CENTRAL TEXAS WATER CONSERVATION

2017 - 2018 Report

CITY OF FLORENCE
CENTRAL TEXAS WATER CONSERVATION

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EXECUTIVE SUMMARY

The city of Florence is located in Williamson County, Texas with a population of 1,249 (U.S. Census Bureau, 2016). Florence is a small community that relies on local businesses and surrounding construction opportunities for their economic development. Since early 2010, low rainfall and an increase in water usage throughout the Central Texas region has caused the Trinity Aquifer to become depleted (George, Mace, and Petrossian, 2011). The Trinity Aquifer (consisting of several smaller aquifers within the Trinity Group) is the main source of water for the city. Over the past several years, Florence has been combating a Stage 4 drought and increasing water demand (George, Mace, Petrossian, 2011). Consequently, the city of Florence in collaboration with the University Center for Applied Research and Engagement (UCARE) at Texas A&M University – Central Texas (A&M – CT) has developed the *"City of Florence – Central Texas Water Conservation" (CF-CTWC)* project to research and identify strategies available for water conservation. As a part of the project, UCARE has evaluated the following three goals:

1. Create and increase awareness of water conservation including rainwater harvesting.

2. Research and seek grants and programs that provide financial support for water conservation including rainwater harvesting.

3. Conduct feasibility analysis of rainwater harvesting.

Goal 1: Create and increase awareness of water conservation including rainwater harvesting.

In order to *"create and increase awareness of water conservation",* an unconventional *guerrilla marketing strategy* that involves dissemination of water conservation awareness information through posters and brochures is used. In addition, 2 different questionnaire surveys (survey 1 and survey 2) were conducted. Both online and paper-based questionnaires were used to gather

survey information. However, the response rate to the surveys was marginal. Response rates were 3.5% (43 out of 1249 citizens) for survey 1 and 2.16% (27 out of 1249 citizens) for survey 2. The results indicate significant interest (95%) among the surveyed citizens of Florence towards water conservation with 76% of the surveyed citizens willing to participate in community water conservation programs. In addition, 80% of the surveyed citizens expressed interest in rainwater conservation, out of which 60% expressed interest in buying rain barrels to conserve rain water. Based on the surveys, UCARE recommends the city of Florence develop water conservation programs including competitions and the provision of incentives to consumers.

Since the response rates for the questionnaire surveys are very low, UCARE recommends the city of Florence conduct a few more rounds of surveys to better gauge the citizens' interest in water conservation. Consequently, a full-blown *water conservation awareness campaign* that can be implemented by the city of Florence has been provided. The *water conservation awareness campaign* developed by the Marketing Research Club (MRC) at A&M – Central Texas aims to educate the citizens of Florence about ways to conserve water. The awareness campaign proposal consists of three major components: (1) a pre-survey to gauge Florence residents' awareness and attitudes toward water conservation, (2) a water conservation awareness campaign to educate the residents about the importance of water conservation, including tips on how to conserve water, and (3) a post-survey to gauge the effectiveness of the awareness campaign.

Goal 2: Research and seek grants and programs that provide financial support for water conservation including rain water harvesting.

As a part of the *CF-CTWS* project, UCARE has researched and identified numerous grants that provide financial support for water conservation. UCARE has provided 16 grant resources that the city of Florence can apply for. In addition, UCARE has identified 10 websites that the city of

Florence can use to search water conservation related grants in the future. The grant agencies that offer water conservation-related grants include, but are not limited to: federal and state government grants, Texas Department of Agriculture, Business in Texas, Texas Water Development Board, Capital Area Council of Governments, and Economic Development Administration.

UCARE recommends the city of Florence continue to seek grants for groundwater infrastructure development. This may require a dedicated grant writer who would be willing to engage in the grant writing process. The city can also collaborate with local educational institutes such as A&M – CT in their grant writing efforts.

Goal 3: Conduct feasibility analysis of rainwater harvesting.

In order to address the city of Florence's water problems, UCARE has evaluated the feasibility of a rainwater harvesting program. The analysis conducted on the *rainwater harvesting program* provides the following important insights: (1) Assuming that the purchasing power of an average household for rain barrels is less than $500, the amount of rainwater that can be collected by a household will range between 2,879 – 30,021 gallons per year and will result in annual household savings of $12 – $130; (2) the city of Florence will be able to save anywhere between 0.29 to 4.07 million gallons of water (rainwater will be able to fulfill 0.82% - 11.65% of the household demand) and an annual savings ranging between $ 1,243 - $17,665.

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BACKGROUND

The city of Florence, Texas covers a geographic area of 0.8 square miles and is located about 13 miles west from Georgetown, Texas (City of Florence, 2018). The territorial limits of the city of Florence have grown by 8% since 2000 (City of Florence, 2018). As of 2016, the city has a population of 1249 residents (484 households) with an average population growth rate of 1.56% per year (U.S. Census Bureau, 2016). Figure 1 presents a map of Florence.

Figure 1. Map of city of Florence

Water Usage

This section presents the information on household water usage in the city of Florence. The household water usage information was collected from water usage reports provided by the city's

director of public works. Figure 2 presents the annual household usage in the city of Florence for years 2015 and 2016. The average yearly household water usage in the city of Florence is anticipated to be around 35 million gallons; this does not include the water usage of businesses. Figure 3 indicates that the water usage is high during the summer months (April to August). Based on the population growth of 1.56% per year, UCARE anticipates the population of city of Florence will be 1,444 residents and the annual water usage by households will be 40.5 million gallons by the year 2028.
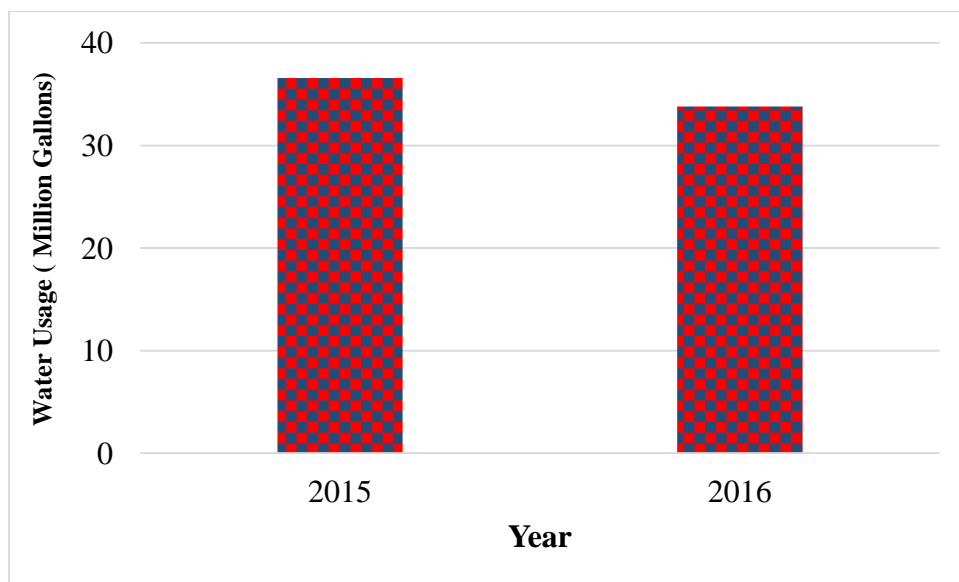
Figure 2. Annual water usage in the city of Florence
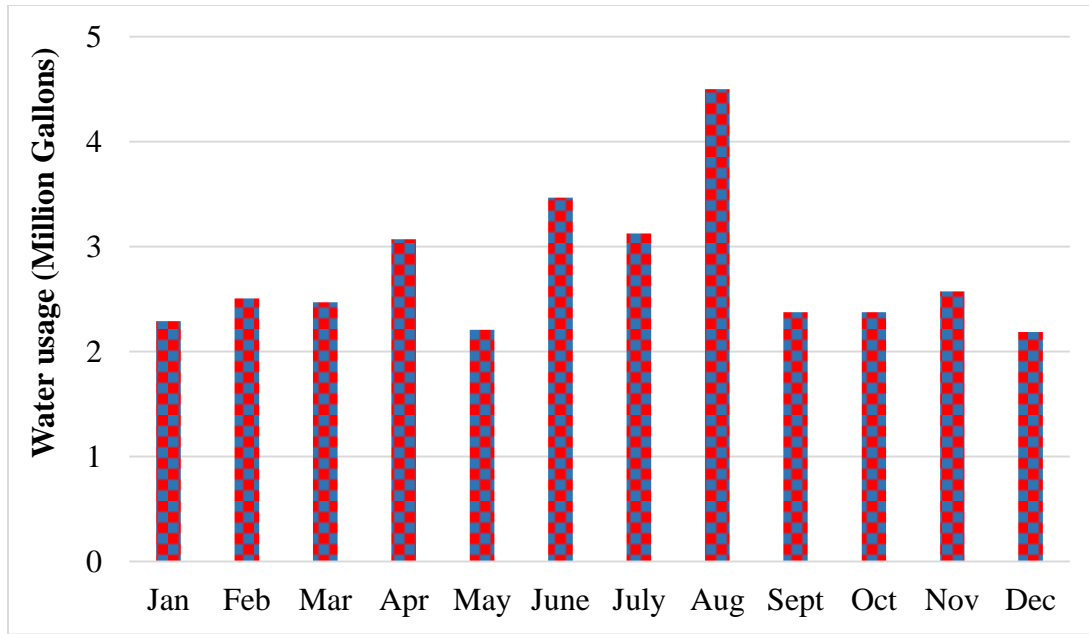
Figure 3. Monthly water usage in the city of Florence for the year 2016

Ground water system

Florence currently has three fully operational groundwater wells. A fourth well (Well 1) is currently inoperable and is being used as a test site by an outside agency. Table 1 presents the effective pumping rate and tank capacities for each of the three operating wells. Note that the city also has an elevated water tank with a capacity of 150,000 gallons. According to budget spreadsheets provided by the city of Florence, total water production cost in the year 2012 was approximately $96,000, with an additional $9,000 being allotted for water distribution.

Table 1

Effective pumping rate and tank capacities for different wells

Well number	Effective pumping capacity Gallons per minute (GPM)	Tank Capacity Gallons
Well 2	57	200,000
Well 3	38	80,000
Well 4	125	66,000

Contract with Georgetown

The city of Florence has a 40-year surface water supply contract with the city of Georgetown, which can be terminated by either party at their discretion. Based on the contract, the City of Florence purchases water from the city of Georgetown annually. Even though the reserved water quantity is 500 acre-feet, the quantity of water supplied by Georgetown is 200 acre-feet (which is approximately 65,165,800 gallons) due to infrastructure capacity constraints. The water is treated in Georgetown and transported to Florence via established pipelines. This water is then stored, retreated, and distributed by the city of Florence. The annual cost of procuring water from Georgetown is given by Equation (1) shown below. Note that all the costs are expressed in dollars.

Currently, the city of Florence has reserved 500 Acre-Feet of water under the contract which results in a minimum cost of $61,941 (without including the cost for the volume of water procured).

Annual cost of Georgetown water = 54.50*Acre-feet/year + 1294.87*12 + 1596.76*12 + (4.33/1000)*volume of water procured (1)

WATER CONSERVATION AWARENESS

In order to create water conservation awareness among the citizens of Florence, UCARE developed two approaches: (1) A short-term marketing strategy employing *Guerrilla marketing tactics*; and (2) a long-term sustainable water conservation campaign that can be implemented by city of Florence (*Water Conservation Awareness Campaign*).

Guerrilla marketing strategy

Initially, a guerrilla marketing strategy was implemented for the *"CF-CTWS"* project to gauge water conservation attitudes of the city. Guerrilla marketing tactics were used in the

dissemination of information; this advertising strategy concept better fits projects restricted by budgets and projects that require more personal interactions with the target market. It consisted of survey 1, water conservation awareness information such as posters and brochures, and survey 2. Appendix A presents detailed results of survey 1 and survey 2.

Survey 1 results

Survey 1 was conducted to gauge the current water conservation practices of the city of Florence. The response rate for the online survey was 3.5% (43 citizens out of 1249 citizens). Some of the important insights of survey 1 include:

1. 54% of the surveyed citizens believe that their current water conservation practices are excellent and around 43% of the surveyed citizens believe that their current water conservation practices are poor. In addition, 42% of the surveyed citizens suggested that they don't know whether their water conservation efforts are effective and 28% of the surveyed citizens expressed lack of knowledge in water conservation.

2. A significant 95% of the surveyed citizens expressed interest in water conservation with 54% of the surveyed citizens willing to spend money on water conservation programs. In addition, 76% of the surveyed citizens expressed interest in participating in community water conservation programs.

3. 84% of the surveyed citizens expressed interest in rainwater harvesting. However, only 19% of the surveyed citizens own rain barrels.

Water conservation information

In the initial stage of the guerrilla marketing strategy, UCARE developed posters and brochures to provide water conservation information to the citizens of Florence. Figures 4 presents samples of the posters and brochures.

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Figure 4. Sample posters and brochures

Survey 2 results

Survey 2 was a follow up attempt to comprehensively understand the current water conservation practices of the city of Florence. The response rate for the online survey was 2.16% (27 citizens out of 1249 citizens). Survey 2 consisted of different set of questions related to water conservation and rainwater harvesting. Some of the important insights of survey 2 are:

1. 89% of the surveyed citizens believed that their water conservation practices were either excellent or average and 11% of the surveyed citizens believed that their water conservation practices are poor. In addition, 11% suggested that they don't know whether their water conservation efforts are effective, 30% of the surveyed citizens expressed lack of knowledge in water conservation, and 52% suggested that nothing prevents them from conserving water.

2. A significant 93% of the surveyed citizens expressed interest in water conservation with 48% of the citizens willing to spend money on water conservation programs. A majority of citizens (80%) preferred spending less than $100 on water conservation initiatives. In addition, around 58% of the surveyed citizens expressed interest in water conservation race.

3. 89% of the surveyed citizens expressed interest in rain harvesting with 60% expressing an interest in buying rain barrel.

Since, the response rates to both survey 1 and survey 2 were very low, UCARE proposes the implementation of a more robust marketing plan to help increase citizen engagement in water conservation. Therefore, UCARE proposes the use of the Water Conservation Awareness Campaign provided in the next section.

Water Conservation Awareness Campaign

As a part of sub-contract between UCARE and MRC, the members of MRC has developed a Water Conservation Awareness Campaign proposal to aid the efforts of water conservation within the city of Florence. Through this campaign, the ultimate goal is to help educate citizens to find common practices that provide a sustainable and prosperous future for Florence. The proposal consists of three major components: (1) a pre-survey to gauge the Florence residents' awareness and attitudes toward water conservation, (2) a water conservation awareness campaign to educate the citizens about the importance of water conservation and tips on how to conserve water, and (3) a post-survey to gauge the effectiveness of the awareness campaign.

Pre-Survey

Marketing research is an integral part of any marketing campaign, allowing information to be gathered and used to guide marketing efforts. Consequently, MRC proposes the use of surveys to collect information necessary for the awareness campaign. Survey research is a technique that is relatively easy, less time-consuming to implement, and provides standardized responses that are easy to tally and compare. More importantly, survey techniques can accommodate a large sample size (i.e., most Florence residents) (Burns, Veeck, & Bush, 2017).

MRC proposes the use of a pre-survey that aims to (1) assess the Florence residents' level of awareness/familiarity of the ongoing water shortage and (2) determine the residents' attitudes toward water conversation in general. The results of this pre-survey will establish the baseline condition of local residents' perceptions and opinions, as well as identifying the focus of the awareness campaign.

Concepts Measured

The pre-survey questionnaire is in Appendix B1. To meet the expressed purpose of the pre-survey, MRC has created a series of survey questions measuring the following concepts:

- the residents' awareness of Florence's water shortage;

- the residents' opinions on the importance of water conservation;

- the residents' familiarity with different ways to conserve water;

- the residents' opinion toward investing in water conservation;

- the residents' beliefs about their personal impact on water conservation;

- the residents' beliefs about the usefulness of a free water conservation awareness/education program;

- the residents' preferred methods to receive water conservation information;

- the residents' preferred methods to commit to water conservation and their level of commitment;

- and basic classification questions (how the residents receive their water, age, gender, income level, education level, number of people residing in the home, and homeowner/renter).

Implementation Plan

MRC suggests that the pre-survey be distributed to all current residents in Florence. However, only residents who are 18 or above should answer the pre-survey, and thus a screening question has been created (see Appendix B1). The city of Florence can choose to do a paper-and-pencil survey and/or an online survey. A paper-and-pencil survey will require manually entering all the data into an Excel file. In contrast, if an online survey software (e.g., Qualtrics, SurveyMonkey, etc.) is used, the data will be recorded automatically by the software and can later be exported to

an Excel file for analysis. If needed, the city of Florence may consider using both methods (paper-and-pencil and online surveys) to maximize response rate. In addition, MRC suggests that a cover letter be included (see Appendix B1) to ensure anonymity of responses to increase response rate.

Analysis Plan

Basic descriptive statistics will be sufficient to analyze this survey. For example, the analyst can produce percentages, frequency, means, and standard deviations for the survey questions. The first step would be to analyze the questions using the entire sample. The second step could be to find out if subgroup differences exist. For example, the analyst can divide the entire sample into subgroups based on a certain classification question. One possible example of a classification question the analyst could choose is gender. The entire sample can then be split into different gender groups (e.g., males, females, or other groups). After that, the analyst can see whether respondents in different gender groups have the same or different opinions and perceptions. The existence of subgroup differences indicates that different marketing strategies need to be utilized to appeal to different groups of people. Another good example involves the classification question that asks whether the respondent owns or rents the house. MRC recommends considering whether home owners and renters may have different preferred methods to commit to water conservation as well as different levels of commitment to Florence's water conservation. Therefore, Florence would use different ways to promote the idea of water conservation to home owners versus renters. Potentially, all the classification questions included in our pre-survey questionnaire can be used to investigate subgroup differences. Inferential statistical analyses (e.g., t-test, Analysis of Variance or ANOVA, correlation, chi-square tests, and regression) can be used as well, though that is not required.

Water Conservation Awareness Campaign

MRC proposes a water conservation awareness campaign by utilizing both traditional and emerging media. In today's increasingly digital world, emerging media (e.g., Internet, social media, etc.) are being used more and more. However, traditional media still has its place in marketing. Thus, to increase the effectiveness of the awareness campaign, MRC will propose tools with respect to both traditional and emerging media.

Traditional Media

Traditional media is the form of media that was common before digital age and is still used today due to its effectiveness in delivering the message to the target audience in a clear and direct manner. For example, flyers, posters, and brochures are all forms of traditional media. The message can be distributed to the public in the form of print, radio, TV, or video. The continuous nature of traditional media helps create a platform to ingrain the message through repeated exposure to local residents on a daily basis, providing a lasting impact. MRC developed the following forms of traditional media for the city of Florence:

1. Storyboard
2. Brochure
3. Water-bill insert

Storyboard

MRC has created a character, *Lawrence from Florence*, which can be used as a central theme for the entire water conservation awareness campaign. MRC has also designed a storyboard revolving around the central character, *Lawrence from Florence*. MRC's external professional animator, Tiffany Marcia, helped design the main character in an animated form. The animated character, *Lawrence from Florence*, is illustrated in Figure 5. The storyboard is illustrated in

Appendix B3. The storyboard can be implemented in a traditional, print form. The storyboard can also be produced in a short animated video. Producing the storyboard in both print and video forms will be another option as well.

Idea by: The Marketing Research Club (MRC)

Animation by: Tiffany Marcia (external animator)
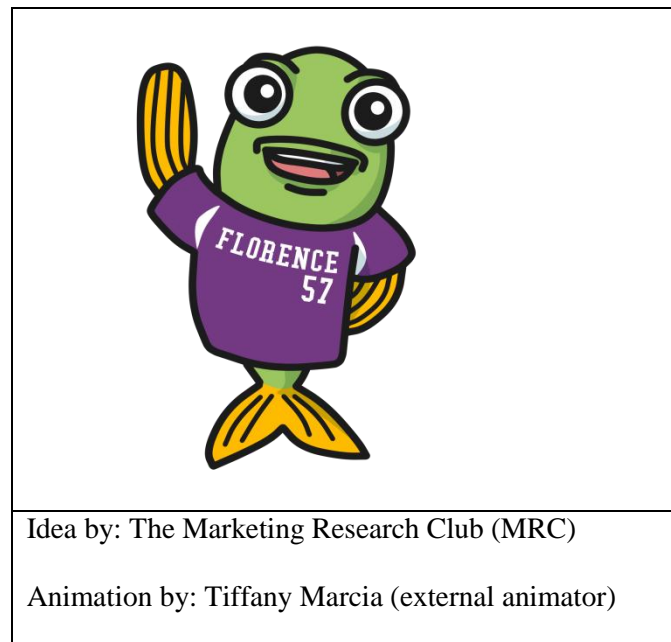
Figure 5. Animated Character, *Lawrence from Florence*

MRC recommends Florence implement a digital storytelling strategy by producing the storyboard in a short, animated video. The rationale behind our encouragement of a digital storytelling strategy is rooted in various marketing concepts. According to Tom et al. (1992), "A marketer who creates spokespersons can control their development by giving them characteristics that are both effective with the target audience and congruent with desirable characteristics of the endorsed product [or service]" (p. 46). Having a created spokesperson, allows consumers to associate the character with a concept, increasing memorability. In this case, MRC proposes that *Lawrence from Florence* be made synonymous with water conservation. A study by Yang and Wu (2011) suggests that digital storytelling "...goes beyond the capabilities of traditional storytelling by generating student interest, concentration, and motivation, facilitating

student collaboration and organization of ideas…" (p. 340). This can be utilized in the water conservation awareness campaign by implementing our storyboard in creative ways.

With respect to implementation, MRC envisions the story to be produced as a digital storyboard and/or radio public service announcement. The digital storyboard could be a short video presented at all school levels and during commercials on local channels on television. The average cost of a video is anywhere between $3,000 and $6,000 depending on the length of the video. The main potential obstacle therefore would be the animation costs.

Brochure

MRC created a brochure for the city of Florence that covers (1) the amount of water a person uses in a day, (2) some tips to conserve water, (3) why a person should save water, and (4) the current water situation in the city of Florence. These topics addressed in the brochure were purposely chosen because of the significance each topic has on educating the public on the importance of water conservation and on ways in which the citizens can help make an impact on conserving water. The brochure is illustrated in Appendix B4.

The brochure was created using various Microsoft Office applications such as MS Word and MS PowerPoint. The time frame for the brochure can be classified as ongoing, because the brochure has already been created. It can be distributed continuously to the public or left at city hall or other locations for the public to access at their most convenient time. The budget for the creation and distribution of the brochures depends on the number of brochures printed and the location at which the brochures are printed. A potential obstacle for the brochure is the distribution. The easiest route for distribution may be placing the brochures throughout the city in locations that receive high foot traffic, so citizens can pick up brochures at their convenience. The brochures can also be handed out at schools or churches, but this requires more effort and time. The

brochure gives the city of Florence a deliverable that can be distributed to key locations (restaurants, banks, grocery stores, library, bookstores, and other retail stores in the city of Florence). The brochure gives insightful information about water usage and tips to conserve water. Such information can help gain support from the residents with respect to the city's water conservation efforts.

Water Bill Insert

The city of Florence sends out residential water bills through the mail once a month. The back of each water bill has blank space that can be utilized to actively engage citizens to participate in furthering their awareness of water conservation. A picture of *Lawrence* on the back of the water bill will help maintain a positive influence in the minds of individuals throughout the city. Under the picture will be a link to direct residents to the Florence city website where citizens can both get education on water conservation and submit water conservation questions. The utilization of the water bill helps to increase the exposure of the water conservation campaign and provides citizens (who have not been exposed to any other marketing materials) the chance to see material that can help the city in their water conservation efforts. See Appendix B5 for "water bill insert".

Emerging Media

Emerging media is a more recent approach to marketing through digital channels, such as social media, websites, email, and mobile applications. This form of marketing is effective in reaching a mass population through internet content. Digital marketing is useful in creating community engagement and user interactivity by providing a forum for two-way communication. One important consideration in implementing a digital/emerging media marketing plan is user readiness, such as whether the population is adaptive to digital media (for instance, social

media.) Based on Florence's current usage of digital media platforms, MRC proposes the implementation of a marketing campaign on the following digital platforms:

1. Facebook page

2. Website

Facebook Content Analysis

By performing a content analysis on Florence's Facebook page, Florence will be able to evaluate previous posts and study what the people in the community are concerned about. MRC did a content analysis of the Florence's Facebook page. Based on our analysis, there is limited information or discussion regarding water conservation via this outlet. This finding indicates that this outlet, Facebook, can be utilized more to engage residents in Florence. This brings up our next section, engagement via Facebook.

Engagement Via Facebook

MRC proposes that utilization of a social media outlet, such as Facebook. This may help generate a heightened sense of community around the water conservation issues. According to the literature, social media, such as Facebook, provide a new element in the promotional mix and enables customers to talk to other customers directly (customer-to-customer interactions) (Mangold & Faulds, 2009). Along this line of reasoning, the city can take advantage of social media to foster more conversations among residents regarding water conservation issues. This may increase a sense of community and even a sense of responsibility toward the community.

The community involvement of Florence's Facebook home page is large, consisting of about 1,462 likes and 1454 follows as of May 2018, and shows a promising opportunity to achieve the ultimate goal of engaging local residents in water conservation. The main rationale for achieving

this goal is to harness the power of Facebook and to encourage residents to communicate with other residents in the community.

To that end, we propose a "Fun Fact" social media campaign that consists of a series of Fun Fact Facebook posts. It is important to have a central theme for all the posts. MRC suggests that the central theme be water conservation tips. MRC created four (4) Facebook posts as a starter of this Fun Fact campaign. The posts are illustrated in Table 2.

Table 2

"Fun Fact" social media campaign" (some examples)

First Post Example (1st of the month)	"Fun Fact 1: Did you know you can save 12.5 gallons just by taking a five minute shower instead of a ten minute shower? For more water saving 'fun facts', visit our website at …"
Second Post Example (15th of the month)	"Fun Fact 2: Did you know that a dripping faucet can waste over 190 gallons of water a month? For more water saving 'fun facts', visit our website at…"
Third Post Example (1st of the month)	"Fun Fact 3: Did you know that 40-80 gallons of water are used when washing your car at home (if the hose runs the whole time)? For more water saving 'fun facts', visit our website at…."
Fourth Post Example (15th of the month)	"Fun Fact 4: Did you know that over 25 gallons of water can be saved every day if watering is done before 8:00 a.m.? For more water saving 'fun facts', visit our website at…"

With respect to implementation, MRC suggests having the job of one city employee include the creation and uploading of the Fun Fact to Facebook posts every month. As indicated in Table 2 above, MRC suggest a bi-monthly posting (i.e., posting first and fifteenth of every month). This is an appropriate schedule, because it helps residents remain interested in the topic while not being overwhelmed by the amount of information. The cost to use social media is relatively low; there is no need for a big budget expense. All that is needed is a designated city employee to keep up with the posting. Measures for maintaining the posts may include keeping track of the number of "Likes" and "Shares" of the posts on Facebook. Potential obstacles may include creating content appropriate for "Fun Facts" related to water conservation, commitment of the employee responsible for creation of the posts (residents will be disengaged if the posts are not posted regularly), and potential technical issues. Resources required to implement include a community Facebook account, Internet access, and a computer.

Engagement Via Online Presence

MRC proposes that the city of Florence maximize the usage of existing online resources, such as the city's official website and the online water bill payment method, to engage the community on water conservation issues. MRC visited the website home page (http://www.florencetex.com/) and did a quick analysis of the page. Currently, the website does a good job of informing the residents of water shortages and tips for water conservation. However, there are other opportunities to engage the residents on water conservation via website.

Currently, the city's official website is heavy on text content, and adding some visual content may help in engaging users. Literature suggests that visual content is more engaging to users than text alone. According to Pieters and Wedel (2004), "The three key ad elements (brand, pictorial, and text) each have unique superiority effects on attention to advertisements … [but]

the pictorial is superior in capturing attention, independent of its size" (p. 36). In order to engage users, we recommend using the image of *Lawrence from Florence* on the website and with online bill pay. People in the community will see the eye-catching visual when they go to the home page and when they use online bill pay, which will create more awareness regarding the water shortage. Given that *Lawrence from Florence* is a character created with human traits, it will help inform, and, more importantly, engage the residents.

With respect to implementation, MRC envisions the online website to include a creation of the visual image (*Lawrence from Florence*) and the message (informational text of Florence's current water status) with a link to a water conservation page. This will give residents valuable tips relevant to the city of Florence for saving water. There will be an image of *Lawrence from Florence* right above the text/link to go along with it. The time frame would involve periodically changing the text when appropriate, for example, when the water restriction level changes. An online presence should be maintained by the website manager, with costs factored into the budget. Measures for the effectiveness of the online presence may include the number of clicks made to the water conservation page. Two main potential obstacles would be technical issues and the lack of customer feedback. Figure 6 shows how MRC visualized the proposed content being added to the current website and online bill pay. The arrows in Figure 6 are representative of an eye-catching placement for a visual advertisement on water conservation on the Florence website:

We recommend to move/edit water conservation tips link.

Lawrence from Florence

Insert text and the water conservations tips link. Also include other information regarding Florence's current water status.

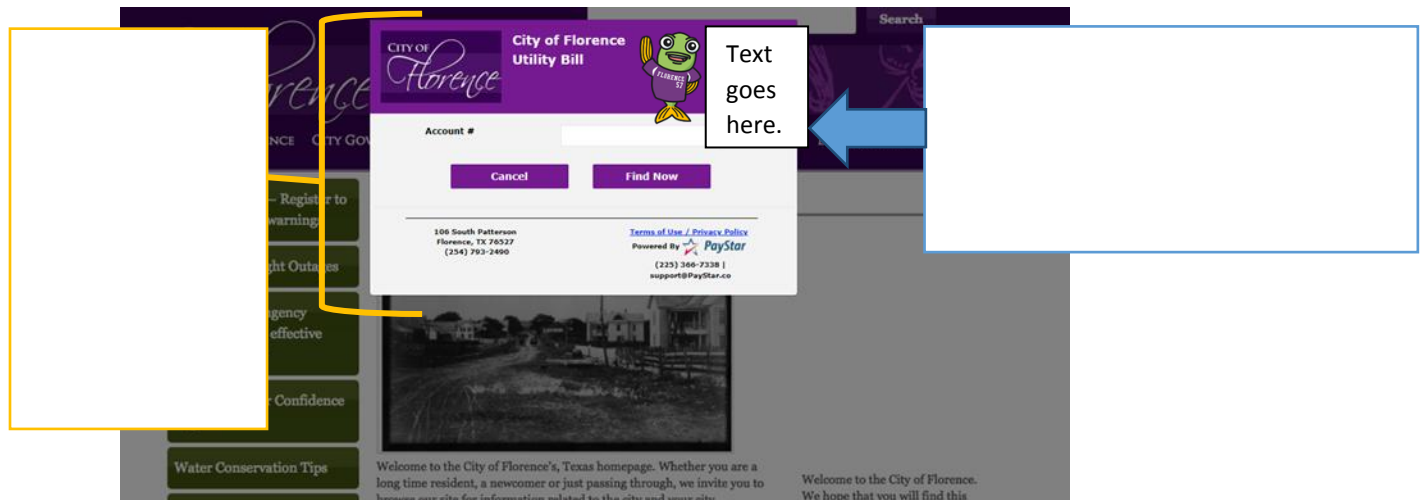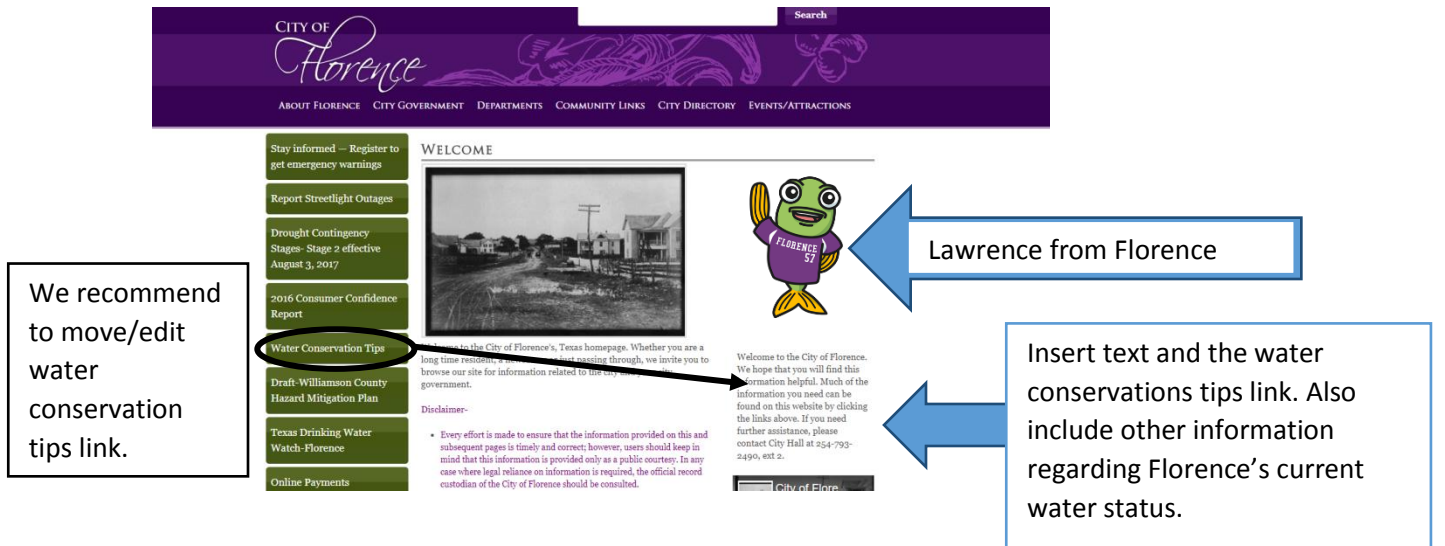Text goes here.

Figure 6. Proposed Visual Placement for the Current Website and Online Bill Pay

Post-Survey

After the implementation of the provided campaign, it is crucial to reassess the knowledge and awareness of the issue at hand to verify the impact of the newly disseminated information and tools. The advantages of using surveys for marketing research were discussed previously (see the

pre-survey section). The pre-survey section highlighted this tool as an efficient and simple way to gather information that affects future marketing efforts.

MRC proposes the use of a post-survey design to verify the effectiveness of the campaign by (1) reassessing the Florence residents' level of awareness/familiarity of the ongoing water shortage and (2) assessing any changes in residents' attitudes toward water conversation in general after being exposed to the various elements of the water conservation campaign. The results of this post-survey will establish the success level of the campaign and assess changes in local residents' perceptions and opinions toward water conservation and the drought issues. One of two possible post-surveys will be used, depending on whether the resident had completed the pre-survey or not.

Concepts Measured

The two post-survey questionnaires are illustrated in Appendix B2. The post-survey questions created measure the following concepts:

- the residents' familiarity with the water conservation campaign;

- a reassessment of the residents' awareness of Florence's water shortage;

- a reassessment of the residents' opinions on the importance of water conservation;

- a reassessment of the residents' familiarity with different ways to conserve water;

- a reassessment of the residents' opinions toward investing in water conservation;

- a reassessment of the residents' beliefs about their personal impact on water conservation;

- a reassessment of the residents' beliefs about the usefulness of a free water conservation awareness/education program;

- a reassessment of the residents' preferred methods to receive water conservation information;

- a reassessment of the residents' preferred methods to commit to water conservation and their level of commitment;

- and basic classification questions (how the residents receive their water, age, gender, income level, education level, number of people residing in the home, and homeowner/renter) to apply additional changes to specific groups of people.

Implementation Plan

MRC suggests that the post-survey be made available for those who completed the pre-survey, while also expanding a wider net to those who may have gained awareness through the campaign. As with the pre-survey, screening questions will ensure that participants are at least 18 years of age and they will be directed to a different set of questions depending on their answer ("Yes" or "No") to the question "Did you complete the first water conservation survey that was implemented between ___ (month) and ___ (month), ____ (year)?" (See Appendix B2: B2a and B2b). MRC recommend implementing the post-surveys in the same fashion as the pre-surveys (e.g., paper-and-pencil and online). As mentioned previously in the pre-survey section, the paper-and-pencil format will require manual inputting of data into Excel, and the online format will automatically record data for later Excel exportability. A cover letter should be included for the post-survey as well.

Analysis Plan

The same basic descriptive statistics outlined in the pre-survey section are applicable to analyzing the post-survey results. It would be interesting to see if there exist any differences in water conservation awareness and attitudes between the citizens who had completed the pre-

survey versus people who had not completed the pre-survey. Once the information has been grouped and analyzed from various perspectives, conclusions can be made to help shape the future of marketing efforts as they relate to dissemination of information and awareness for water conservation and other relatable ideas.

WATER CONSERVATION GRANTS

As part of the *"CF-CTWC"* project, UCARE was asked to identify potential sources of funding for water conservation programs. Over the course of the project, five separate email messages with several links for finding sources were sent to assist city of Florence to show ways to reduce costs associated with helping to fix, repair, or replace existing water conditions within the city. Deliverable 1 offered three links to broad web links including "Business in Texas", Texas eGrants, and Texas Department of Agriculture (TDA). Additionally, a specific link was identified for TDA Small Town Environmental Programs (STEP) with applications open until Feb. 1, 2018. Next, deliverable 2 offered more grant opportunities with two broad funding agencies: The Economic Development Administration (EDA) and Grants.gov. Additionally, two specific possibilities for grants within the State of Texas were forwarded: the 2018 National Ground-Water Monitoring Network, CFDA # 15.980 and the TAT Grant Program FYI18, CFDA # 10.761. As a part of deliverable 3, possible grants were sent with two broad hyperlinks to the Texas Water Development Board and the Water for Texas Financial Assistance Programs. Additionally, insights to other communities that have used grant funding for improvements was included: The city of Kilgore, TX used the Texas Leverage Fund, 1992 which helps identify additional sources of financing to communities. Also the Capital Area Council of Governors featured a TDA that seeks small town environment program applications. Table 3 presents grant websites given as information to Florence.

Table 3

Grant websites

Grant Sites
Submitted on 09/20/17
https://businessintexas.com/services/grants
https://txapps.texas.gov/tolapp/egrants/search.htm
http://www.texasagriculture.gov/GrantsServices/RuralEconomicDevelopment/TexasCapitalFund.aspx
https://www.grants.gov/web/grants/search-grants.html
Submitted on 10/20/17
http://www.texasagriculture.gov/GrantsServices/RuralEconomicDevelopment.aspx
https://www.eda.gov/funding-opportunities/
https://www.eda.gov/grants/
http://www.capcog.org/
Submitted on 10/30/17
https://granttrainingcenter.com/member/grant_view/TATFY18
https://granttrainingcenter.com/member/grant_view/G17AS00070
Submitted on 11/13/17
https://businessintexas.com/sites/default/files/07/24/17/incentivessummary.pdf
http://www.capcog.org/in-the-news/tda-seeks-small-town-environmental-program-applications
http://www.twdb.texas.gov/financial/programs/RWPG/index.as
http://www.twdb.texas.gov/publications/shells/swift_info_sheet.pdf?d=23992.845
http://www.kilgore-edc.com/texas-leverage-fund
http://www.twdb.texas.gov/
Notes:
Two specific possibilities for grants within the State of Texas were forwarded. 1) 2018 National Ground-Water Monitoring Network, CFDA # 15.980 and 2) TAT Grant Program FYI18, CFDA # 10.761.

Tax Exemptions

Rainwater harvesting system equipment is sales tax exempt in Texas. Section 151.355 of the Texas Tax Code exempts rainwater harvesting equipment and supplies from state sales tax. To claim this exemption, the purchaser must furnish a Tax Exemption Application Form 01-339 to the supplier at the time of purchase (Texas Tax Code, 2007). In addition, the following water components are exempt from taxes:

- Rainwater harvesting equipment or supplies, water recycling and reuse equipment or supplies, or other equipment, services, or supplies used solely to reduce or eliminate water use;

- Equipment, services, or supplies used solely for desalination of surface water or groundwater;

- Equipment, services, or supplies used solely for brush control designed to enhance the availability of water;

- Equipment, services, or supplies used solely for precipitation enhancement;

- Equipment, services, or supplies used solely to construct or operate a water or wastewater system certified by the Texas Commission on Environmental Quality as a regional system;

- Equipment, services, or supplies used solely to construct or operate a water supply or wastewater system by a private entity as a public-private partnership as certified by the political subdivision that is a party to the project;

- Tangible personal property specifically used to process, reuse, or recycle wastewater that will be used in fracturing work performed at an oil or gas well.

Based on the above tax exemption components, Florence can identify tax exemption opportunities in rainwater harvesting and wastewater treatment systems.

FEASIBILITY ANALYSIS OF RAINWATER HARVESTING

As one component to address the city of Florence's water problems, UCARE has evaluated using a rainwater harvesting program.

Rainwater harvesting program

Rainwater has always been vital for communities to recharge both their springs and aquifers. The use of rainwater harvesting is not a new idea, but has been in use throughout the world for thousands of years. Water usage needs such as irrigation, toilet flushing, and vehicle washing that are usually met with potable water can be supplemented with rainwater. The use of rainwater to fill these demands can help save money and energy that would otherwise be used to treat and transport potable water.

Decentralized rainwater harvesting (DRH) can be an alternative method for the city of Florence to assist in supplementing certain water needs for residents in the community. DRH involves households using their own rain barrels to catch rainwater. Therefore, in this study UCARE explored the feasibility of rainwater harvesting for the city of Florence. Figure 7 presents an example of rain barrel.

Figure 7. Example of 54-gallon rain barrel

Rainfall data

In order to study the feasibility of DRH, it is important to understand the rainfall rate for the city of Florence. Based on the rainfall data provided by Williamson County's station 41-3199-03, UCARE has estimated the average monthly precipitation for the city of Florence (Figure 8).
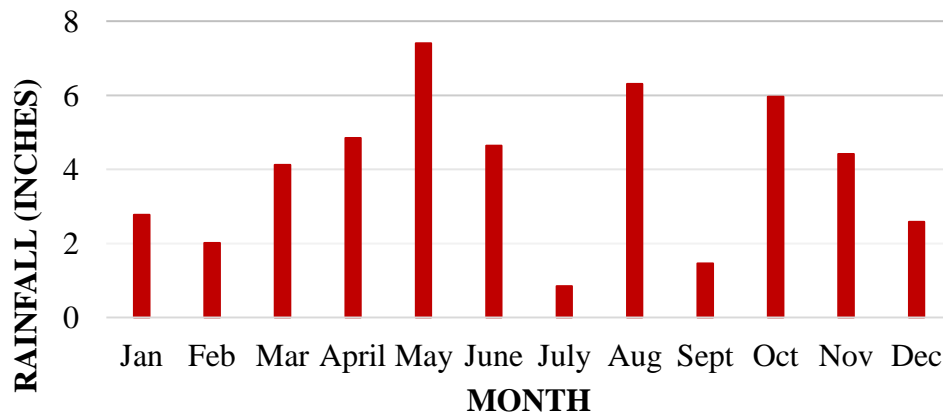

Figure. 8. Average monthly rainfall for the city of Florence

Methodology

A DRH analytical approach consisting of simulation and cost benefit analysis (CBA) was developed and is presented in Figure 9. A simulation model was developed that uses a set of input parameters and provides outputs such as yearly rainwater supply (rainwater that is harvested), yearly water usage, and volumetric reliability (percentage of water demand met by harvested rainwater). The daily rainfall and daily water usage (input parameters) are simulated by using their probability distributions. The simulated rainfall and water usage are compared with the actual historical data to validate the model. The outputs of simulation model are used as input parameters for CBA to estimate economic benefits and payback period.
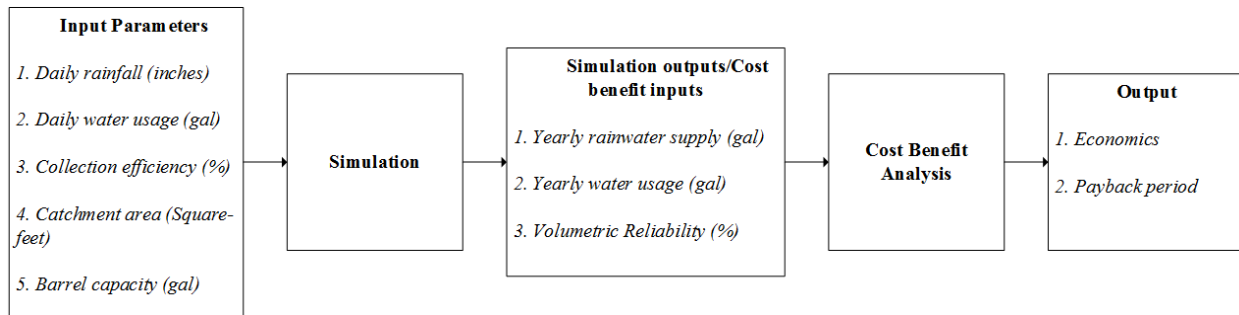
Figure 9. DRH analytical approach

Limitations

There are several limitations in this study due to factors such as market imperfection, quantification of intangibles, and income distribution. Market imperfection occurs when there is a limited number of market competitors; this may be due to the limited acceptance of rainwater harvesting as a viable water supply which leads to non-competitive pricing of rainwater harvesting equipment. Quantification of intangibles can be weighted in multiple ways depending on the scenarios and perceptions, which may vary by the person conducting the analysis. According to our surveys, income distribution in Florence shows 48% of its residents with an income of $25,000 or less and the remaining 52% is distributed in the upper income brackets (Figure 10). The income survey results places a majority of Florence residents below the Texas poverty level leading to a purchasing power disparity (US Census Bureau, 2017). Purchasing power disparity can limit participation from lower income families in programs that require monetary investment.
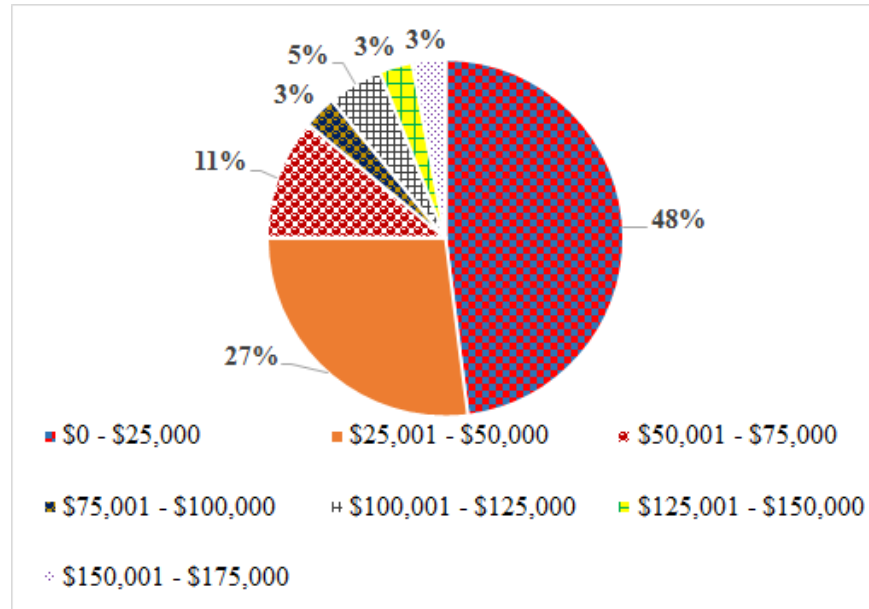
Figure 10. Yearly income levels for Florence residents

Results of the DRH study

The results of the DRH are presented from both the household and the city of Florence perspective.

Household perspective

An analysis was conducted for individual households. Figure 11 presents information on the rainwater collected. It indicates that a 2,500 gallon rain barrel is a better capacity compared to other barrels as it helps to achieve highest rainwater collection with lowest cost. Any capacity above 2,500 gallons results in insignificant increase in rainwater collection; however, the cost increases significantly. Therefore, a household in the city of Florence is encouraged to use any rain barrel with a capacity below 2,500 gallons based on their purchasing power. Table 4 presents the cost, rainwater collectable per household per year, and savings per year per household for different rain barrel capacities. UCARE classified a dry year as a year with three

times less rainfall compared to average year and wet year is three times more rainfall compared to the current year. Assuming that the maximum purchasing power of an average household in the city of Florence is less than $500 for rain barrel purchase, UCARE predicts that the rainwater collected per household per year will range between 2,879 and 30,021 gallons/year resulting in annual household savings of $12 - $ 130 per year.

Table 5 presents the payback period for a rain barrel with and without gutter systems. It indicates that the payback period for rain barrel with gutters is significantly larger due to the extra cost attributed to gutter system installation.
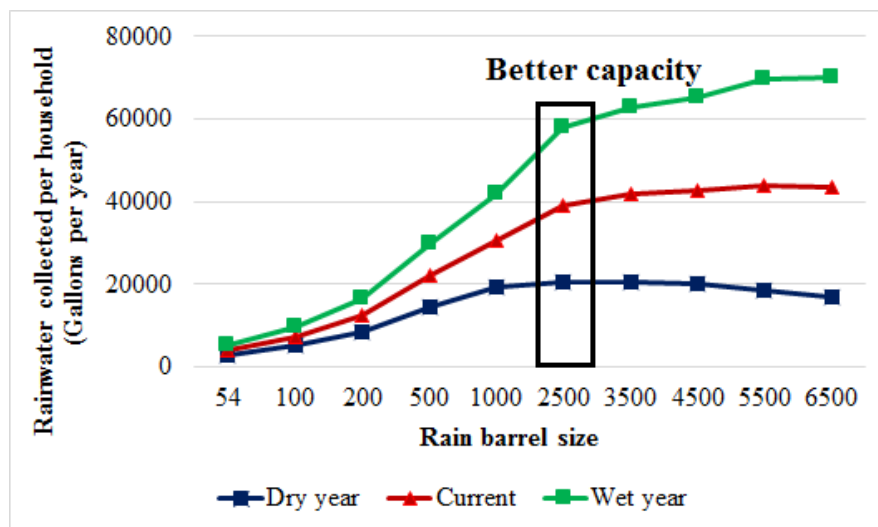

Figure 11. Rain water collected per household by using different rain barrel sizes

Table 4

Rainwater that can be collected by each entity for different barrel sizes

Rain barrel size (Gallons)	Cost	Rainwater collectable per household (Gallons per year)			Savings to the household/year
		Dry year	Average Year	Wet year	
54	$70	2,879	4,066	5,252	$12 – $23
100	$190	5,139	7,319	9,499	$22 – $41
200	$240	8,555	12,556	16,555	$37 – $72
500	$450	14,355	22,179	30,021	$62 – $130
1,000	$660	19,257	30,658	42,059	$83 – $182
2,500**	$1,080**	20,671**	39,291**	57,911**	$90 – $251**
3,500	$1,740*	20,580	41,735	62,889	$89 – $272
4,500	$2,400*	20,219	42,738	65,257	$88 – $283
5,500	$2,500	18,360	44,117	69,873	$80 – $303
6,500	$3,160*	16,968	43,536	70,104	$73 – $303

*Estimated by UCARE   **Better capacity

Table 5

Payback period for different rain barrels without and with gutter

Rain Barrel size (Gallons)	Payback period for barrel only	Payback period for barrel with gutter installation*
54	3 – 6 years	44 – 81 years
100	5 – 9 years	27 – 51 years
200	3 – 6 years	16 – 32 years
500	3 – 7 years	11 – 22 years
1,000	4 – 8 years	9 -19 years
2,500	4 – 12 years	8 – 23 years

*The average cost of gutter is $941.

City of Florence perspective

This section expands the analysis to present the benefits to the city of Florence itself of implementing a DRS system. In this study, UCARE assumes that the purchasing power of an average household in the city of Florence for rain barrel is less than $ 500. Table 6 shows the rainwater collected, rainwater reliability, and savings under different household participation

rate. It indicates that anywhere between 0.29 to 4.07 million gallons of rainwater collected per year depending on the household participation rate. In addition, the reliability of rainwater will be between 0.82% – 11.65%, so rainwater will be able to help meet around 0.82 % to 11.65% of the city's water usage. The savings in water cost for the city of Florence will range between $1,243- $17,665 per year.

Table 6

Rainwater collected, rainwater reliability, and savings under different household participation rate

Household participation rate	Rainwater collected (Million Gallons/year)	Rainwater Reliability (%)	Savings to the city ($/year)
10% (48 households)	0.29 – 0.56	0.82 – 1.60	1,243 – 2,428
25% (121 households)	0.70 – 1.37	2.02 – 3.93	3,061 – 5,955
50% (242 households)	1.40 – 2.72	3.99 – 7.77	6,056 – 11,774
75% (363 households)	2.09 – 4.07	6.00 – 11.65	9,090 – 17,665

*Barrel size of 54 (50% household), 100 (25% household), 200 (15% household), 500 (10% household) are considered.

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APPENDIX A

This Appendix presents survey results of Guerrilla marketing strategy.

Survey 1 results

The survey area of Florence, TX has a population of 1,249. For survey 1, UCARE recruited 43 participants to take our online survey detailing different questions pertaining to water conservation, rain water harvesting, and general demographic information. Demographics gathered from the survey 1 demonstrate that 62% of surveyed citizens were male, and 38% females. Ethnicity was broken down into 53.85% Caucasian, 35.90% Latino, 5.13% African American, and 2.56% Middle Eastern. Primary language for surveyed citizens were 72.97% English speakers, 24.32% Spanish speakers, and 2.70% other. The small number of non-English speakers was not a barrier in recruiting participants for the study, and not a cause for our relatively small sample of 43 participants. The surveyed citizen's geography was split with 70% urban residents (city) and 30% rural residents (country). This indicates that any measures taken by UCARE to disseminate information throughout Florence would reach the vast majority of citizens. Florence citizens in survey 1 were also found to be employed in a variety of industries.
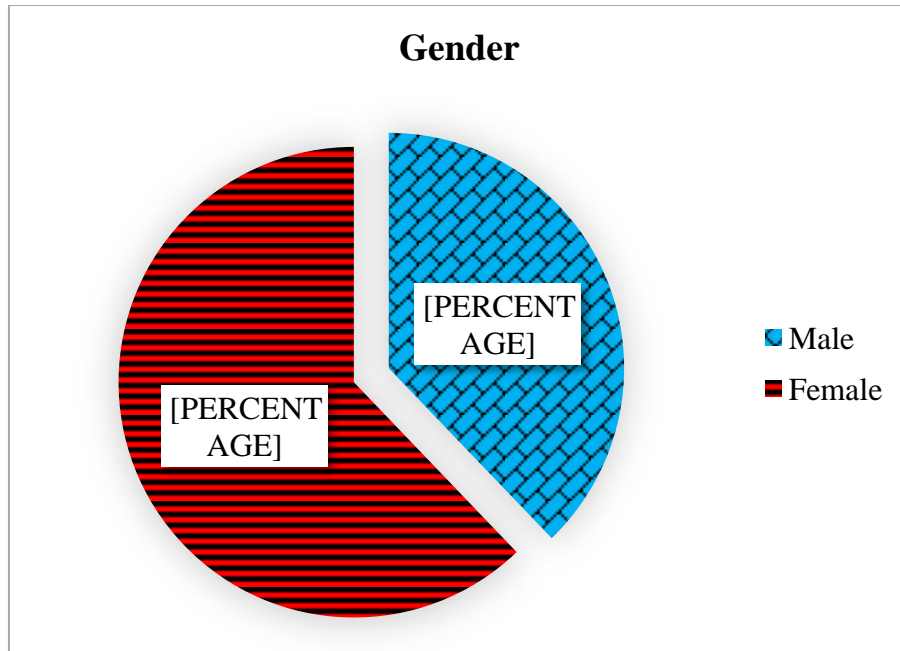
Gender

[PERCENTAGE]

[PERCENTAGE]

Male
Female

Figure A1. Gender of surveyed citizens

Ethnicity

60%

54%

40%

36%

20%

5%

0%

3%

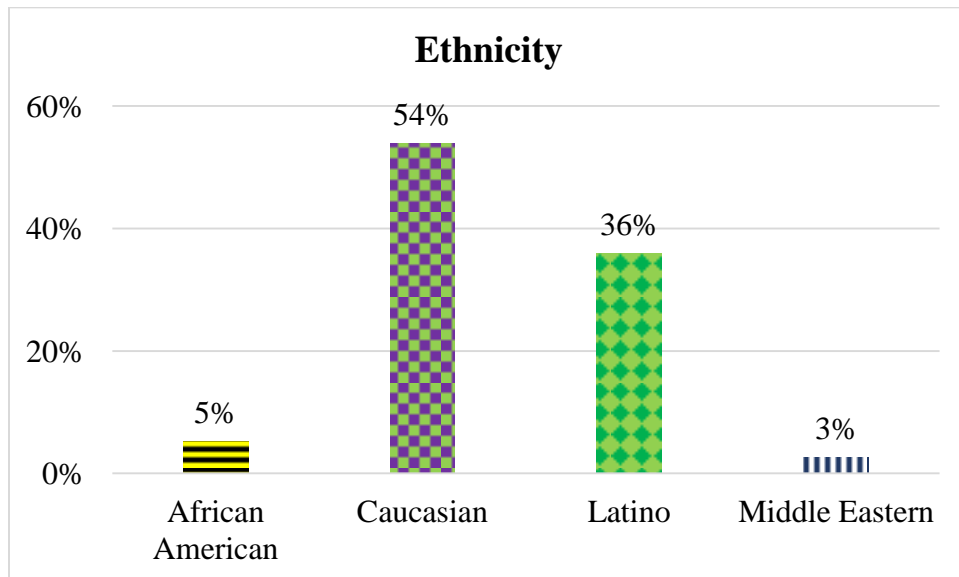African American   Caucasian   Latino   Middle Eastern

Figure A2. Ethnicity of surveyed citizens
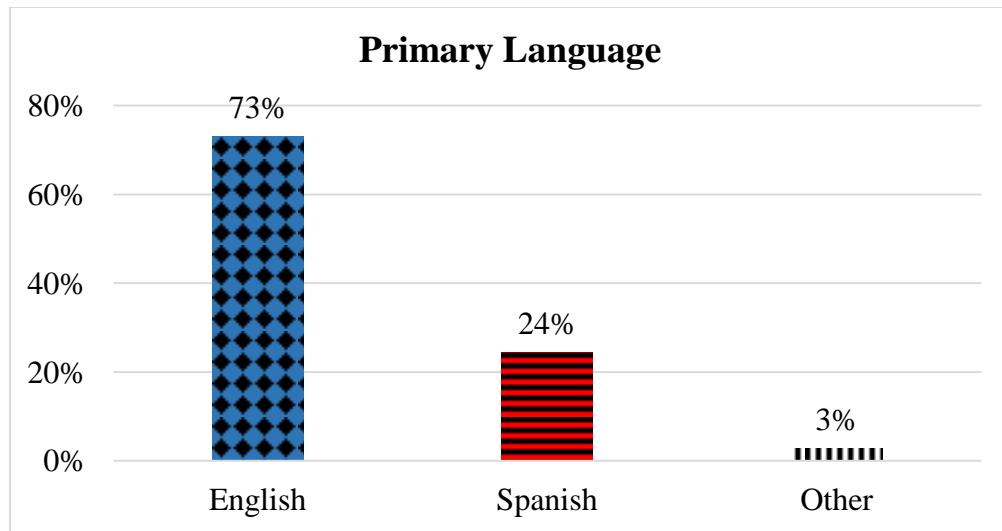
Figure A3. Primary language of the surveyed citizens
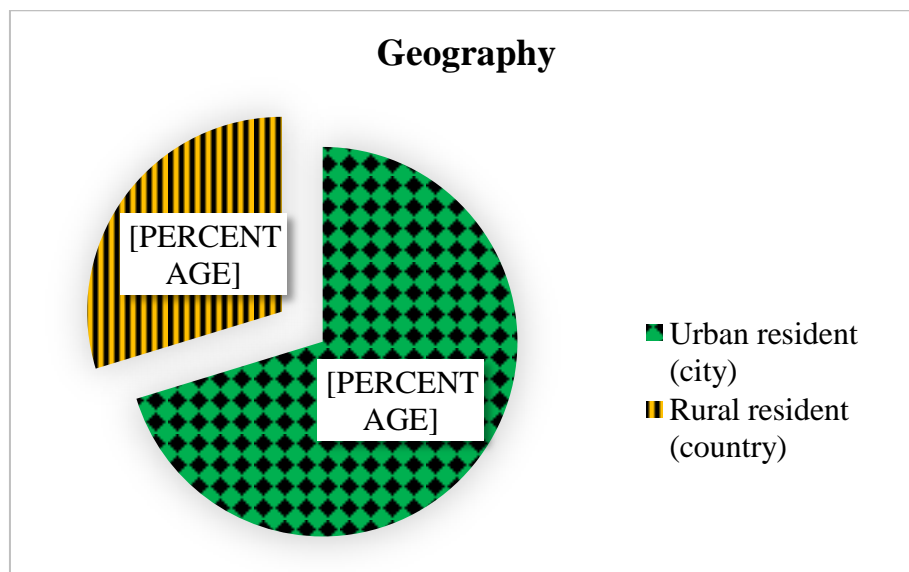
Figure A4. Geography of the surveyed citizens
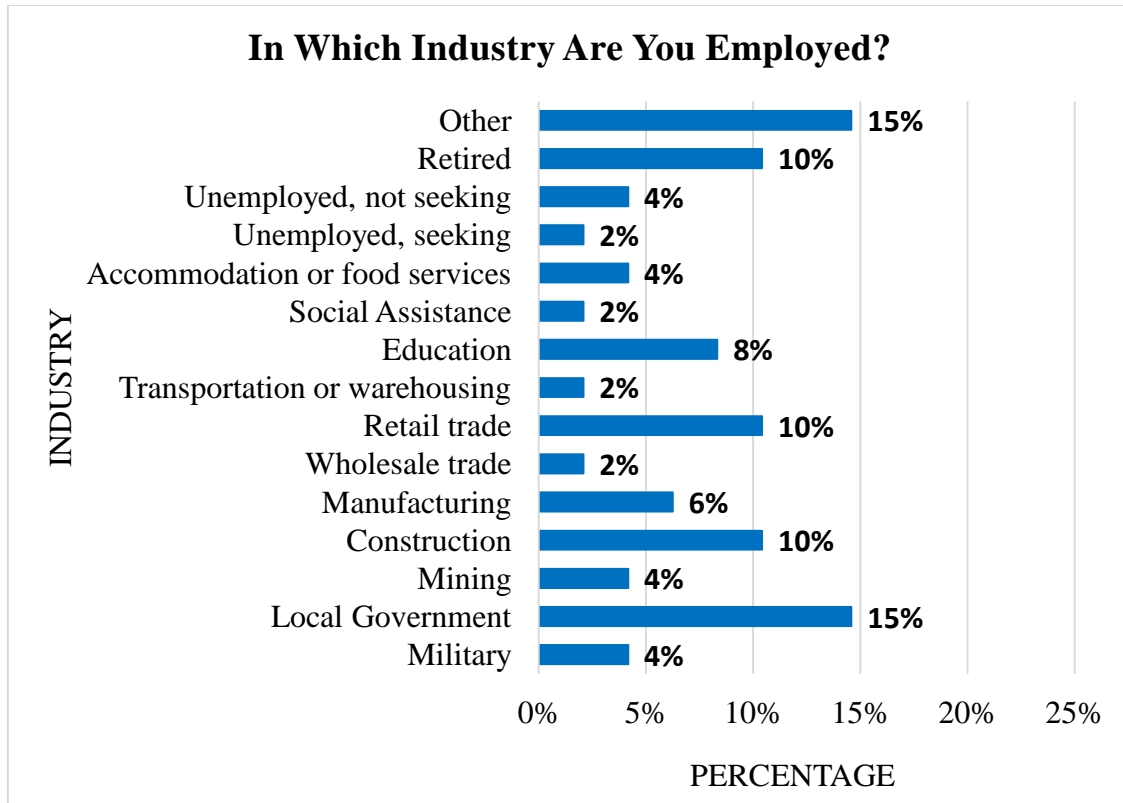
In Which Industry Are You Employed?

Industry	Percentage
Other	15%
Retired	10%
Unemployed, not seeking	4%
Unemployed, seeking	2%
Accommodation or food services	4%
Social Assistance	2%
Education	8%
Transportation or warehousing	2%
Retail trade	10%
Wholesale trade	2%
Manufacturing	6%
Construction	10%
Mining	4%
Local Government	15%
Military	4%

Figure A5. Industry in which surveyed citizens are employed

After asking general demographic questions, the survey asked general questions regarding how the citizens conserve water. This helped UCARE ascertain the level of knowledge citizens have regarding water conservation and their willingness to participate in a water conservation initiative. Most citizens of Florence rated their water conservation practices as average. Additionally, over 70% of citizens are water conscious, actively thinking about the amount of water they use daily. These responses demonstrate that citizens are aware of the water scarcity and are contemplating the necessity to save and preserve water as a resource.
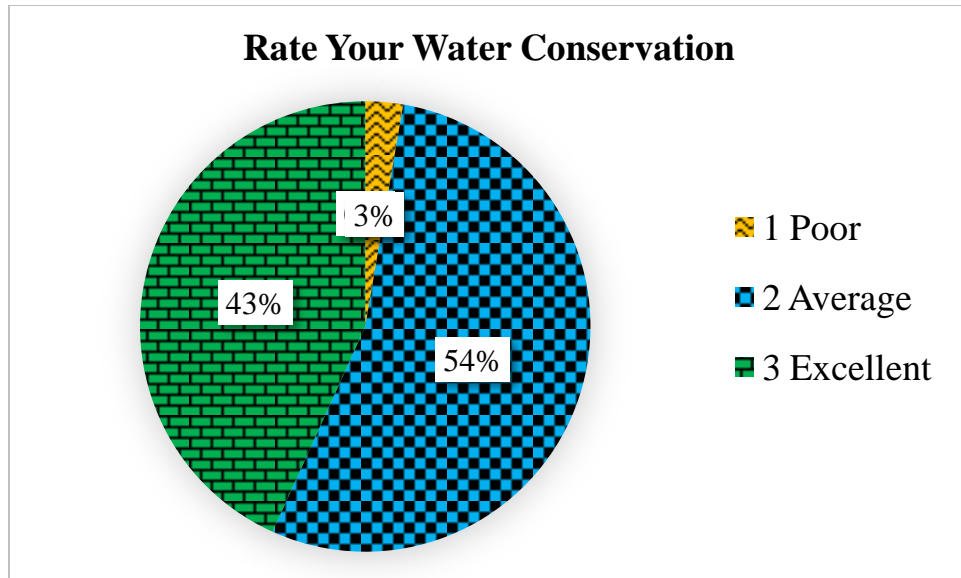
Rate Your Water Conservation

3%

43%

54%

- 1 Poor
- 2 Average
- 3 Excellent

Figure A6. Water conservation rating of surveyed citizens

Do you think about your daily water use?
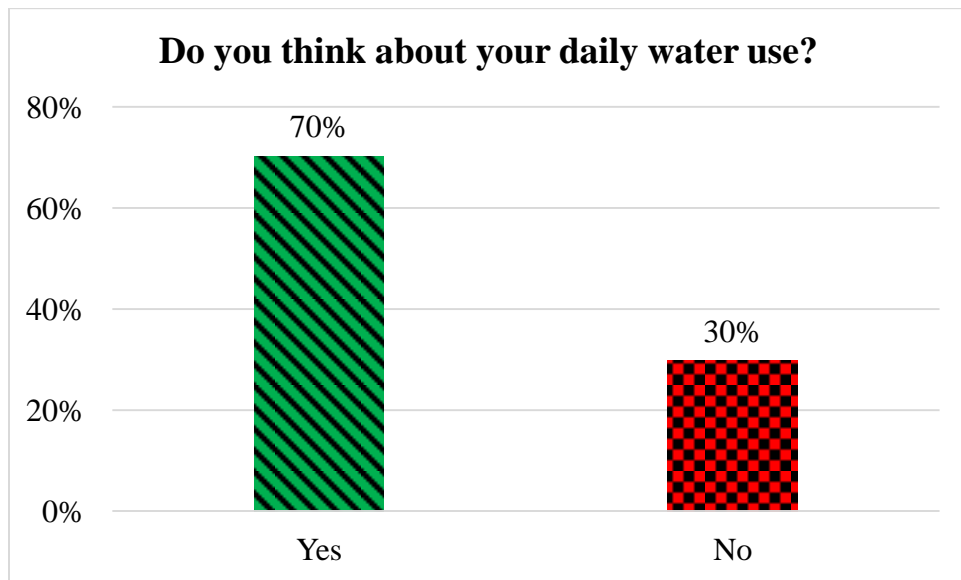
70%

30%

| | Yes | No |

Figure A7. Percentage of surveyed citizens think about their daily water use

Although surveyed citizens would rate themselves as average regarding water conservation, their level of willingness to be part of water conservation initiatives was significant with 95% willing to do so. This demonstrates water conservation campaign or program should be effective and well-received in Florence.
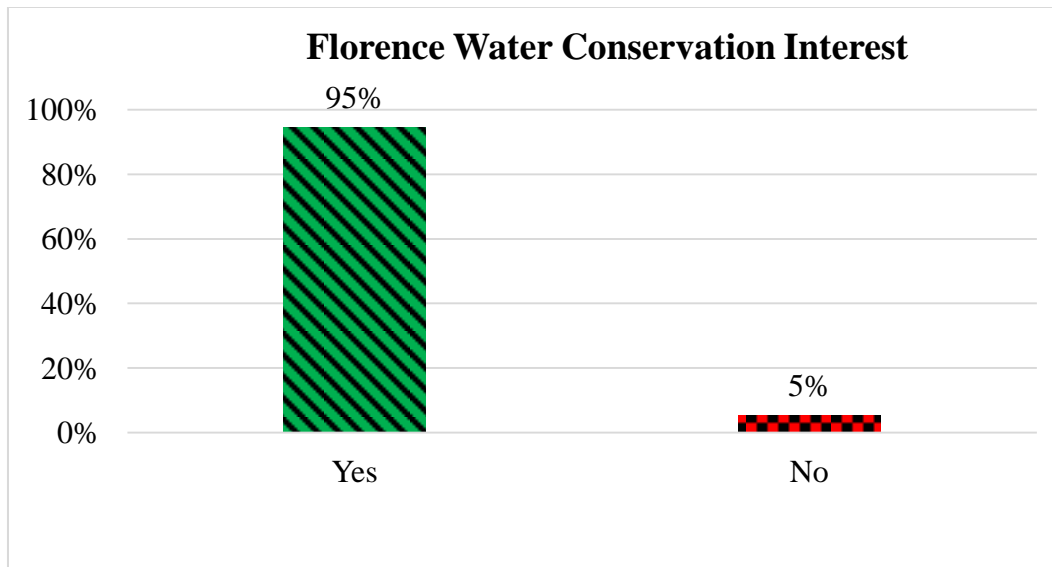
Figure A8. Water conservation interest of surveyed citizens

When asked about the different barriers to conserving water, a sense of futility was the most reason stated. 42% of surveyed citizens indicated that they did not think their individual efforts to conserve water would make long-term impacts, followed by 28% suggesting that there was nothing prevents them from conserving water. In addition, 17% suggested that they lack knowledge on how to conserve water. These results indicate that an awareness campaign about the effectiveness of a collaborative effort to conserve water, as well as instructing citizens on how easy it is to save water, should be the focus of a water conservation effort for Florence.

What prevents you from conserving water?

- Don't know if conservation efforts are effective
- Users can't make a difference
- Don't know how to conserve water
- Have the right to use as much water
- Other
- Nothing prevents me from conserving water

43%
28%
8%
4%
18%
4%
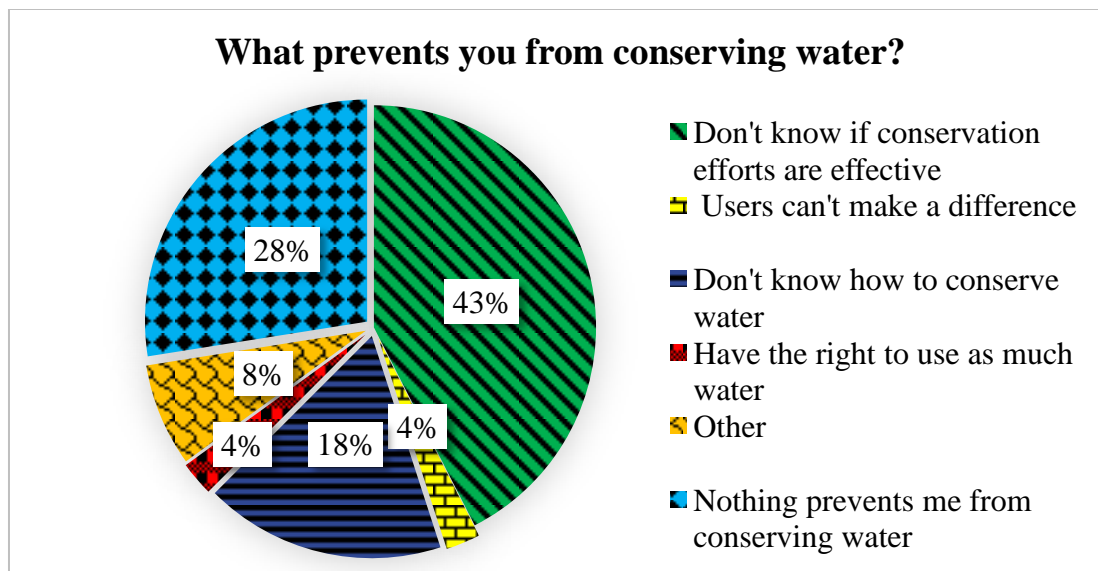
Figure A9. Water conservation barriers for surveyed citizens

To assess information dissemination and where/how citizens obtain information city information, questions were asked to pinpoint the most popular mediums. The results indicate that 19% of the surveyed citizens received information from utility bills, 13% of the surveyed citizens received information from websites/internet, and 11% of the surveyed citizens received information from television news. Due to Florence not having a specific citywide method for getting information to their citizens like a newsletter or a local newspaper, there were limited media available to UCARE to use to disseminate information. Therefore, UCARE believes that the city utility bill is the most prudent venue of information for citizens.

How Do You Access Water-saving Tips and Programs?

Source	Percentage
Other	3%
Word of mouth	6%
E-mail messages	1%
Events	6%
Flyer/brochures	1%
Web sites/Internet	13%
Government access television	0%
Television commercials	6%
Television news	11%
Radio commercials	4%
Radio news stories	3%
Utility bill/water bill inserts	19%
Chamber or civic group publications	5%
Direct mail	1%
Magazine/trade publication…	1%
Magazine/trade publication articles	8%
Newspaper advertisements	5%
Newspaper article	6%

Figure A10. Access to water–saving tips and programs

Water conservation methods may entail a personal monetary investment into systems that aid water conservation. Infrastructure such as gutters, rain barrels, water saving facets, fixtures, toilets, and showers could be installed in citizen's homes to reduce water waste. Questions were asked to assess how willing citizens were to spend money on infrastructure to reduce water use. 54% of surveyed citizens reported that they were unwilling to spend money on water conservation. This should not be taken as an inherently negative attitude from the citizens about paying for water conservation. A similar question was asked to see if citizens were willing to donate money towards a community water conservation effort, with 51.35% reporting that they would. Both of these questions suggest that to at least half of surveyed citizens is open to the idea of investing personal funds into water conservation. One factor that affects percentages of

citizens willing to spend their own money on water conservation is that a large number of households were below the federal poverty line (FPL). As a result, they may lack necessary resources to support water reduction as compared to other households above the FPL. In fact, 80% of surveyed citizens are willing to spend up $100 on water conservation programs with the remaining 20% of the surveyed citizens surveyed were willing to spend $200-$300.
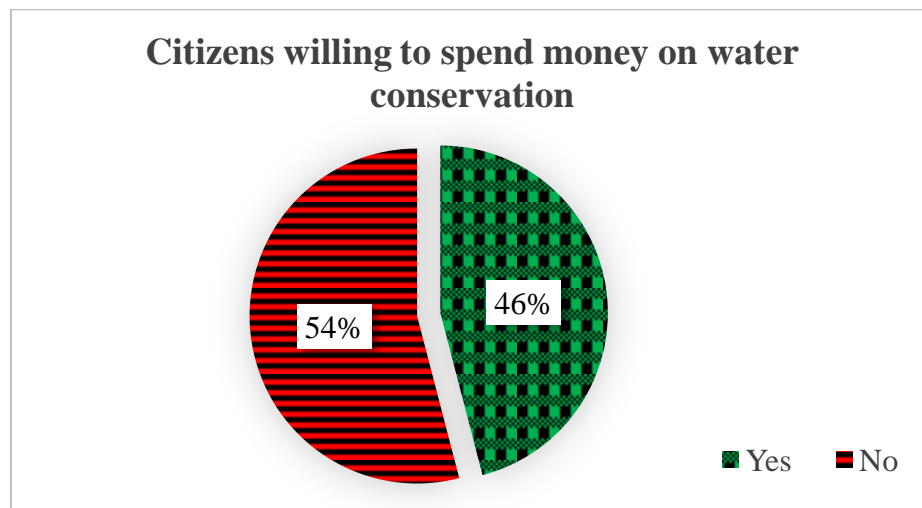

Figure A11. Surveyed citizens' willingness to spend money on water conservation
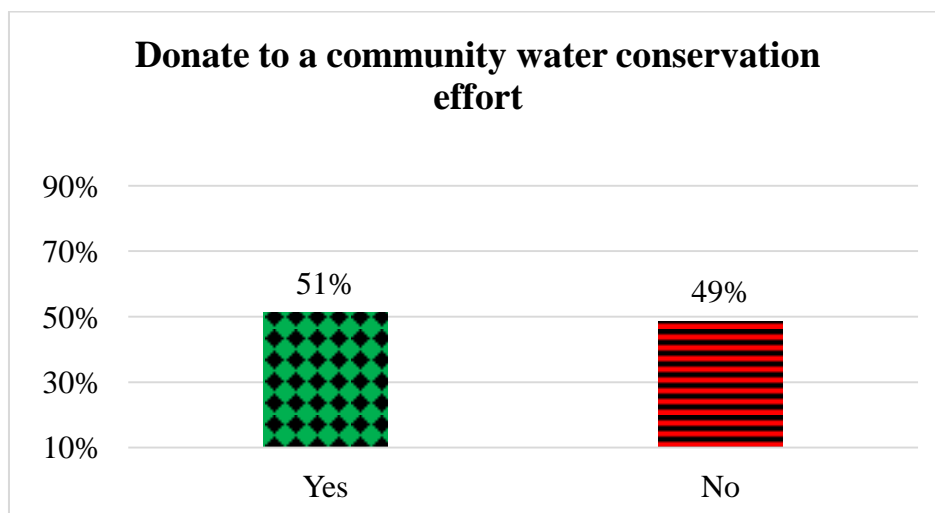
Figure A12. Surveyed citizens' willingness to donate for water conservation effort
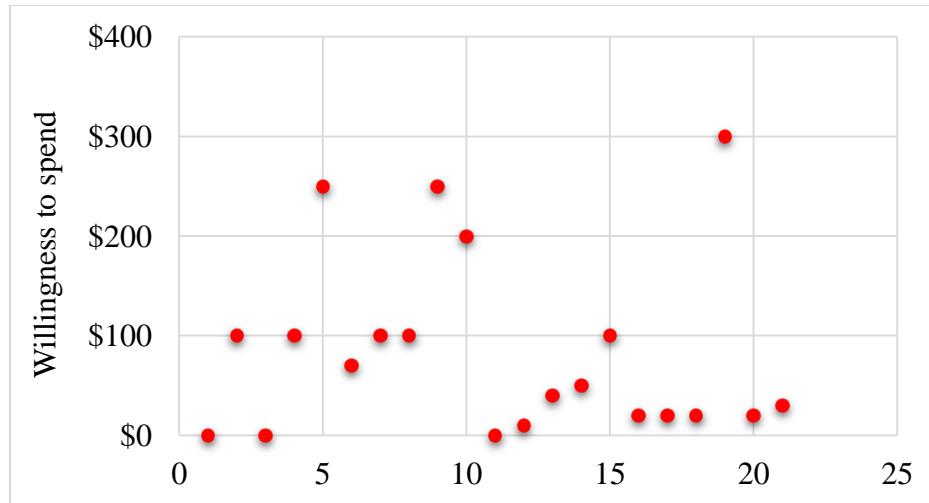
Figure A13. Amount of money surveyed citizens are willing to spend on water conservation

Questions were asked to gauge how receptive citizens are to a community-lead water conservation effort. 76% of surveyed citizens stated that they would be willing to participate in community water conservation programs. When it was framed as a competition with a reward for the winner, 68% of surveyed citizens stated they would participate in a water conservation competition. Knowing that obtaining 100% participation is impossible, a survey question asking what incentive would enable the remaining 32 % to participate in a water conservation race was included. The two incentives that tied for second place at 24% were receiving an award and receiving a gift card. The biggest incentive was "Other", with a majority of citizens stating monetary compensation would enable them to participate. Based on the data, the best incentive could be a combination of both an award and a small-value gift card.
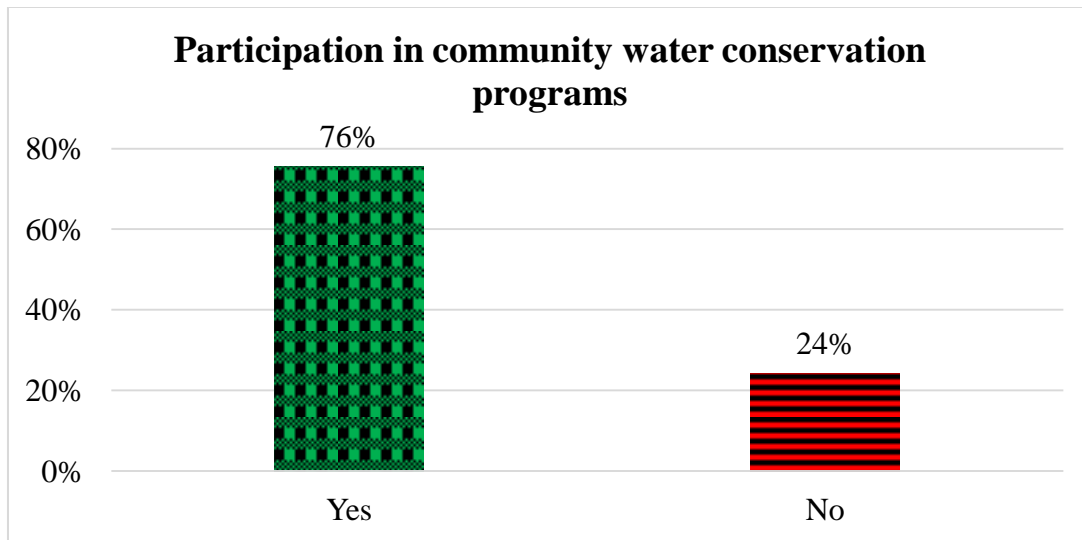
Figure A14. Surveyed citizens' willingness to participate in water conservation programs
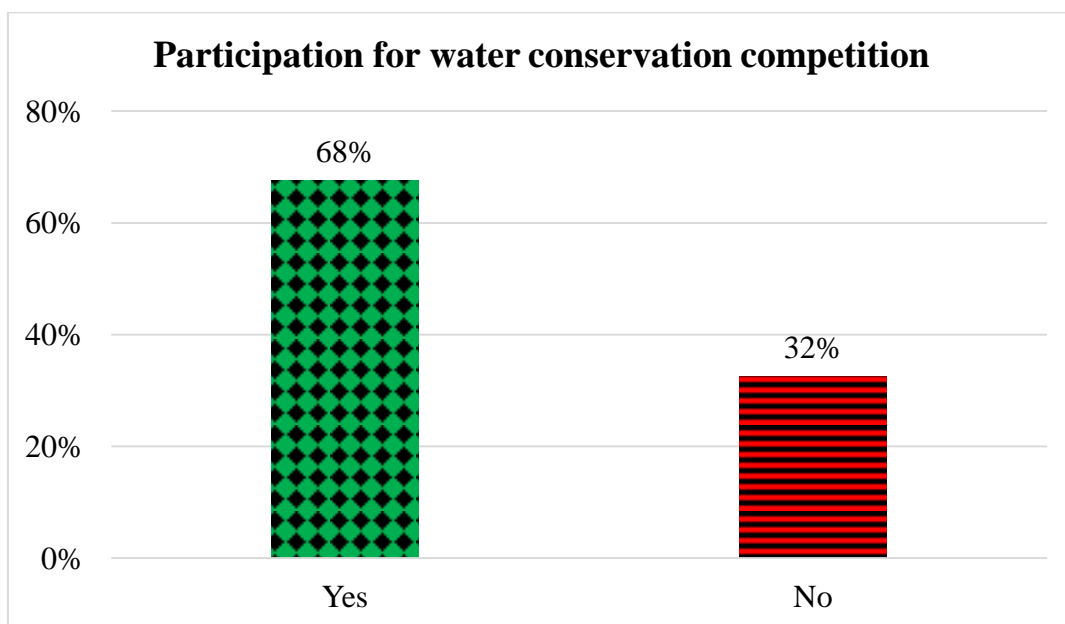
Figure A15. Surveyed citizens' willingness to participate in water conservation programs
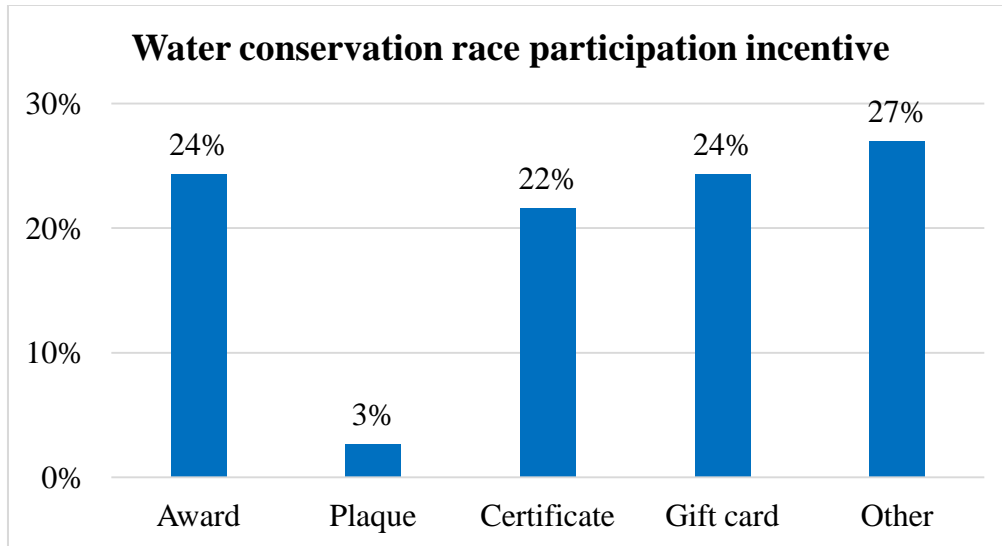
Figure A16. Water conservation race participation incentive preferences for surveyed citizens

Survey 2 results

For the data gathered from the survey 2, many of the demographics were similar. 27 people took survey 2 out of 1249 resident. An important piece of data in survey 2 was that only 22% of citizens took the survey 1, with 78% not having taken survey 1.
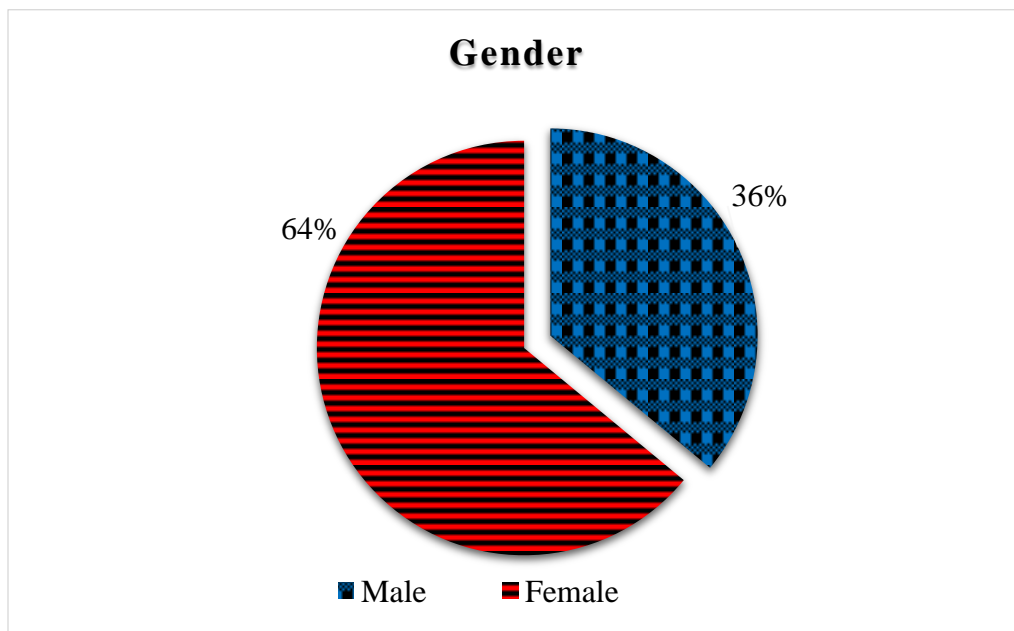
Figure A17. Gender of the surveyed citizens
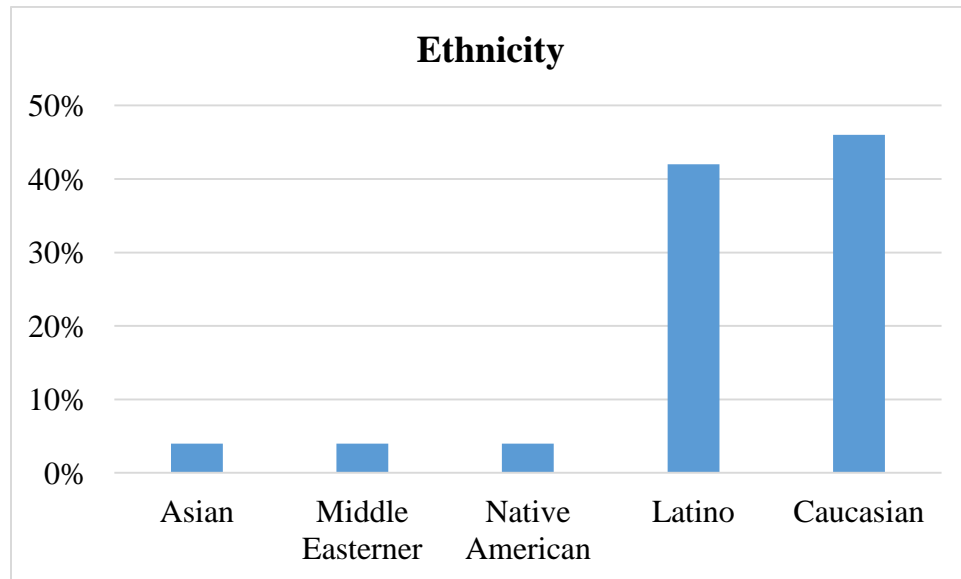
Ethnicity

Figure A18. Ethnicity of the surveyed citizens
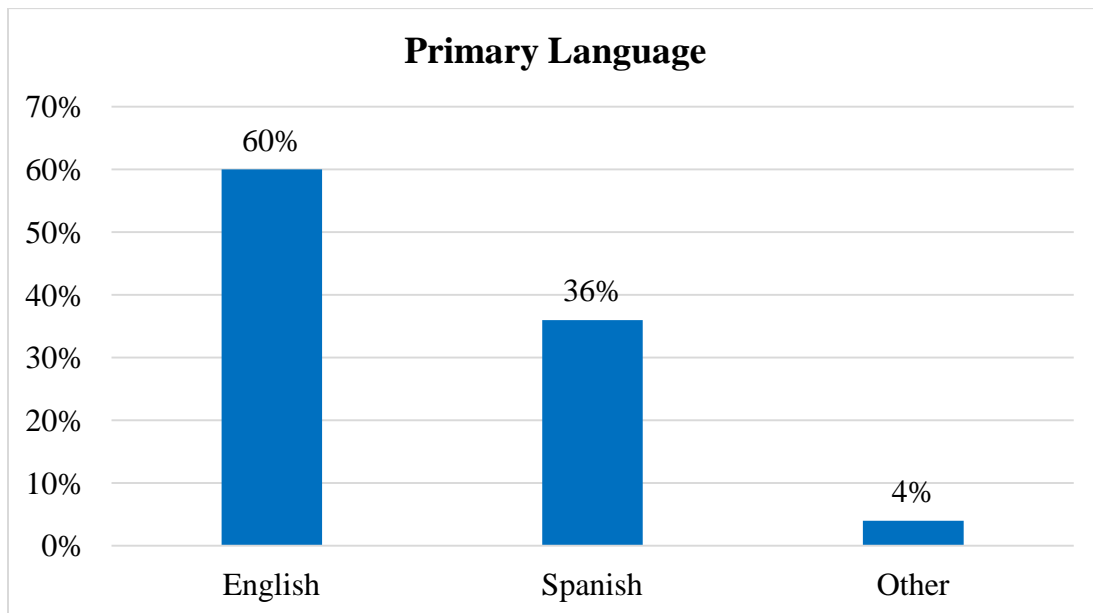
Primary Language

Figure A19. Primary language for the surveyed citizens
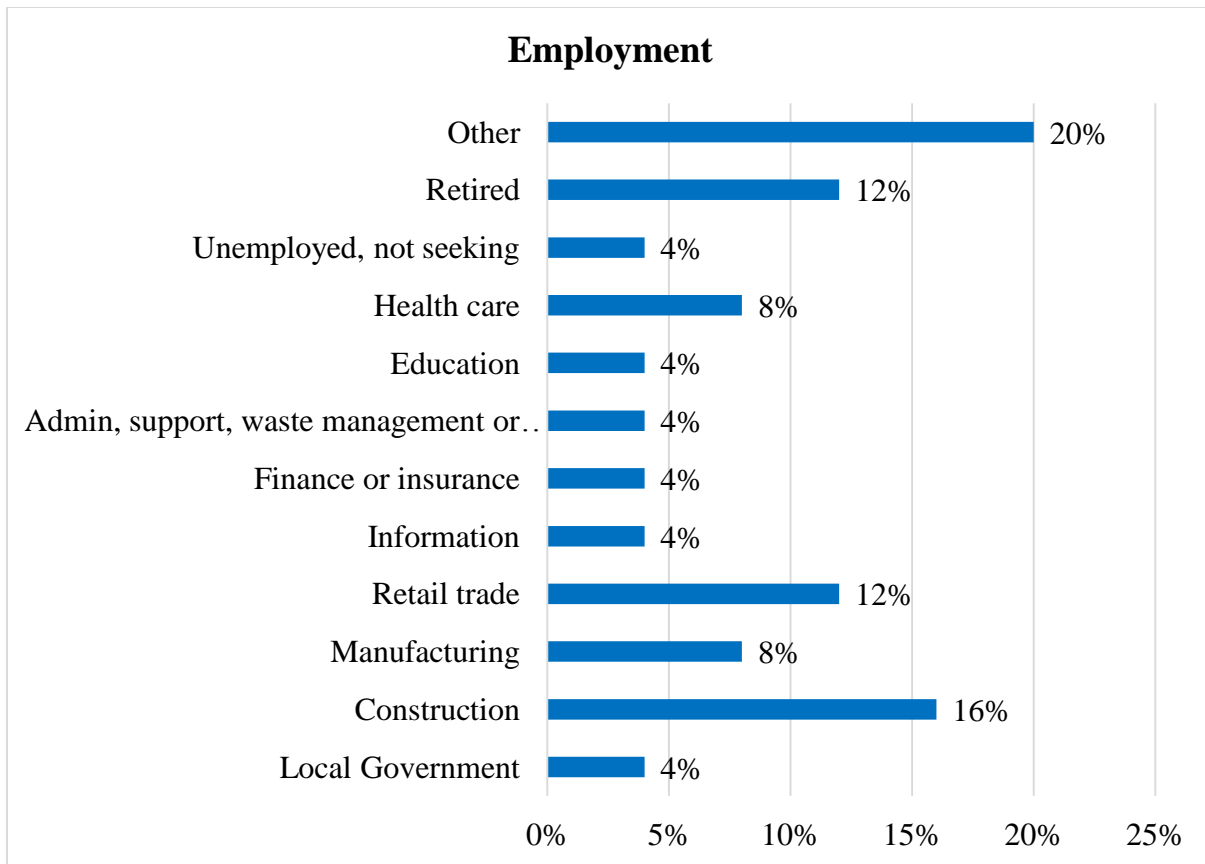
Figure A20. Industry which surveyed citizens are employed
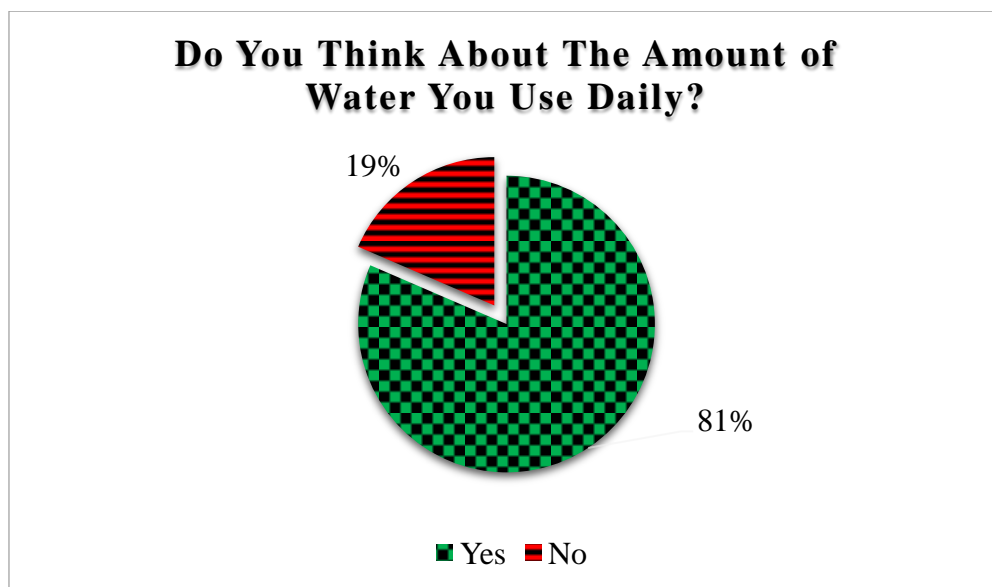
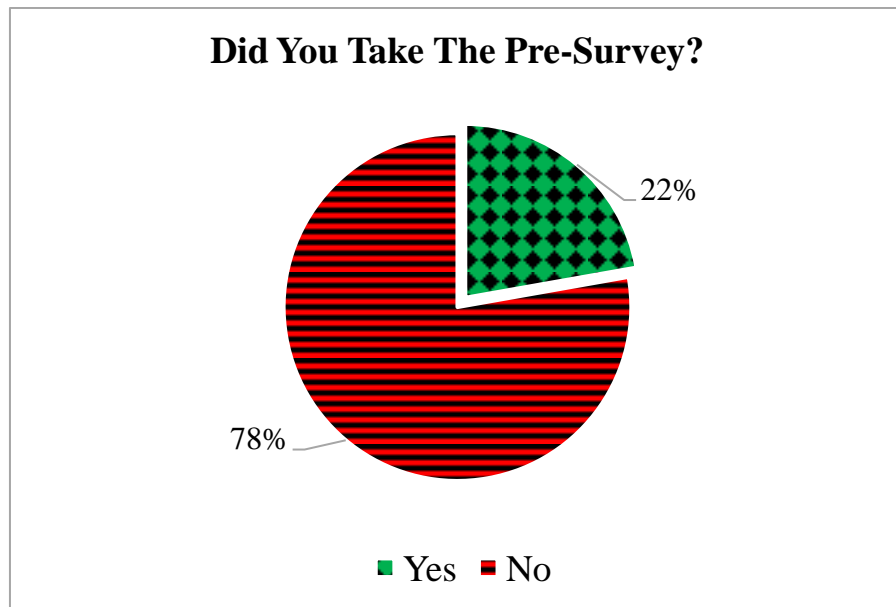*Figure A21.* What surveyed citizens think about their daily water use

Did You Take The Pre-Survey?

22%

78%

■ Yes ■ No

Figure A22. Percentage of surveyed citizens who took pre-survey

The survey 2 data shows that the citizen's current water conservation practices were similar to the survey 1 responses. 48% responded average, with 41% and 11% for excellent and poor respectively. Citizens' water conservation interest is also similar, with 93% being interested in water conservation.
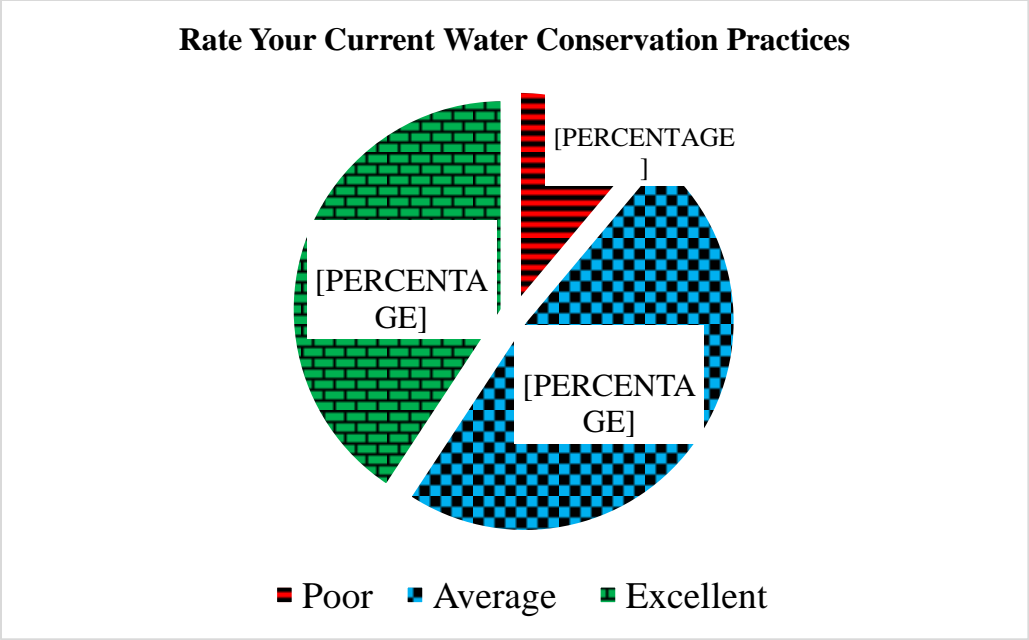
Rate Your Current Water Conservation Practices

[PERCENTAGE]

[PERCENTAGE]

[PERCENTAGE]

■ Poor ■ Average ■ Excellent

Figure A23. Water conservation rating of surveyed citizens

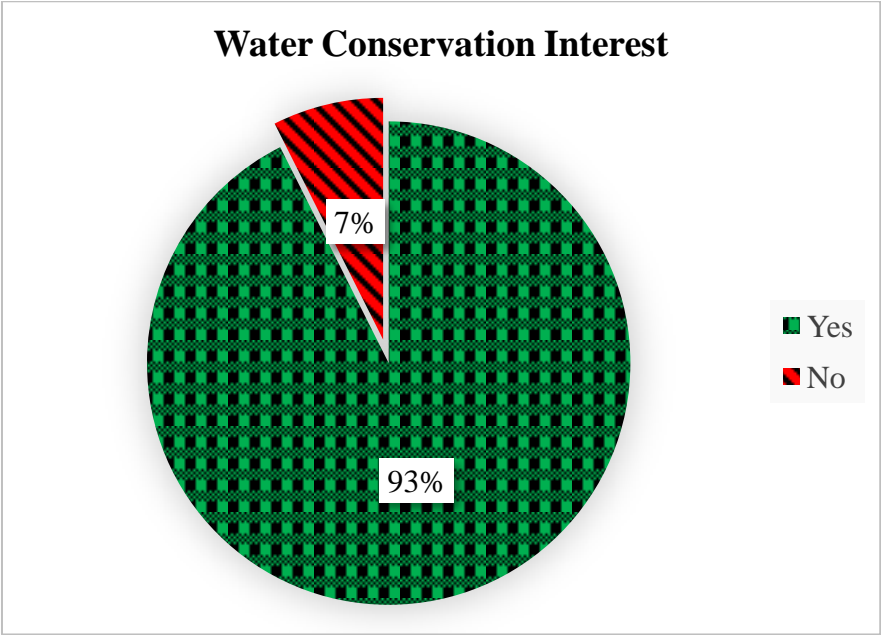**Water Conservation Interest**

7%

93%

■ Yes
■ No

Figure A24. Water conservation interest of the surveyed citizens

When asking citizens about how frequently they thought about water conservation since the time of the survey 1, a vast majority of the surveyed citizens reported that they either always thought about conserving water (41%), or thought about it several times (44%).
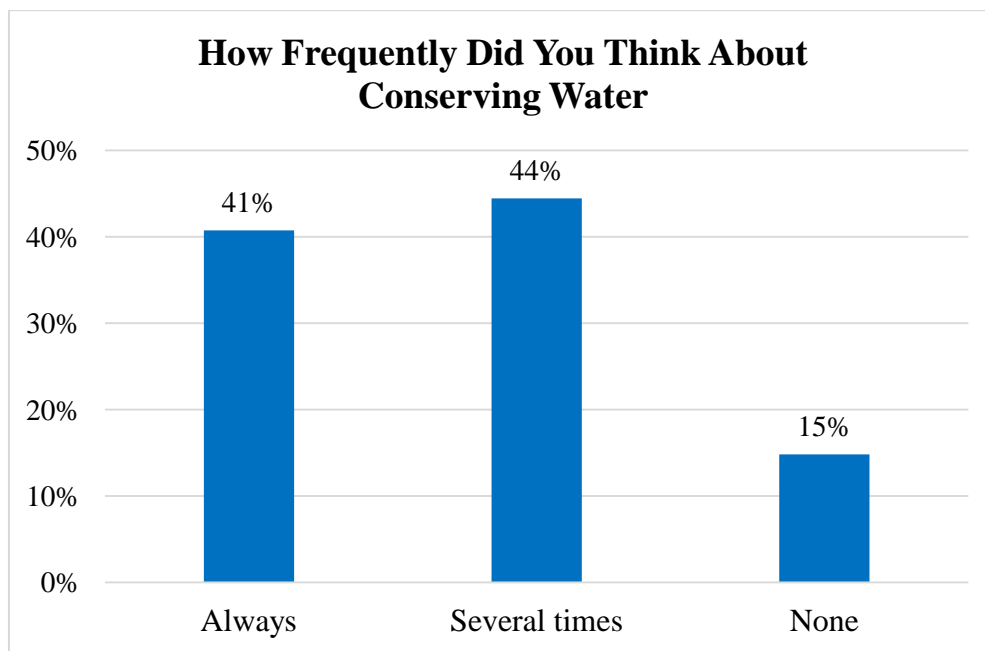

Figure A25. Frequency of thinking about water conservation by the surveyed citizens

Asking citizens on what prevented them from conserving water, the responses were opposite when compared to the survey 1. Survey 1 results showed that 42% of surveyed citizens stated that they did not think their individual efforts to conserve water would make long-term impacts. The next leading reasons were there was nothing preventing them from conserving at 28%, and a lack of knowledge on how to conserve water at 17%. Survey 2 results were 52% reporting nothing prevented them from conserving water, and 30% citizens stated that they did not think their individual efforts to conserve water would make long-term impacts. This change shows that citizens may be more conscientious about water conservation than previously thought.
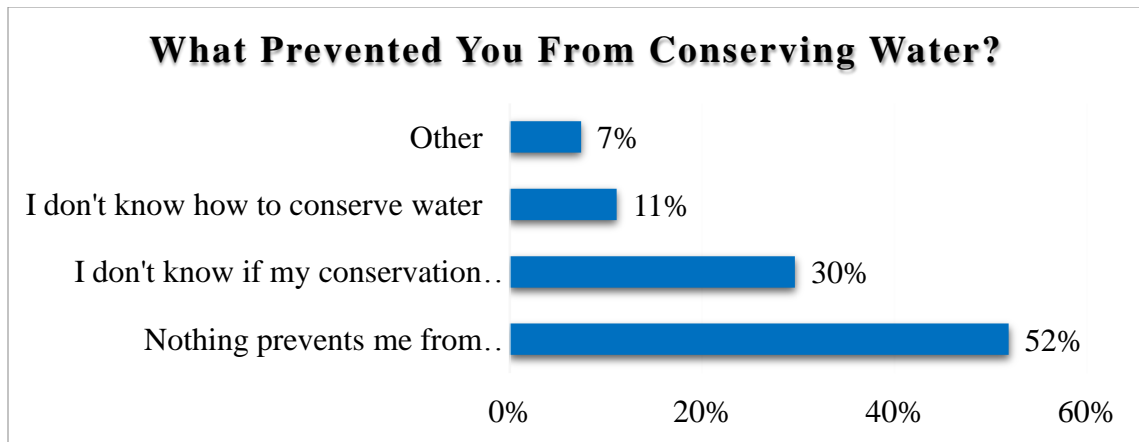
What Prevented You From Conserving Water?

Other — 7%

I don't know how to conserve water — 11%

I don't know if my conservation… — 30%

Nothing prevents me from… — 52%

(0% — 20% — 40% — 60%)

Figure A26. Barriers to water conservation

When asked if citizens would spend personal funds on water conservation, 52% said they would not and 48% said that they would. Of those surveyed that would spend personal funds on water conservation, the average that they did spend towards water conservation was $146.36. Of those that reported what they spent, a majority of them were households that fall below the FPL and contribute only small amounts to water conservation. If expanded to the entire city, a similar trend of spending the average should be seen with a majority of households.
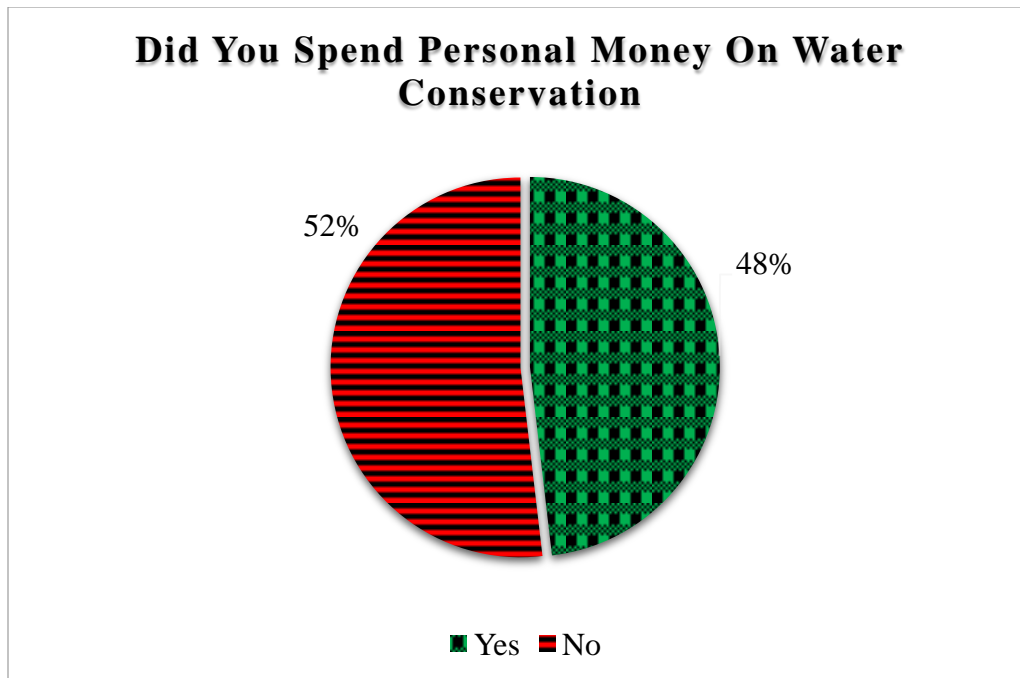
Did You Spend Personal Money On Water Conservation

52%   48%

Yes   No

Figure A27. Water conservation spending by surveyed citizens

Survey 2 results showed that a similar portion of citizens, as that of survey 1, wanted to be part of a water conservation program, 62%. The same result was seen with donating to a water conservation program, split at 50% for choosing to donate and choosing not to donate. Data showed that the incentives that could be used to increase participation in a community water conservation race were different from the survey 1. The leading incentive of gift card for post-survey citizens increased over survey 1 citizens by just over 30%. This coupled with previous survey information suggests that a gift card may be the most prudent incentive to use when trying to increase citizen participation.
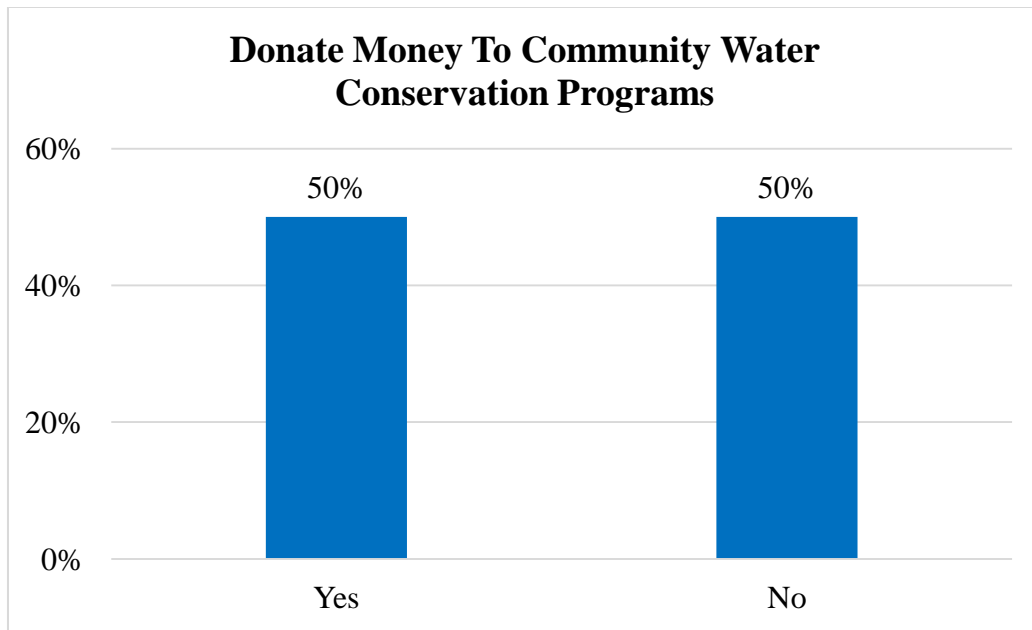
Donate Money To Community Water Conservation Programs

Figure A28. Willingness of surveyed citizens to donate to community water conservation programs

Would You Participate In A Water Conservation Race?
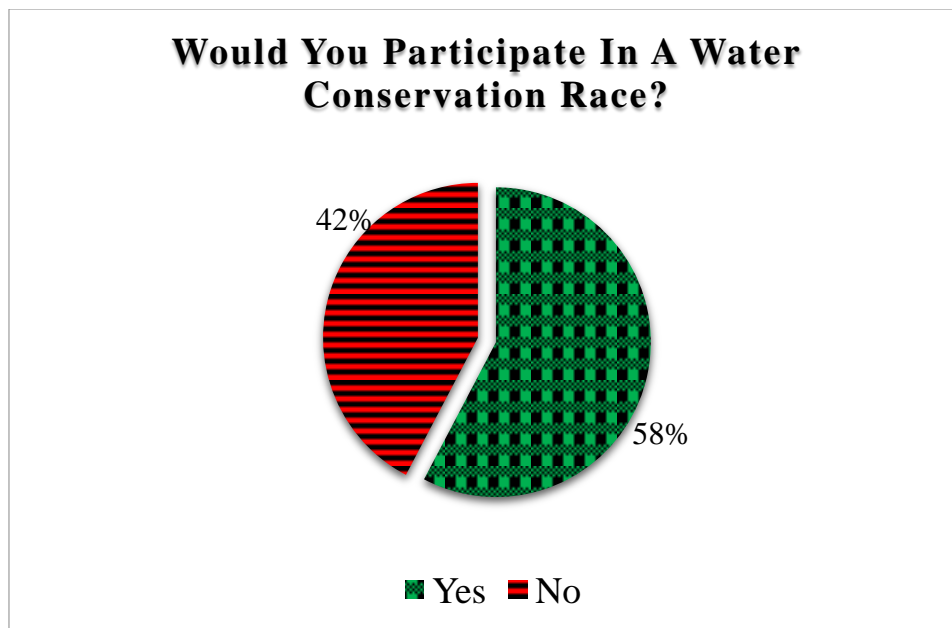
Figure A29. Willingness of surveyed citizens to participate in water conservation

What gift will enable you to participate in a water conservation race?
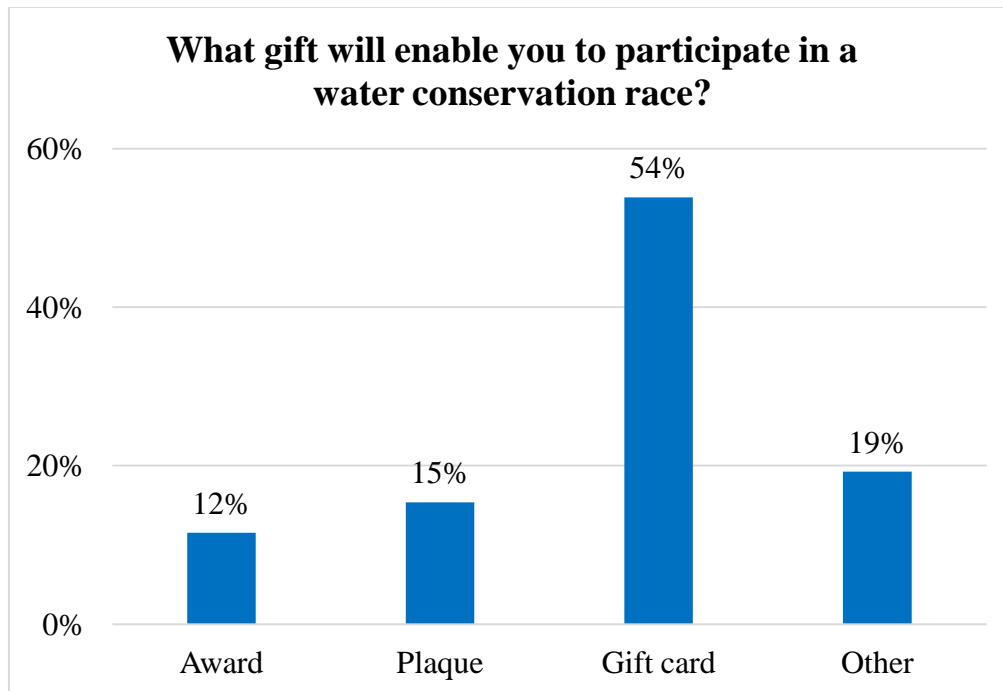
Figure A30. Water conservation race participation incentive preference for surveyed citizens

For household activity that citizens reported using most to save water, 35% said they cut down on the amount of time they took showering as a means to save water. The second most frequent choice was not running the water while washing dishes at 27%. These two water conservation measures at home should be the primary methods to focus on for future efforts by city of Florence to conserve water on a small-scale.
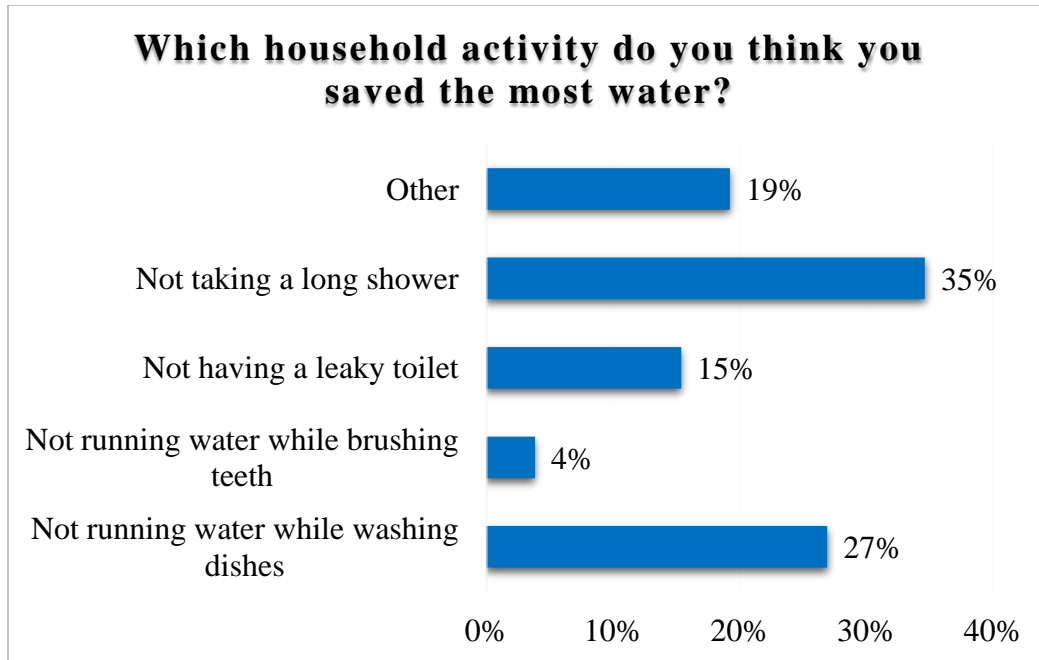
Figure A31. Activities that saved the most water for surveyed citizens

In survey 2, an effort was made to judge whether the citizens of Florence would be interested in rainwater harvesting as a form of water conservation. Data shows that an overwhelming majority of citizens, 80%, are interested in rainwater harvesting. The city of Florence has showed interest in rain barrels as a way to collect rainwater and has expressed that they would like to know how citizens feel about that option. Florence wants to see if it would be something citizens would be interested in before making an effort to using city's resources. From the response data, only 16% of citizens currently own a rain barrel for rainwater harvesting. Of the citizens surveyed, 72% of them currently do not harvest rainwater at all, while 24% harvest every time it rains, and 4% stating they do it sometimes. If options were given to citizens on how to obtain a rain barrel, 60% would be interested in buying one upfront and 4% would want to lease one. 36% of citizens would like to use their own method of rainwater harvesting. To go along with the Florence city decision makers' preferences in using rain barrels to harvest rainwater, UCARE needed to see if an adequate infrastructure for rain barrels was in place.

Components like gutters and sidings are needed to maximize rainwater harvesting through rain barrels. 72% of citizens own their place of residence, while 24% rent. This information demonstrates that to install the necessary infrastructure would be possible for a majority of citizens, since they are free to make major changes to their property.
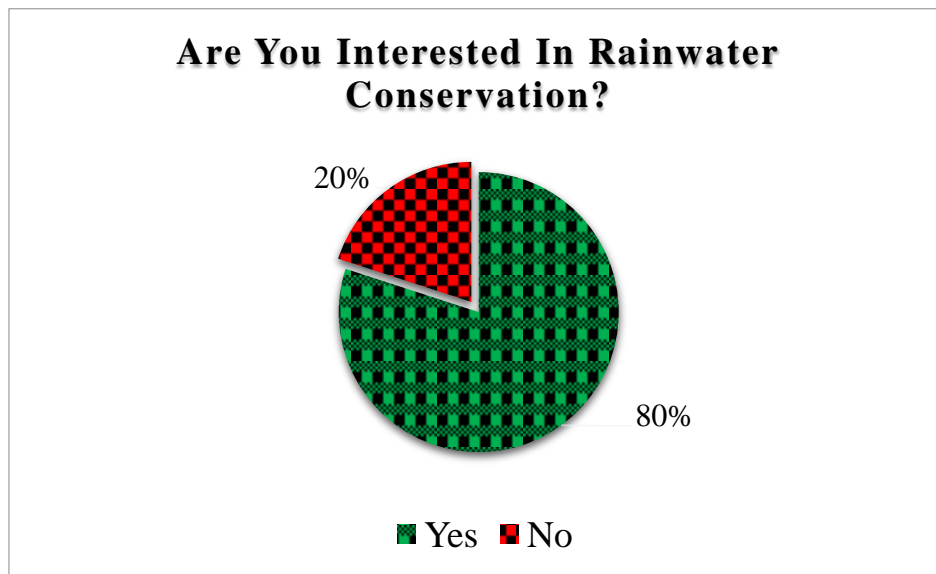

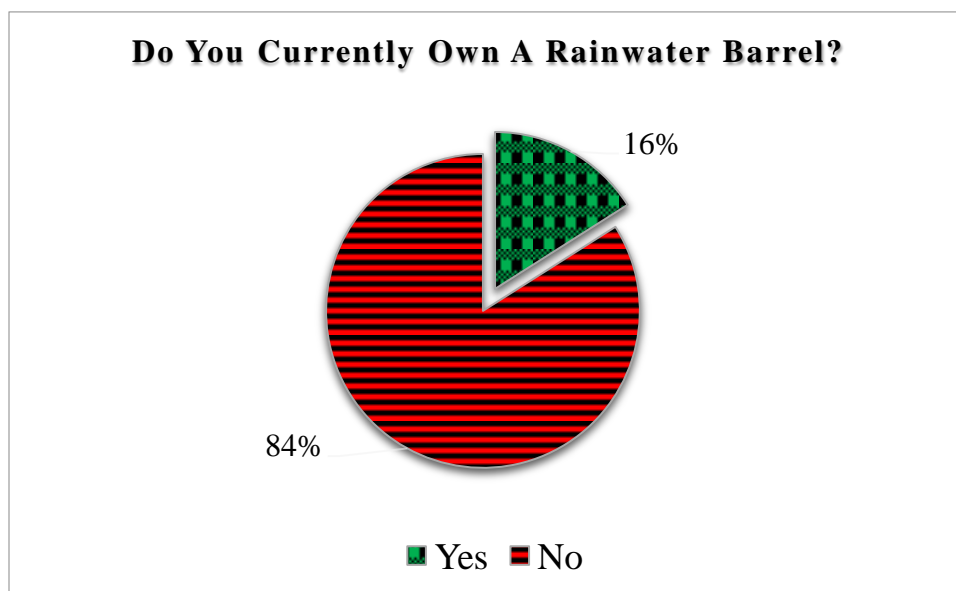*Figure A32.* Rainwater conservation interest of the surveyed citizens.

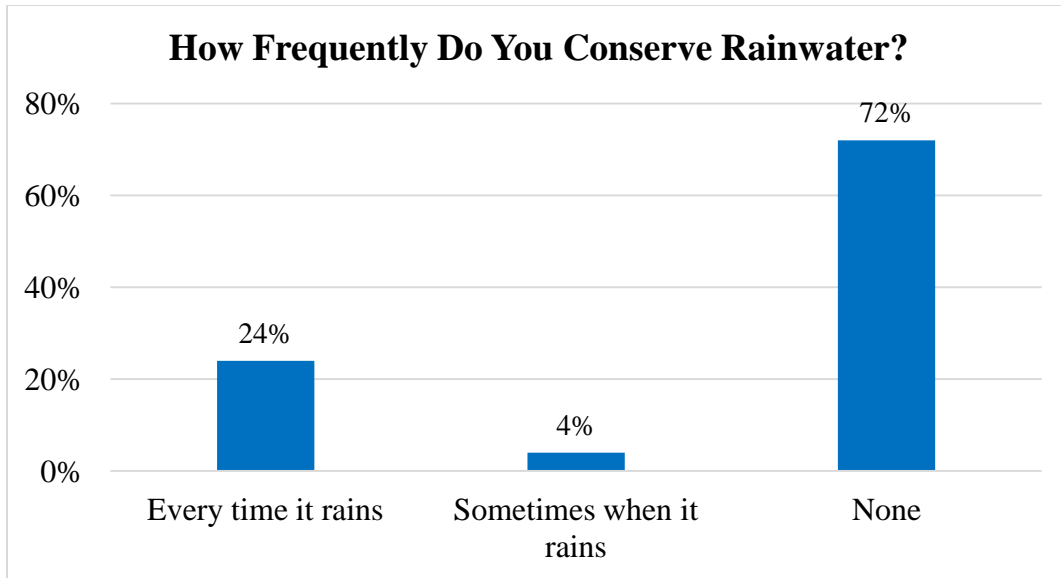*Figure A33.* Percentage of surveyed citizens who own rain barrel

Figure A34. Frequency of rainwater conservation by the surveyed citizens
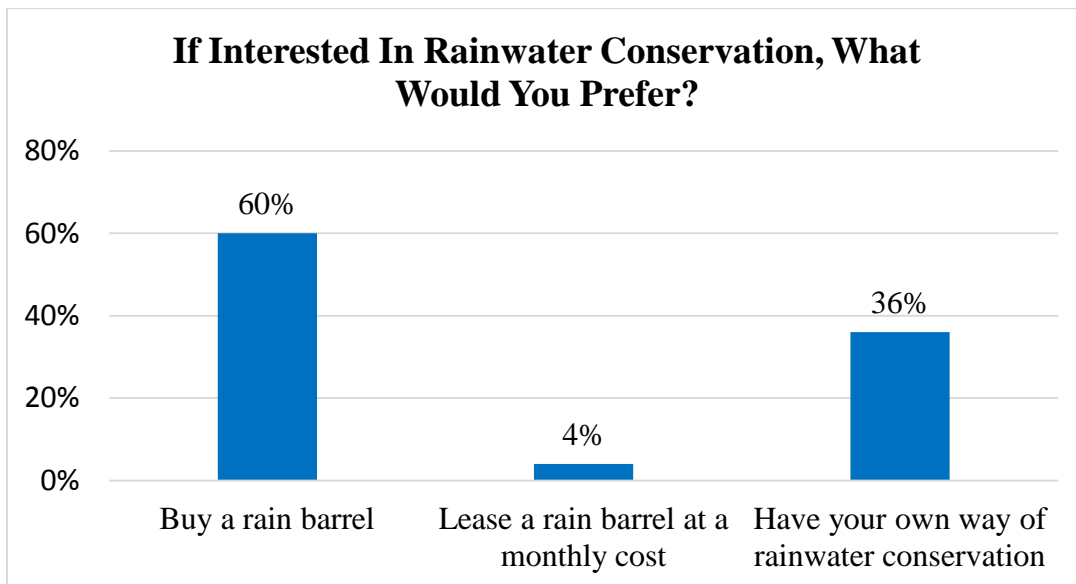

Figure A35. Preference for rainwater conservation by the surveyed citizens

Do You Own or Rent Your Place of Residence?

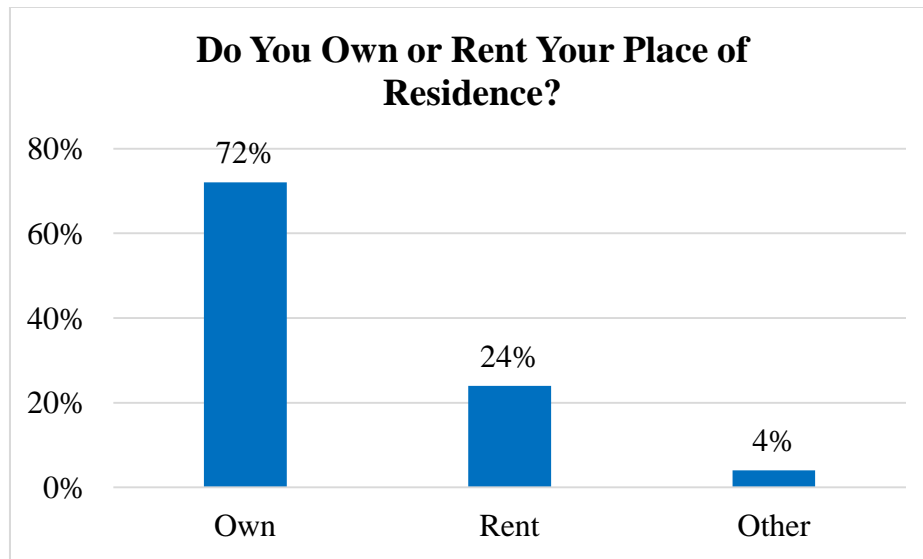Own: 72%
Rent: 24%
Other: 4%

Figure A36. Residential status of the surveyed citizens

The findings from the survey collection are promising for Florence. A majority of citizens are interested in rainwater harvesting, especially in using rain barrels as a way to collect rainwater. With a public interest in wanting to use rain barrels, Florence could implement a plan for purchasing rain barrels to sell to citizens. As the average citizen is willing to spend $146.36, this presents multiple methods for obtaining rain barrels. On average, a 54-gallon rain barrel would cost $70 to buy. Research shows that the optimal strategy would be for citizens to utilize two rain barrels positioned around their homes to maximize collection. As two 54-gallon barrels would be $140, it would be possible for the average citizen to support the city's effort to implement rain barrels.

Unfortunately, the response rates for survey 1 and survey 2 are very low. Therefore, it is important to concentrate on implementing a more robust awareness campaign. Collaborating with local businesses and local community groups such as churches and schools, would increase the number of people who would participate in rainwater conservation.

APPENDIX B

COVER LETTER

Dear Florence Residents:

We are the Council members of the city of Florence, who are promoting water conservation awareness to address our city water shortage through a short survey.

The purpose of the enclosed survey is to gather information about the residents' knowledge about and attitudes toward the ongoing water shortage. Your opinion is very important for us as we discuss ways to solve water shortage issues.

The survey will take _____ minutes to complete. Your name or personal information will not be asked in this study. All your responses are only shown as overall data. Only people directly involved with this project will have access to the surveys.

This study is completely voluntary and you are free to withdraw at any time. Completion and return of this survey indicates voluntary consent to participate in this study.

Questions about this study can be directed to _____, Department of _____, Florence, TX xxxxx-xxxx. Phone (xxx) xxx-xxxx.

Thank you for taking the time to assist us in this research.

    Council member name

    Phone number

    E-mail

Council member name

Phone number

E-mail

Council member name

Phone number

E-mail

1.   Are you a resident of Florence, Texas? **(Screening question)**

Yes

No (this response skips to the end; not a candidate for the purpose of this survey)

2.   Are you 18 years old or older? **(Screening question)**

Yes

No (this response skips to the end; not a candidate for the purpose of this survey)

3.   Are you aware of the current water shortage in Florence?

Yes

No

4.   How important is water conservation to you/your household?

Not at all important (1)

Slightly important (2)

Moderately important (3)

Very important (4)

Extremely important (5)

5.   How familiar are you with different ways to conserve water?

Not familiar at all

Somewhat familiar

Very familiar

6.   From where do you currently receive your water for household use:

Purchase from the city

Pump from a personal well

Unknown

Other (please specify) _____

7.   Is an investment (time, money, effort, etc.) toward water conservation worth the long-term results?

Definitely not (1)

Probably not (2)

Might/might not (3)

Probably yes (4)

Definitely yes (5)

8.   What impact do you feel your/your household's actions have on water conservation?

No impact (1)

Little impact (2)

Impact unknown (3)

Some impact (4)

Significant impact (5)

9.   Do you think that information and tips from free water conservation awareness/education program would be useful for implementing in your household?

Definitely not (1)

Probably not (2)

Might/might not (3)

Probably yes (4)

Definitely yes (5)

10. Rank the ways you most prefer to receive water conservation information: (1 being most favorite and 6 being least favorite)

Flyer/Brochure

Social media

Video

Website

Workshops (in-person)

Other _____ (please specify if relevant)

11. What actions would you be willing to take in order to help conserve water: (check all that apply)

Take shorter/fewer showers

Limit/Time grass watering

Turn off running water when brushing teeth, washing face, washing dishes, etc.

Turn off running water while washing vehicle

Repair any water leaks in home (self/contract)

Comply with additional water usage schedules

No actions

Other _____ (please specify)

12. Please explain what other actions you would be willing to take in order to help conserve water: _____

13. How committed would you be to help in a water shortage?

Not at all (1)

A little (2)

A moderate amount (3)

A lot (4)

A great deal (5)

Demographic section:

14. Age (e.g., 28) _____

15. What is your gender?

Male

Female

Other

Prefer not to answer

16. What is your annual household income?

Less than $24,999

$25,000 - $34,999

$35,000 - $59,999

$60,000 - $99,999

$100,000+

17. Are you a:

Homeowner

Renter

Other _____

18. How many people currently reside in your home?

_____

19. What is your highest level of education?

Some high school (no diploma/GED)

High school diploma/GED

Some college (no degree)

Associate's degree

Bachelor's or higher degree

Master's degree

Ph.D. degree

Other

Appendix B2: Post-Surveys

Appendix B2a: Post-survey (if completed the pre-survey)

This post-survey is for participants who completed the pre-survey (i.e., people who answer Yes to Question 2):

1.   Are you 18 years old or older?

Yes (continue)

No (Skip to end; not a candidate)

2.   Did you complete the first water conservation survey that was implemented between ___ (month) and ___ (month), ____ (year)?

Yes (continue)

No (Skip to end; not a candidate)

3.   What portions of the water conservation campaign have you seen/received since you completed the previous survey?

Flyer/Brochure

Social media

Video

Website

Workshops (in-person)

Other _____ (please specify)

None

5.   Has the importance of water conservation to you/your household changed since you completed the previous survey?

No change at all

Yes, slightly improved

Yes, moderately improved

Yes, much improved

6.   Has your familiarity with different ways to conserve water changed since you completed the previous survey?

No change at all

Yes, slightly improved

Yes, moderately improved

Yes, much improved

7.   Has the source of your household water changed since you completed the previous survey?

No

Yes, Purchase from the city to Pump from a personal well

Yes, Pump from a personal well to Purchase from the city

Unknown

Other _____

8.   Have you made an investment (time, money, effort, etc.) toward water conservation since you completed the previous survey?

No

Yes, implemented some water conservation tips

Yes, implemented a lot of water conservation tips

Other _____

9.   What impact do you feel your/your household's actions have/have not made on water conservation?

No impact

Little impact

Impact unknown

Some impact

Significant impact

10. Were the information and tips from the free water conservation awareness/education program useful for implementing in your household?

Definitely not

Probably not

Might/might not (neutral)

Probably yes

Definitely yes

Unable to judge

11. What additional resources would be useful for future water conservation education?

More traditional media (radio, commercial/video, flyers, brochures, posters, etc.)

More emerging/new media (internet, social media, etc.)

Other _____

12. Rank the ways you most prefer to receive water conservation information: (1 being most favorite and 6 being least favorite)

Flyer/Brochure

Social media

Video

Website

Workshops (in-person)

Other _____ (please specify)

13. What actions would you be willing to take in order to help conserve water in the future: (check all that apply)

Take shorter/fewer showers

Limit/Time grass watering

Turn off running water when brushing teeth, washing face, washing dishes, etc.

Turn off running water while washing vehicle

Repair any water leaks in home (self/contract)

Comply with additional water usage schedules

No actions

Other

14. Please explain what other actions you would be willing to take in order to help conserve water: _____

15. Has your commitment to help in a water shortage changed since you completed the previous survey?

No change

Yes, some increased involvement

Yes, a lot more involved

Demographic section:

16. Age (e.g., 28) _____

17. What is your gender?

Male

Female

Other

Prefer not to answer

18. What is your annual household income?

Less than $24,999

$25,000 - $34,999

$35,000 - $59,999

$60,000 - $99,999

$100,000+

19. Are you a:

Homeowner

Renter

Other _____

20. How many people currently reside in your home?

_____

21. What is your highest level of education?

Some high school (no diploma/GED)

High school diploma/GED

Some college (no degree)

Associate's degree

Bachelor's or higher degree

Master's degree

Ph.D. degree

Other

Appendix B2b: Post-Survey (if did NOT complete the pre-survey, but may have seen some campaign materials)

This post-survey is for participants who did not complete the pre-survey (i.e., people who answer No to Question 2). The goal of this post-survey is to assess if the participants are familiar with the campaign.

1.	Are you 18 years old or older?

Yes (continue)

No (Skip to end; not a candidate)

2.	Did you complete the first water conservation survey that was implemented between ___ (month) and ___ (month), ____ (year)?

Yes (Skip to end; not a candidate)

No (continue)

3.	Are you aware of the current water shortage in Florence?

Yes

No

4.	Have you seen any portion of water conservation campaign that was implemented between ___ (month) and ___ (month), ____ (year)?

No (skip to Q13)

Yes, Flyer/Brochure

Yes, Social media

Yes, Video

Yes, Website

Yes, Workshops (in-person)

Yes, Other _____ (please specify)

The following questions relate to your _interaction_ with the water conservation campaign materials.

5.	Has your knowledge/awareness changed through the information and tips included in the campaign?

No change

Yes, a little

Yes, moderate

Yes, a lot

6.   Has the importance of water conservation to you/your household changed because of the campaign materials?

No change at all

Yes, slightly improved

Yes, moderately improved

Yes, much improved

7.   Has your familiarity with different ways to conserve water changed because of the campaign materials?

No change at all

Yes, slightly improved

Yes, moderately improved

Yes, much improved

8.   Has the source of your household water changed because of the campaign materials? [From where you currently receive your water for household use:]

No

Yes, Purchase from the city to Pump from a personal well

Yes, Pump from a personal well to Purchase from the city

Unknown

Other _____

9.   Have you made an investment (time, money, effort, etc.) toward water conservation because of the campaign materials?

No

Yes, implemented some water conservation tips

Yes, implemented a lot of water conservation tips

Other _____

10. What impact do you feel your/your household's actions have/have not made on water conservation?

No impact

Little impact

Impact unknown

Some impact

Significant impact

11. Were the information and tips from free water conservation awareness/education program useful for implementing in your household?

Definitely not

Probably not

Might/might not (neutral)

Probably yes

Definitely yes

Unable to judge

12. What additional resources would be useful for future water conservation education?

More traditional media (radio, commercial/video, flyers, brochures, posters, etc.)

More emerging/new media (internet, social media, etc.)

Other _____

13. Rank the ways you most prefer to receive water conservation information: (1 being most favorite and 6 being least favorite)

Flyer/Brochure

Social media

Video

Website

Workshops (in-person)

Other _____ (please specify)

14. What actions would you be willing to take in order to help conserve water in the future: (check all that apply)

Take shorter/fewer showers

Limit/Time grass watering

Turn off running water when brushing teeth, washing face, washing dishes, etc.

Turn off running water while washing vehicle

Repair any water leaks in home (self/contract)

Comply with additional water usage schedules

No actions

Other

15. Please explain what other actions you would be willing to take in order to help conserve water: _____

16. Has your commitment to help in a water shortage changed because of the campaign materials?

No change

Yes, some increased involvement

Yes, a lot more involved

Demographic section:

17. Age (e.g., 28) _____

18. What is your gender?

Male

Female

Other

Prefer not to answer

19. What is your annual household income?

Less than $24,999

$25,000 - $34,999

$35,000 - $59,999

$60,000 - $99,999

$100,000+

20. Are you a:

Homeowner

Renter

Other _____

21. How many people currently reside in your home?

_____

22. What is your highest level of education?

Some high school (no diploma/GED)

High school diploma/GED

Some college (no degree)

Associate's degree

Bachelor's or higher degree

Master's degree

Ph.D. degree

Other

Appendix B3: Character Description and Storyboard

Character Description

- Lawrence

Lawrence is a guppy fish born at the same time as the founding of Florence circa 1857. He is orange and wears a purple jersey to show his love for his hometown, Florence. As a fish, Lawrence is directly affected by the water drought. After Florence began experiencing the water drought, Lawrence made it his mission to educate the citizens of Florence about the water crisis. He informs citizens of small ways to help reduce water usage and in turn save the city from the water drought. Throughout the storyboard Lawrence teaches a Florence citizen some ways to save water.

- Billy, Bill & William

Billy, Bill, and William are the names at different points in life for a young boy from Florence. Lawrence befriends the young boy Billy and begins to educate him on ways to reduce water usage. Throughout the storyboard Billy grows from a young boy to a middle school aged boy (Bill) to a high school aged boy (William). As Billy grows up, Lawrence uses different scenarios in which he can save water. There would need to be consistency among the three characters so that it would be clear it is the same child at different ages. Maybe the same hair style and shirt color and pants throughout the story. Throughout the story boards are a few ideas of what Billy, Bill and William could look like. Again, we would like to incorporate the purple and white

colors of the football team. Maybe with a white shirt, and purple sneakers or consistent accents in the background.

***Copyright Information for Lawrence from Florence**: This work is licensed under the Creative Commons Attribution 4.0 International License. To view a copy of this license, visit http://creativecommons.org/licenses/by/4.0/. The storyboard idea (from character development to each scene development) came from the Marketing Research Club and can be used by the city of Florence if desired. The Lawrence image (Figure 1) can be used by the city of Florence on promotional materials if desired; however, we request that our external animation artist (Tiffany Marcia) be credited. We also request that we be informed if the Lawrence image is used. The storyboard (Appendix B3) was created using a graphic design software, Canva (www.canva.com), and thus **cannot** be replicated or redistributed without contacting Canva. Contact us if there is any question about the copyright issues; the faculty advisor to MRC is Dr. Shuqin (Monica) Wei and her email address is Shuqin.wei@tamuct.edu.

(B1) Billy's Story

Howdy, I'm Lawrence from Florence!

I'm here to talk to you about our water problem, and I need your help.

This is my friend, Billy. Billy keeps the water on while brushing his teeth. He wastes 4 gallons of water.

4 gal. total

When Billy takes a bath, he uses 36 gallons of water! Wow, thats a lot!

40 gal. total

Bill sings his ABCS while washing his hands, awesome!

But, he left the water on the entire time. That is a whole gallon down the drain!

41 gal. total

Before, Billy used 44 gallons of water. Woah!
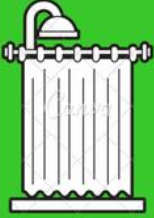
Today, Billy learned how to save water in school. Let us see what he does differently!

This time, Billy turns off the water while he brushes his teeth! He saved 3 gallons. Good job Billy!

1 gal

Billy takes a quick shower.

Because he took a shower instead of a bath, Billy saved 21 gallons of water. Awesome!

16 gal

Now, Billy turns off the water while washing his hands. He saved almost a gallon, way to go Billy!

17 gal total.

Billy only used 17 gallons of water, not 41. Go Billy!

Florence is running out of water and I need your help. Making small changes will help out a lot!

The average person uses about 100 gallons of water a day.

If you want more information, please go to https://water.usgs.gov/edu/activity-percapita.html

Thank you for listening!

I hope I helped you learn something! I am Lawrence from Florence and I am happy to help. Have fun saving water!

Credits

Lawrence - Tiffany Marcia

Storyboard - Marketing Research Club at Texas A&M University - Central Texas

Storyboard images - www.canva.com

Howdy, I'm Lawrence from Florence!

I'm here to talk to you about our water problem, and I need your help.

This is my friend, Bill. Bill keeps the water on while washing the dishes. He wastes 16 gallons of water.

16 gal. total

When Bill gives his dog a bath, he uses 36 gallons of water! Wow, that's a lot!

52 gal. total

Bill washes his hands and face after football practice, awesome!

However, he left the water on the whole time. That's 3 gallons down the drain!

55 gal. total

Before, Bill used 55 gallons of water. Woah!

Today, Bill learned how to save water in school. Let us see what he does differently!

FLORENCE 57

This time Bill turns off the water while scrubbing the dishes. Bill saved 10 gallons of water!

6 gal

This time Bill washes his dog outside. Because he did this, he doesn't have to water the grass tonight. He saved 10 gallons, way to go Bill!

32 gal

Now, Bill turns off the water while washing his hands and face. He saved a gallon! Way to go Bill!

34 gal

Bill only used 34 gallons of water, not 55. Go Bill!

Florence is in a water crisis and we need your help. Making small changes will help out a lot!

The average person uses about 100 gallons of water a day.

If you want more information, please go tohttps://water.usgs.gov/edu/activity-percapita.html

Thank you for listening!

I hope I helped you learn something! I am Lawrence from Florence and I am happy to help! Have fun saving water!

Credits

Lawrence - Tiffany Marcia

Storyboard - Marketing Research Club at Texas A&M University - Central Texas

Storyboard images - www.canva.com

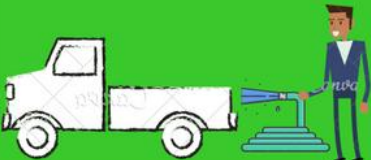**Howdy, I'm Lawrence from Florence!**

FLORENCE 57

I'm here to talk to you about our water problem, and I need your help.

This is my friend, William. William keeps the water on while shaving. He wastes 2 gallons of water.

2 gal. total

William likes to take care of his truck

When William washes his truck with the hose, he uses 10 gallons of water.

12 gal. total

William takes a bath after a hard day at football practice. He uses 36 gallons of water. That's a lot!

FLORENCE 57

48 gal. total

85

Before, William used 48 gallons of water. Woah!

Today, William learned how to save water in school. Let us see what he does differently!

This time William turns off the water while shaving. He saved 1 gallon, good job William!
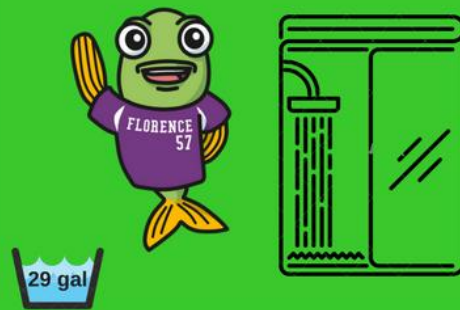
1 gal

William uses a bucket and a spray nozzle to wash his truck.

This saves William 9 gallons of water, awesome!

4 gal

William takes a shower after practice, instead of a bath. This saves him 11 gallons of water.

29 gal

William only used 29 gallons of water, not 48. Go William!

Florence is in a water crisis and we need your help. Making small changes will help out a lot!

The average person uses about 100 gallons of water a day.

If you want more information, please go to https://water.usgs.gov/edu/activity-percapita.html

Thank you for listening!

I hope I helped you learn something! I am Lawrence from Florence and I am happy to help! Have fun saving water!

Credits

Lawrence - Tiffany Marcia

Storyboard - Marketing Research Club at Texas A&M University - Central Texas

Storyboard images - www.canva.com

*Copyright Information: This work is licensed under the Creative Commons Attribution 4.0 International License. To view a copy of this license, visit http://creativecommons.org/licenses/by/4.0/. The storyboard idea (from character development to each scene development) came from the Marketing Research Club and can be used by the city of Florence if desired. The Lawrence image (Figure 1) can be used by the city of Florence on promotional materials if desired; however, we request that our external animation artist (Tiffany Marcia) be credited. We also request that we be informed if the Lawrence image is used. The storyboard (Appendix B3) was created using a graphic design software, Canva

(www.canva.com), and thus **cannot** be replicated or redistributed without contacting Canva. Contact us if there is any question about the copyright issues; the faculty advisor to MRC is Dr. Shuqin (Monica) Wei and her email address is Shuqin.wei@tamuct.edu.

Appendix B4: Water Conservation Brochure

How Much Water We Use

Did you know...?

A faucet uses 3 gallons of water per minute

A shower uses 5 gallons of water per minute

A toilet uses 5 gallons of water per flush

X 3 = A dishwasher uses 15 gallons of water per load

X 10 = A washer uses 55 gallons of water per load

The Current Water Situation

Just like most of the rest of the world, Florence is experiencing a water crisis. The community has been plagued with water supply issues for years.

Hi y'all! This is Lawrence and I am here to remind you that just like humans, I live on water too!

FLORENCE 57

Why We Must Save Water

Did you know...?

Only 1% of Earth's water supply is drinkable. The remaining water supply ice (2%) and saltwater (97%).

Water is our Earth's most precious natural resource. It's important that we use this limited resource wisely and not waste it.

By reducing the amount of water we use and waste, we can save our water, save our money, save our planet, and most importantly save our future!

Meet Lawrence From Florence

Lawrence is a guppy fish born at the same time as the founding of Florence circa 1857. He is orange and wears a purple jersey to show his love for his hometown, Florence.

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As a fish, Lawrence is directly affected by the water drought. After Florence began experiencing the water drought, Lawrence made it his mission to educate the citizens of Florence about the water crisis. He informs citizens of small ways to help reduce water usage and in turn save the city from the water drought. Help Lawrence save Florence!

Water Conservation Tips

Here are some of the many ways to reduce water use:

- **Fix leaks**
  Saves 110 gallons each month

- **Install faucet aerators**
  Saves 1.2 gallons per person per day

- **Turn off the faucet when brushing teeth or shaving**
  Saves 10 gallons per person per day

- **Wash full loads of clothes & dishes**
  Saves 15-45 gallons per load (washer)
  Saves 5-15 gallons per load (dishwasher)

Do your part to save water. Remember, every drop counts!

For more water conservation tips, check out:
http://saveourwater.com/conservation-lifestyle/

WATER CONSERVATION

CITY OF *Florence*

Appendix B5: Water Bill Insert

TO LEARN MORE ABOUT WAYS TO SAVE WATER, GO TO: www.florencetex.com	Florence water bill example.