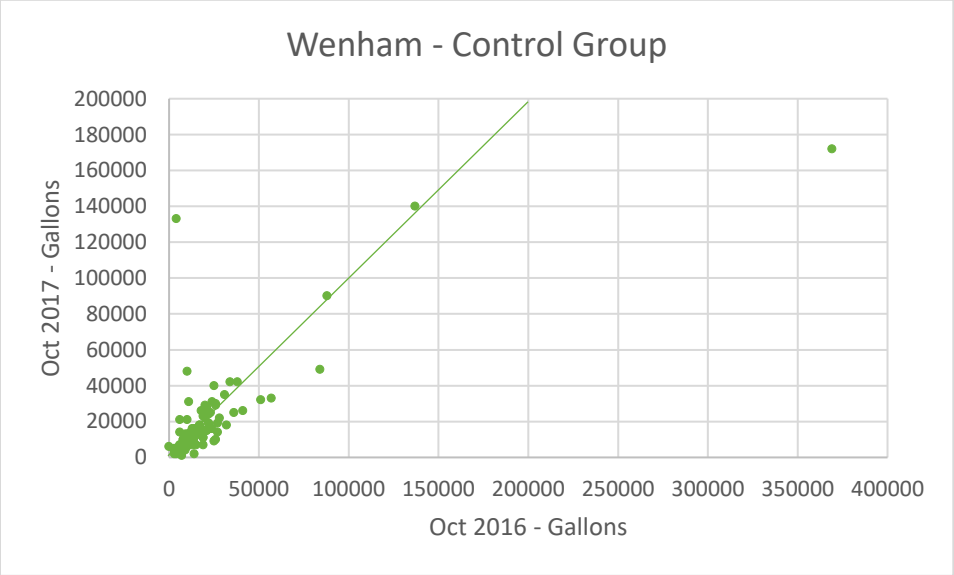
Oct 2016 - Gallons


Wenham - Control Group
Oct 2017 - Gallons
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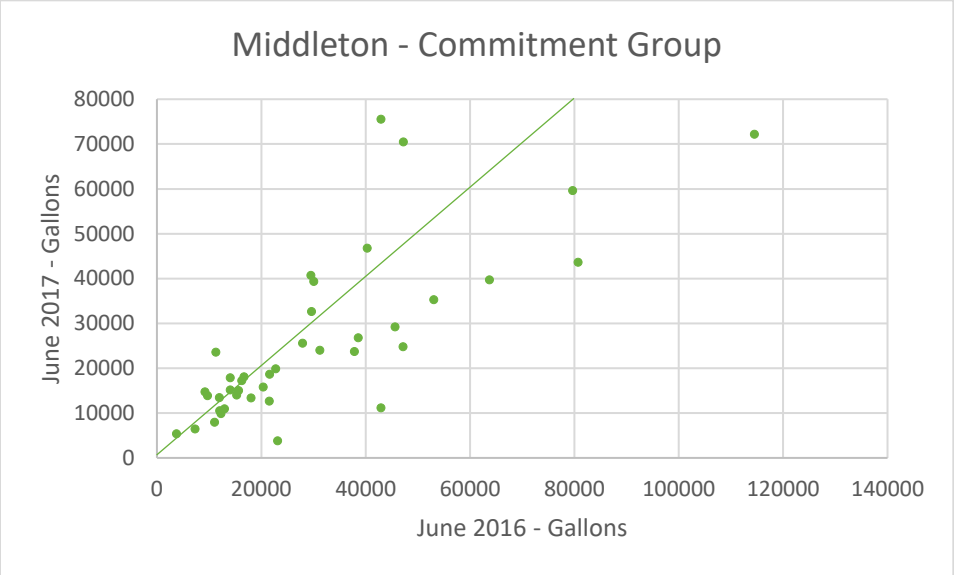
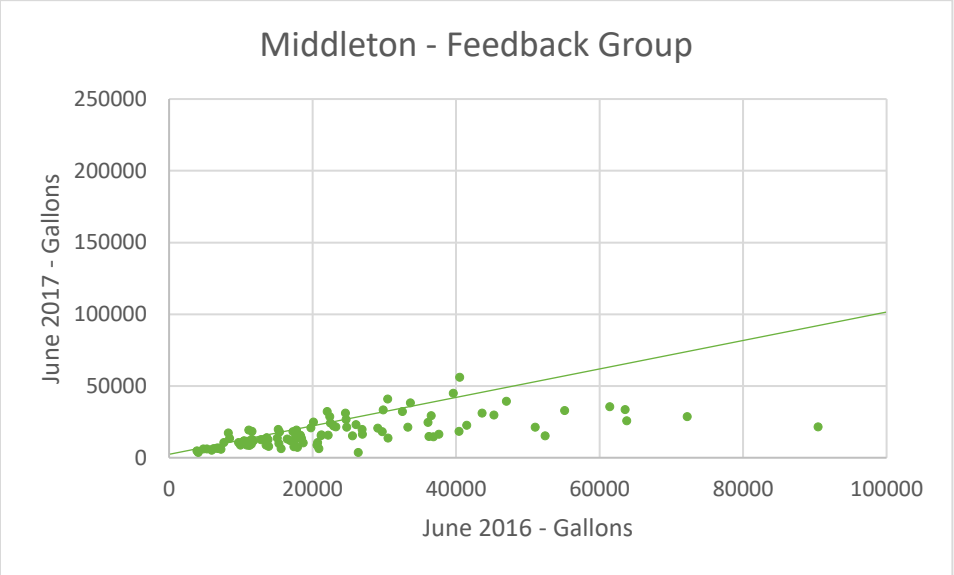
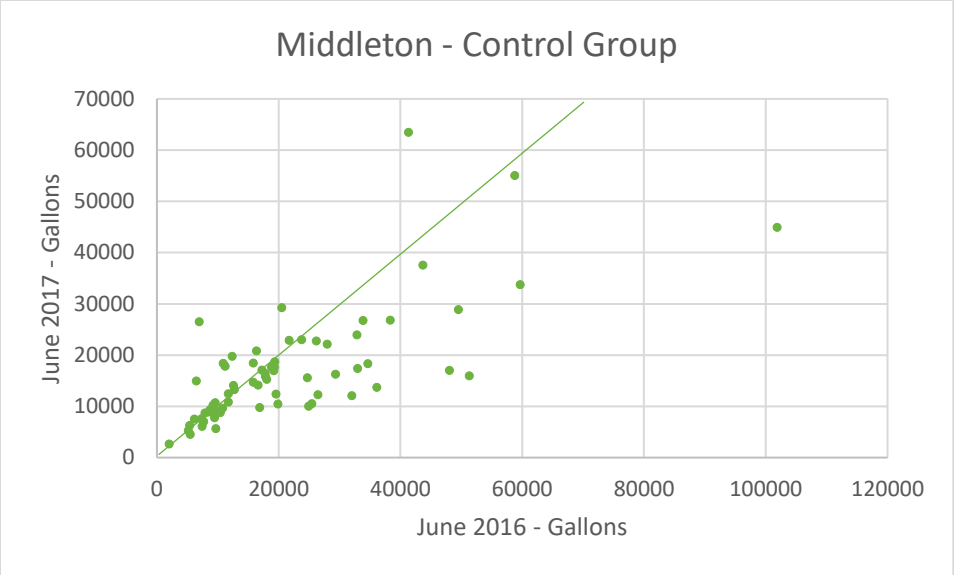
Oct 2016 - Gallons

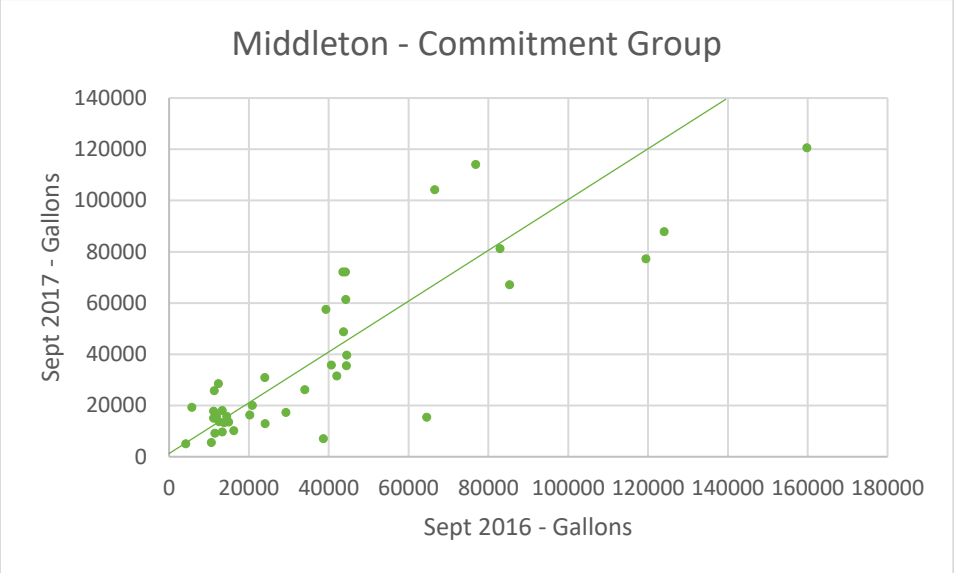
Middleton – June Quarters

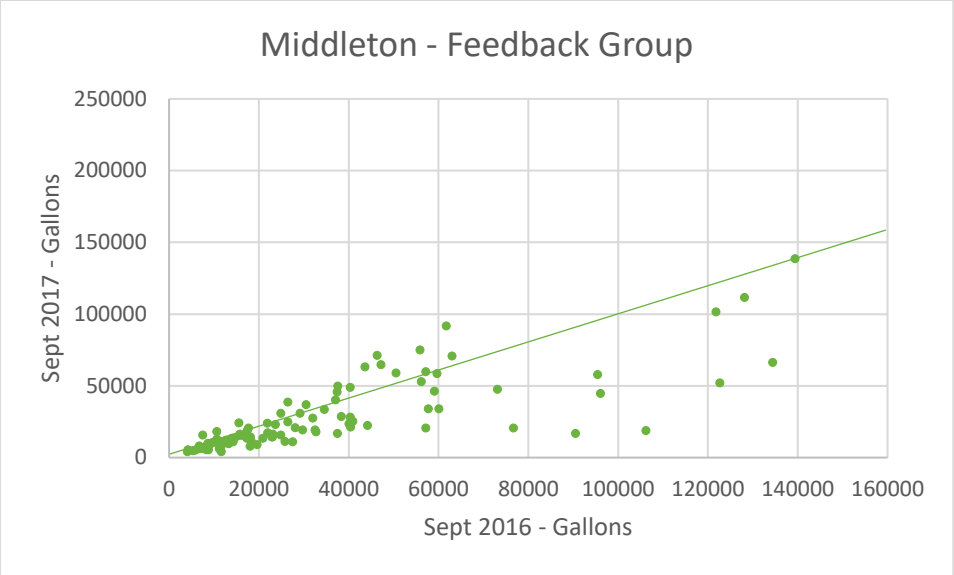






Middleton – September Quarters




Middleton - Feedback Group
Sept 2017 - Gallons
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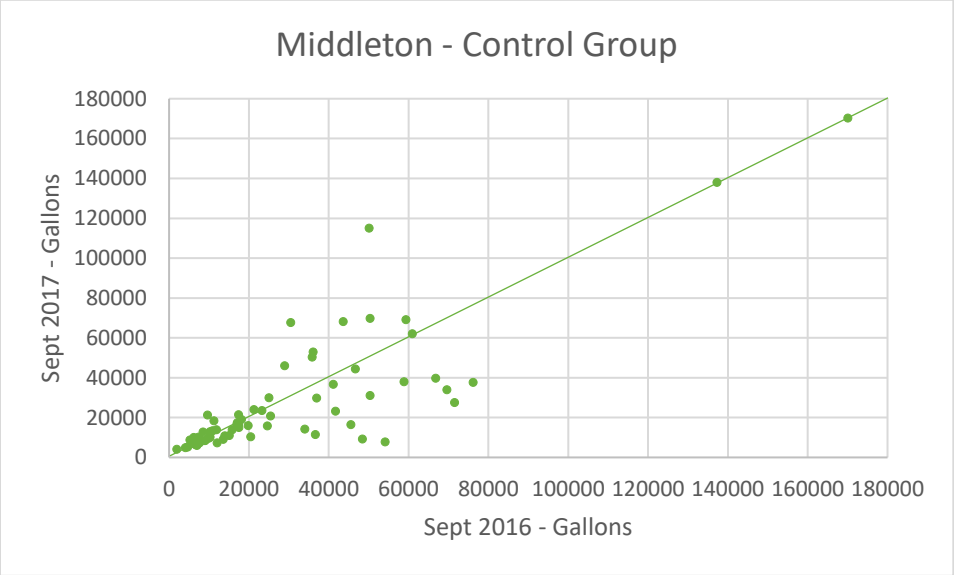
Sept 2016 - Gallons


Middleton - Control Group
Sept 2017 - Gallons
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Sept 2016 - Gallons

Appendix G: Survey Comments

Below are comments from respondents to the survey.

Wenham

Would like to be able to water lawn, etc.

Why do I see businesses in Beverly watering grass in the daytime? Water from Wenham Lake!

We're already doing most of the things suggested. Wenham has a strict no-water policy.

Wenham residents should be able to water lawns twice a week.

We wonder why the town of Beverly doesn't have to conserve water!

We water planters only 2 or 3 times a week.

We use very little.

We use sprinkler system only for a short time - about one month - and turn it off if a rainy week.

We should connect to the state water system or build water storage so we don't harm the local river delta.

We reuse pitchers of water in cooking rather than pour them down the sink. I keep hoses in good repair and pool gaskets well lubricated to prevent leaks. You could offer a water conservation service like Mass saves (?).

We no longer use chemicals or fertilizers to grow grass in our yard. We are allowing and encouraging natural plants. We do not water the lawn at all.

We just don't water our lawn in an effort to save water.

We hope our neighbors down the street who illegally use their sprinkler system all summer also received this survey - otherwise your results will skew towards water conservation, at least from this neighborhood.

We have two neighbors that have sprinkler systems that water their grass all summer long. The system runs even when it rains! What a waste! Enforce the violators that can be fined.

We had sufficient rain this spring so I gladly did not have to spend the time nor use any water unnecessarily except to water my potted plants.

We had sod installed this summer. That let to heavy watering - much more than we would ever normally use.

We do water garden, but have rain barrels.

We do not water our lawn at all - we have a pool which we fill when it gets low which increases our water use.

We do not water lawn. We do feel that is a waste of money and water. We live in woods anyway and do not feel pressure to have a perfect lawn.

We do not water lawn, but we have big vegetable garden and flower gardens and we need to water those.

We are grateful for clean water and do not take it for granted.

Water conservation should be our priority.

Want to be able to use irrigation system. Should be able to use well water at owner's discretion.

Try to conserve as much as possible.

Too much lawn watering, golf courses, homes.

This should be about retaining the value of our real estate by maintaining the landscaping which includes trees, shrubs and gardens as well as grass.
There should be better policing of adherance to water ban.
There are already water bans in places all summer. What's the point of this survey?
The Hamilton Wenham Garden Club Facebook page occassionally has water conservation tips.
Some residents continue to use irrigation despite the ban. Is there enough enforcement?
Several years in the recent past our lawns were really burnt by the end of July. This summer, despite the drought, we had rain at welcome intervals. It was interesting to learn how little water a lawn needs in order to stay healthy.
Please ask builders of new homes not to plant so much grass if homeowners won't be allowed to care for their investment.
People on the North Shore stress too much about lawns. Turning brown is natural.
Over-reaching.
My outdoor water use is reserved for plants only.
My lawn is usually brown by August. Yet some neighbors have bright green lawns.
Lawn is more weeds than grass. Stays green all summer.
Keep up the good work!
It's ridiculous, the estates have their systems going 24/7, even regular houses have their irrigation going. No one pays attention to the ban it seems. Fines need to be implemented.
It's disheartening that Beverly doesn't have water bans and we always do.
It's difficult having a 'permanent' water ban to take it seriously, especially after good rains. Perhaps we don't fully understand what happens to these gift rains that doesn't improve the amount of available water, eh?
I'm all for water conservation as long as it applies to everyone.
I would never use that sort of service.
I work in the landscape industry and already know about how to keep my lawn healthy, and believe watering a lawn is a waste of water and money. However, I will water unestablished plants in the landscape.
I wonder why homes with sprinkler systems don't have to dig a well or get fined. No one cares. The grass gives it away.
I wish I could wash my car as a trade-off for not watering the lawn.
I water our vegetable garden at dawn or dusk as needed. Rain keeps the lawn alive - never water it.
I think sprinklers should not be allowed - complete waste of water. Should only be allowed if planting new grass.
I think education is key to using water efficiently - your information was very helpful in letting people know that in most cases lawns will "come back" on their own as soon as it rains.
I really need to water my gardens daily as plants need to be moist and cost so much to buy.
I have no problem with conservation, but the quality of our water in Wenham is very poor. We need much better treatment for our water.
I don't water my lawn and trust it will come back in the fall.
I don't need to water my lawn because the ground around my house is pretty moist.

I didn't water as I was recovering from surgery. Next year I will water.
I conserve water every day, inside and outside my house.
High limbed canopy tree coverage is very important. Education of grass type, naturalize more areas, mulch mowing, mowing height. Call me for more: 978-468-7057 John Clemonzi
Have vegetable garden. Suggestion: encourage local officials to reduce fixed fees and to raise usage rates to put aside more emergency funds.
Continue to charge mega users a high rate.

Middleton

Would love to water lawn every day but it's too expensive and not worth wasting water!
Why are sprinklers for lawns allowed in this town? There are water bans all summer but built in sprinklers go off all day and in the rain. They keep building and our water supply can't handle it.
We would like to be able to water in early morning. Evening watering caused some issues for our lawn with excess moisture overnight.
We will cut down on water use next summer.
We use a lot of water because we have a pool and a large lawn.
We only outdoor water to keep our vegetables and flowers alive. On a hot, sunny week, the most would be every other day - hand watering only!
We have well water and a septic system, so we are a mostly closed loop of the water cycle. We try to conserve water but do not let it rule our lives.
We do not use water for our lawn.
We do need to use for watering our vegetables, not lawn.
Water is more important than green grass. Preference for no spraying of pesticides.
Want to know how to optimize - save $, water, and protect lawn.
Very good information.
Try to expand the Middleton bog.
This past summer we did have more rain, which is always good!
They should allow grass watering 3 days a week, not 2.
There is a fine line between wantinng to conserve water and watering enough so trees and bushes that protect yard are kept watered enough to live. We let grass go dormant but water new bushes twice a week.
The water quality is poor. It is often brown. Outside watering is limited, therefore our grass, flowers, and shrubs often die.
The people with wells need to be educated about the water shed and water use. Town of Danvers needs to comply since they are sucking the Middleton reservoir dry. Danvers ran sprinklers during drought of 2016.
The amount of hours allotted for watering lawn doesn't take info affect the size of the land or lawn, yet we pay taxes based on the size - I think water allotment should reflect this. On 2 acres, the 2 hour time period 3 times per week doesn't effect the health of the lawn. The lawn is so unhealthy with weeds, grubs and dead spots! We are working with landscapers on how to cut down size of lawn and

water requirements, but it is so discouraging having invested in nice landscaping to have your lawn ruined and your property looking poorly.
Should regulate wells also. If there is a water ban it should include private wells.
People who have wells take from the same aquifer or water source, but still drains the water and should be under the same rules.
Only water potted outdoor plants and occassionally fill a small plastic kid's pool.
My sprinkler system is broken. Otherwise, I would have watered one or two times a week.
My opinion three days a week was plenty.
Middletonhas had water restrictions for last few years so we only water gardens, not lawn.
Middleton either needs to stop approving more subdivisions or find another water source! I pay too much taxes for forced communist water bans. Do your job. Find more water.
It's always strict so not sure how grass would ever be green as stated in mailing.
It is a constant battle with husband about watering lawn too much! Conservation is more important to me.
I'm on a well.
I'm not sure we received any info on the Healthy Lawn, Happy Summer campaign, but thank you. Any info is helpful.
If we had more water pressure, sprinklers would work better and would need to run less time. Water pressure is bad in Middleton.
I wish the town would enforce the watering restrictions more.
I use sprinklers so the lawn get water every 2-3 days.
I think we are conservative.
I have not used any sprinklers for 6 years to conserve.
I have irrigation and turn it on manually twice a week.
I have a rain barrel I use for my flower gardens, buI have a large vegetable garden that I water in the evenings three times a week. Also, we are the highest house in Middleton and have such extremely low water pressure that some sprinklers don't work.
I don't water the lawn and only infrequently water flower beds. For us, it's an environmental and financial issue.
I do feel that the town starts their no watering bans too soon.
I collect water from downspouts when it rains into a large barrel for watering outside plants.
How could we have had a level 3 water ban given all the rain we had? You can't expect people to water their lawns 3x per week in August and have them stay green. It's not realistic!
How about policing the businesses on Rt 114 who water their late evening and even when it is raining? It has been going on for years, but nothing has been done about it.
Good luck with your initiatives.
Frustrating to see Danvers businesses/apt complexes watering grass when it is raining and we are on level 4 restrictions. Frustrating that people with well water think they are exempt. Discounted rain barrel program would be nice. If Middleton wants to save water, stop building more housing developments!

For a town that has permanent water restrictions in place, there is far too much residential construction going on. It just increases the burden on the water supply and makes no sense whatsoever. Yet, we are constantly pushed to restrict our water usage to compensate for this growth.
Don't remember the materials is we received them. Also have a personal well.
Commercial businesses should not be able to have unrestricted water use if residences are restricted.
Saving water should apply to all.
Abandoned lawn voluntarily to try to limit water use.