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November 2, 2018

To: Rob Whipple
Water Efficiency Specialist
Western Municipal Water District

Fr: Kurt Schwabe, Ph.D., Professor
Maria Perez-Urdiales, Ph.D., Post-doctoral Researcher
Yuhua Xiong, Graduate Student Researcher
School of Public Policy, University of California at Riverside

Re: WMWD-UCR Water Conservation Study – Final Report

Dear Rob:

Please find herein the final summary of the survey results for the WMWD-UCR Water Conservation study. This final summary builds upon the previous two summaries based on your feedback and now includes 83 tables and figures (whereas the first report included the results from the twenty-five primary questions and the second report included fifty-seven figures that explored the cross-tabs). Specifically, this final report includes the main results from the overall survey, a significant number of cross-tabs, and a statistical analysis of conservation program adoption with a focus on exploring how water conservation adoption may differ across age groups, particularly age groups represented by millennials and baby boomers

SURVEY DEVELOPMENT, DISTRIBUTION, AND SAMPLE

The results presented in this final report are based on a survey that WMWD and UCR developed using the findings from four focus groups, ten cognitive interviews, one pretest, and input from both WMWD staff and UCR researchers. Three of the focus groups were performed in English, and took place on November 9th, 2017, November 30th, 2017, and December 17th, 2017.[1] We held a final focus group—in Spanish—on January 22nd, 2018. After developing the preliminary survey instrument based on the four focus groups, we tested and revised the draft survey instrument through five cognitive interviews in English and five cognitive interviews in Spanish. We then again tested and updated the survey instrument based on a pretest—from June 2nd, 2018 to June 17th, 2018—of eighteen respondents randomly chosen from a list of single-family residential accounts within the WMWD service area. The survey was finalized on June 18th, 2018. WMWD developed a webpage that described the purposes and details of the survey, addressed privacy issues and emphasized the fact that this was a completely voluntary survey. The WMWD survey webpage included a link that would take the customers to the actual survey, which was on a secure platform at UC Riverside.

Survey Distribution

All single family residential customers with active WMWD accounts were informed and encouraged to participate in the survey via two mechanisms. First, emails were sent to all of the WMWD single family residential active accounts for which WMWD had email addresses on file. The emails were sent on June 19th and June 27th, 2018. A link to WMWD survey landing page was provided in the

[1] A summary of the focus group findings is found in the brief Focus Group Summary Report (January 18th, 2018).

email, which also described—in both English and Spanish—the purpose of the survey. An example of the email sent on June 19th is provided in figure 1 below.

Figure 1. Sample Email Sent to WMWD Customers

Dear Western Municipal Water District (WMWD) Customer / Estimado consumidor de Western Municipal Water District (WMWD):

We want to know more about how you conserve water and need your help! / Nos gustaría saber más acerca de cómo conserva agua y necesitamos su ayuda!

WMWD has partnered with researchers at the University of California at Riverside (UCR) and developed an online survey to better understand your water conservation efforts so that we can better meet the needs of our customers. The confidential survey should take about 10 minutes to complete and you will have the opportunity to enter a drawing for one of ten $200 Amazon Gift Cards as a way of saying "thank you" for your time!

To take the survey in English, please take note of your WMWD account number (in the following format: 1234567-123456*) and click here:*

If you have any questions, please contact Rob Whipple, Water Resources Specialist at 951-571-7259.

WMWD está colaborando con investigadores de la Universidad de California Riverside (UCR) y juntos han desarrollado una encuesta online para comprender mejor sus esfuerzos de conservación de agua y así satisfacer mejor las necesidades de nuestros clientes. La encuesta, que es confidencial, le tomará unos 10 minutos y podrá ganar una de las 10 tarjetas Amazon de 200$ que sorteamos para agradecer su colaboración!

Para tomar la encuesta en Español, por favor tome note de su número de cuenta de WMWD (en el siguiente formato: 1234567-123456) y haga click aquí:

Si tiene alguna pregunta, por favor contacte a Rob Whipple, Especialista en Recursos Hídricos en el 951-571-7259.

Second, on July 26th, 2018, a postcard was sent to all single family residential customers with active WMWD accounts.

There were a total of 463 unique surveys completed from June 19th to August 30th, 2018, 462 in English and one in Spanish.

Survey Sample

Two issues surrounding the survey sample deserve attention. First, all of the results presented in this report are based on the 462 responses to the English version of the survey. Second, as with any survey sample, one needs to be aware of sample selection issues. To address whether we have a representative sample, we compared our sample Irrigated Area in 2018 (measured in ft^2), Water Use (CCF) in 2017 (annual), and number of people per household to the overall population of single-family residential accounts. For each of these three measures, we could not reject the null hypothesis that the distributions of the samples are equal.[2] To wit, based on these three variables, our sample is representative of the overall population of single-family residential households in WMWD.

[2] The p-values associated the Wilcoxon test statistic under the null hypothesis of similar distributions were 0.90 (Irrigated Area), 0.11 (persons per household), and 0.26 (Water Use). As such, we cannot reject the null hypothesis that the distributions associated with these three variables are the same. Of course, there may be other factors by which respondents self-selected into the survey in a proportion not representative of the overall population of single family residential water users within WMWD. In those circumstances, the responses from this survey may not be representative of the district as whole.

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SUMMARY OF GENERAL RESULTS

The following summary is based on the 462 responses. The first four questions (Q1 to Q4) seek to understand the degree to which respondents are active in their own landscape maintenance and watering choices, as well as to better understand their perceptions about overall water use at their residence.

Approximately 60% of the respondents do not "outsource" maintenance of their lawn/garden to a non-household member (Question 1a), but of those that do, 80% still indicate they take an active role in determining watering needs and schedules (Question 1b). As such, the majority of respondents are in charge of their landscape choices/maintenance and watering needs. Questions Q1c and Q1d provide information on how the irrigated area and water use differ between those that have a landscaper or gardener relative to those that do not. As shown, those that have someone else manager their landscaping have less irrigated area yet use more water over the course of a year, on average, than those that do not have a gardener or landscaper.

Nearly 30% live in residences located in an HOA (Question 2a); of those that live in an HOA, around 37% feel they are restricted in their outdoor water use and landscape choices, which may include a perception regarding their ability to install water efficient landscapes to reduce outdoor water use (Question 2b). To the degree to which there is misinformation here, there may be opportunities for further efficiency and conservation adoption.

Respondents were then asked to indicate whether they feel they use more water indoors or outdoors, followed by whether they feel indoor water conservation saves more water than outdoor conservation. Over one-third (36%) of the respondents indicated they feel they use more water for outdoor use than indoor use, one-quarter felt the opposite (25%), 10% felt they used about the same amount indoors as outdoors, and nearly 30% where unsure (Question 3a). Q3b breaks down these responses by whether the respondent has someone else take care of their lawn (Q1a) to better understand how perceptions of water use may change depending on how active the respondent is in taking care of their lawn/watering. As shown in Q3b, 38% (18%) of the respondents who have someone else take care of their landscaping feel they use more water outdoors (indoors) than indoors (outdoors) relative to respondents who take care of the landscaping themselves. The difference between responses here seems to be that those with landscapers seem less sure about their water use relative to those that do not have landscapers, which seems logical since they may be more removed from the day-to-day or week-to-week outdoor water use decisions.

In terms of potential gains in water conservation at the household level, nearly 50% felt they can save more water by focusing on outdoor water conservation relative to indoor water conservation, 11% felt they can save more water indoors, while 40% were unsure (Q4a). Segmenting these results into those that have landscapers from those that do not, we again see there is more uncertainty about relative water savings potential from those who do use a landscaper, although these same people are more likely to feel they can save more water from outdoor conservation than indoor conservation. From a research perspective, and if outdoor water conservation is where WMWD wants to target its efforts, based on our sample there is a significant portion of households who are unsure whether to focus on indoor or outdoor conservation.

Adoption/Use of Outdoor Water Efficient Technologies

Questions (5) through (7) present results on the proportion of respondents that adopt particular outdoor water conservation technologies, and both why and why not. Nearly 60% of the respondents (271) reported as using drip irrigation, with slightly over 40% (198) having high-efficiency sprinkler

nozzles installed. Lawn/turfgrass replacement was indicated by 35% of the respondents, although this seems like an exceedingly high percentage. One possible explanation as to why this might be such a high percentage relates to the extent to which respondents have engaged in these practices on an area basis (e.g., perhaps they responded to removing and replacing a small patch of turfgrass or lawn).[3] Alternatively, or in conjunction with this explanation, one must be cognizant of possible sample self-selection—i.e., are people that have engaged in lawn/turfgrass replacement perhaps more likely to fill out this survey relative to people who have not engaged in such replacement.[4] Slightly over a quarter of the respondents indicated they use weather-based irrigation controllers, while about one in five indicated that they did not use any of these (not shown). The fact that nearly 20% of respondents indicate not adopting any of these outdoor conservation technologies suggests significant opportunity to save water outdoors for a large fraction of WMWD single family residential accounts. For each of the major outdoor conservation technologies, Questions 5c and 5d provide a comparison of the average irrigated acreage and water use. Respondents who use drip irrigation, on average, have more irrigated area than respondents that do not use drip irrigation but rely on any of the other strategies. Perhaps what is noticeable here is that those that do not report using any of these strategies have, on average, lower irrigated area (8,740) than those households that report using at least one of these technologies. Similarly, from a water use perspective, we see that those that do not employ any of the water conservation technologies use significantly less water annually, on average, than households that do use one or more of the technologies. Of course, because this group has less irrigated area, on average, than those that use some sort of conservation technology, it is not surprising that their water usage may be lower.

Question 5d compares water conservation technology uptake between those that use a gardener relative to those that do not. As shown, there is not a significant difference in the uptake percentages across these two groups, although the percentage of respondents with a landscaper who adopt high efficiency sprinkler nozzles is higher than those without a landscaper (26% to 21%), but these same people are less likely to engage in lawn/turfgrass replacement (15% to 22%). For question 5e, we see that those households in an HOA are significantly more likely to have a WBIC (20% vs. 12%) but less likely to have replaced their turfgrass or lawn (16% vs. 20%) relative to those respondents who do not live in an HOA. Question 5f compares conservation strategy adoption by response to whether indoor or outdoor conservation saves more water; as shown, adoption rates do not differ significantly by whether the respondent feels indoor or outdoor conservation can save more water.

As shown in Question (6) for each of the main outdoor conservation technologies, the most significant reasons for using any of these technologies is primarily the potential money savings on their water bill followed by potential water savings. This is most pronounced for lawn/turfgrass replacement. Notice that respondents were asked to choose their most important factor, and this was for those households that participated. Perhaps more useful are the results from Question (7) which indicate the most important factor influencing a respondent's choice to not use any of these strategies. For lawn/turf replacement, we see that the most important factor is cost—117 of the 209

[3] It may be useful to compare those residents that indicated having replaced lawn/turfgrass with WMWD records as to whether these respondents participated formally in the turf rebate programs. For comparison sake, one could also make comparisons with the other two programs: high-efficiency sprinkler nozzles and weather-based irrigation controllers.

[4] This sort of evaluation would require information on lawn/turfgrass replacement from those that did not fill out the survey and thus is not possible at this juncture. Data on actual program participation, as mentioned in the previous footnote, could be used to compare the degree to which there are differences between those that filled out the survey relative to those that did not to compare program participation rates.

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people that responded to this question (56%)—indicated they feel it is too expensive—while the second most important factor, albeit only about 19%, indicate aesthetics are the reason they do not want to replace their lawn/turf. Other notable outcomes from this question include the responses to weather-based irrigation controllers—about an equal amount of respondents do not feel it will save enough water to justify using it, feel it is too expensive, or are simply unaware of this technology. To the degree this is an effective and low-cost device, a targeted marketing /information campaign may produce significant returns. The other noticeable outcome is that out of the 170 respondents that commented on high efficiency sprinkler nozzles, the most significant reason for not adopting—22%—was that the respondents were unaware of this strategy.

Outdoor Water Conservation Behavioral Adjustments

In terms of more behavioral adjustments, Questions (8) through (11) identify outdoor behavioral strategies respondents indicated adopting over the past five years and the extent to which they continue to engage in such behavior. As shown, over 80% of the respondents have stopped washing down sidewalks and driveways, while slightly less have reduced irrigation timing (77%) and car washing habits (70%). Over the past five years, nearly 50% of the respondents also have let part or all of their lawn die or turn brown. From Question (9) we see that while a majority of the respondents that either let their lawn die/turn brown or reduced their irrigation timing began these practices during the last major drought, slightly over 15% started implementing this practice this past year. Conversely, implementing more water conscious car washing habits and not washing down driveways or sidewalks have been on a decline since beyond five years ago, most likely as more and more people practice these behaviors there are fewer and fewer people left who have yet to implemented them. As Question (10) indicates, the majority of respondents continue to practice these water conservation/efficiency habits as evidenced by the red and purple proportion of each bar. The fraction of the green element of the bar, representing they do not do these activities anymore, represents what economists call “backsliding.” As shown, there is very little backsliding in terms car or driveway washing habits. And while there is a large fraction that still engage in less watering (76% indicate they consistently irrigated their yard less) as well as let part or all of their lawn turn brown or die (nearly 80% indicate that they continue to allow this all or part of the time), there is more backsliding associated with these behavioral habits relative to washing cars and driveways.

Focusing on the status a respondents lawn, we see from Q11 that nearly 70% indicate that part or all of their lawn is still dead or brown, and nearly 40% have replaced some or part of their lawn with a different less water intensive / drought tolerant landscape; over a quarter of the respondents indicated that they replaced their lawns (or some part thereof) with something other than plants. While a significant part of the sample still has a lawn that is dead or brown, it might be useful to highlight the fact that there is a sizable fraction that has been doing something to avoid such an outcome through turfgrass/lawn replacement with more drought tolerant landscaping. Q11b compares water use and irrigated area across these categories. Surprising, those households that indicated they had replaced their yards with a more drought tolerant landscape had the highest annual water use in 2017 even though they did not have the highest irrigated area.

Front Lawn Conversion: Possibilities and Issues

With particular interest in identifying opportunities to reduce outdoor water use, questions (12) through (15) identify the fraction of households in our sample that have turf/green grass in their front yard and, if so, identify which factors are important to them in terms of considering landscape conversion. As indicated in Question (12a), nearly 60% of the sample has some amount of turf or green grass that make up their front yard. As shown in Q12b, those with some turf/green grass in

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their front yard use, on average, more water (321 CCF to 232 CCF) even though they have less irrigated area (9,796 ft^2 to 13,532 f^2). Such an outcome would be consistent with the idea that grass and turf require more water per unit area than drought-friendly landscaping, yet it is prudent to recognize that these are averages, and that the water use parameter is total water use, which includes both indoor and outdoor water use.

For those that do have a front yard with turf, we have ordered the factors that are most important to the respondents in terms of influencing their decision to convert some or all of this grass to a more drought tolerant landscape (Q13). Focusing on that fraction of respondents who responded either of *very high* importance or of *high* importance, it is clear that the single most important factor is the initial or upfront costs. Water saving is the second most important factor, while the next three categories—money savings on monthly water bill, initial/upfront investment of time, and aesthetics/appeal—are all somewhat equally important with around 80% of the respondents indicating these categories are of moderate, high, or very high importance in terms of being a factor that influences their decision. The rebate level garnered a near 50% response in terms of being a *high* or *very high* factor influencing a respondent's decision. Of course, the rebate level can influence the degree to which initial / upfront costs are imposing depending on the availability of funds/loans. Based on these responses, it seems that anything the agency can do to reduce the burden to households, whether it be financial, timewise, or in terms of the "look" of the landscape, will likely be met with a positive uptake. The other categories listed—duration/length of project, recreation potential, awareness by friends/neighbors, and the opportunity to set an example—seem to be significantly less important to respondents. In particular, based on these results, it seems that people are swayed very little by peer effects and setting an example for others. Indeed, we see that over 50% of the respondents indicated that the influence of others ("Awareness of friends/neighbors who have done it") or the opportunity to influence others ("Opportunity to set an example for others") were of *low* or *very low* importance to their decision to replace part of their lawn with more drought-tolerant landscaping.

In terms of better understanding residential homeowners' beliefs, preferences, and abilities, we asked them to indicate the degree to which they agree or disagree with a variety of statements regarding their front lawn and how it can be managed. Ordering the questions based on the cumulative extent to which they "strongly agree" and "agree", we see in Question (14) that there is strong agreement that the front lawn is important, with 68% of respondents indicating that they agree or strongly agree with the statement that having part of their front yard as green is important, yet this doesn't necessarily mean green grass. Only 39% of the respondents worry about what others think about their front lawn (while 23% strongly disagree that they are worry about what others think). While respondents were somewhat equally divided over the extent to which they require a colorful front lawn as opposed to green grass, with similar responses to the question that they need part of their front lawn to be green grass because they use it, there was significantly less agreement that they need their ***entire*** front yard to be green grass. Finally, people generally were strongly in disagreement with the statements that (i) they can water their lawn less and it would look fine, and (ii) that they don't think about their front yard a lot. Consequently, it seems people have reduced front yard watering to a minimum from their perspective and any additional adjustments will have implications for the look of their front lawn, which they think about often.

Question (15) asks respondents to consider alternatives to green grass in their front yard. Of the over 270 respondents that indicated they have a front yard with green grass on some or all of it, approximately 60% indicated they would consider replacing their front lawn with some other type of

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landscape (Q15a). While those that responded that they would consider replacing their front lawn with some other type of landscape had, on average, more irrigated area yet used less water annually (in 2017), neither of these differences were statistically significant.

As illustrated in Question (15d), of the choices *desert landscape*, *artificial turf*, *gravel*, and *concrete*, over 60% of the respondents indicated they would *definitely* or *probably* consider a desert landscape as a replacement for their grass, with slightly less than 50% potentially considering artificial turf. Quite telling is the aversion to gravel and concrete as replacements for grass. From a marketing perspective, to the degree that WMWD single family residential households consider concrete or gravel as the only alternatives to lawn/turfgrass replacement, it would likely be useful to inform them otherwise. When asked to consider what characteristics of a front yard landscape is most important (Q15e), 46% of the respondents indicated a preference for it being low maintenance as the single most important factor, while the color and functionality (e.g., sit or play on it) were nearly equally attractive with 28% and 26% responding, respectively.

Finally, to better understand what might be the pressure points inhibiting residents from replacing their current grass/lawn with some other type of landscape, we asked respondents to indicate which factors regarding replacement they would want some assistance. As shown in Question (15f), there was significant interest in assistance with installation, landscape design, and both choosing plants and the irrigation system. There seemed to be less of a necessity in requiring assistance with financing and project management, relative to the other categories. That said, in looking at the percentages responding "yes" or "maybe", we see that over 70% of the respondents would accept, or would possibly accept, help with these latter two categories (i.e., financing or project management).

Customer General Beliefs, Attitudes, and Characteristics

Questions (16) to (20) ask questions related to general beliefs, attitudes, and characteristics of customers.[5] We ask these questions with the intent of relating them to observed water use behavior and, for future analyses, water efficiency program participation. The first two questions solicit information from customers as to their outlook on the abundance of water in California and beliefs about future drought. As illustrated, over 60% of the respondents do not agree with the statement that there is a lot of water in California, while only 17% agree with this statement. Eighty percent of the respondents do agree with the statement that California will experience more severe drought, with less than 6% of the respondents disagreeing. To summarize these two outcomes, it seems reasonable to assume that most of WMWD single family residential customers feel water is scarce in California, and it is likely to get worse.[6]

The next three statements in Question (16) relate to the customer beliefs surrounding water agency management. Surprising, 63% of the respondents feel that water agencies are trying to profit from their customers, while around only 11% disagree with such a statement. Consistent with this response is that 64% of respondents feel water agencies need to manage water better, while only 9% disagree that agencies need to do a better job. When asked whether the respondent feels water agencies have spent a lot of time and effort planning for future drought, 37% indicated that they could not agree nor

[5] The appendix provides additional analysis of these responses as they relate to irrigated area, water use, and how these responses differ by whether the household would consider replacing their front lawn.
[6] Of course, sample selection issues need to be addressed as indicated above. But, relating these responses to responses related to water use and water efficiency adoption may be useful in that it would be tying concerns over water availability and the future with current behavior.

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disagree with this statement, while 23% disagreed and 40% agreed with the statement. Investigating the extent to which those respondents who feel their agency is profiting off them or are not managing water well have different water use behavior could be useful if it shows that those respondents who have incorrect perceptions of their water district use more water or participate less in agency water efficiency programs than those respondents who have a more favorable take.[7]

The next two statements relate to personal responsibility for oneself and for society in terms of water conservation. Nearly 90% of the respondents agree with the statement that water conservation at home is good for the environment, while less than 4% disagree with such a statement. As such, most respondents do feel there is a direct connection between their own actions and environmental services/quality. Around 80% of the respondents indicated a personal obligation to save water because it is a limited resource, while 7% felt no obligation. Consequently, respondents do both feel obligated to save water and see a connection between saving water and the environment.

In terms of peer effects and neighborhood perceptions, there was neither significantly strong agreement nor disagreement as to whether respondents feel any pressure from others to conserve water. The mode of the responses is in the neither agree nor disagree category (~ 43%), with a slightly higher percentage of the sample agreeing rather than disagreeing. Interestingly, though, is that while 52% of the sample would neither agree nor disagree with a statement indicating their neighbors use more water than the respondent, 35% of the sample agreed with this assessment while around 12% disagreed.[8]

The next three questions provide some better understanding of the respondents, which will be useful to link to water use and water efficiency program participation to better understand what might be correlated with particular types of behavior. In Question (17a), we see that a significantly large portion of our sample—over 70%—do not regularly engage in outdoor activities around lakes, rivers and streams. In Q17b, we investigated how responses to the statement, "There is a lot of water in California" differed by whether the respondent regularly engages in outdoor activities. Whether someone engaged in outdoor activities regularly does not seem to influence their beliefs much about the how plentiful water is in California. We then look at how responses to the statement, "I feel a personal obligation to save water because it is a limited resource" differs by whether the respondent regularly engages in outdoor activities, we see a slightly stronger feeling of personal responsibility by those that regularly engage relative to those that do not regularly engage in outdoor activities.

Similarly, in Question (18a), we see that around 77% of our sample regularly take walks in or around their neighborhoods. In Q18b, we see that respondents who do regularly take walks around their neighborhood are, as a percentage, slightly less inclined to consider replacing their front lawn although the difference is minor (57% to 60%) and the sample of respondents that answered no to Q18 is small. In Q18c, we see that people that regularly take walks around their neighborhood are slightly more inclined to agree with the statement that their neighbors waste more water than they do (72% to 69%), although the difference is marginal.

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[7] Cross tabbing these responses with willingness to replace turf/grass, adopting water efficient technologies or changing water use behavior may be useful information to emphasize whether a more proactive marketing campaign may be necessary to highlight agency mission, efforts, and progress. The appendix provides some additional analysis addressing these issues.

[8] Crosstabs with how these responses relate to water use and conservation adoption can provide useful information as to the motivations behind water use.

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From Question (19a), we see that the majority of our sample is between 51 and 70 years old, with a near equal percentage between 31-40, 41-50, and greater than 70. Accounting for age is a common factor when estimating water demand. Q19b illustrates how irrigated area differs across these age groups, while Q19c illustrates how water use differs across these age groups. There is a substantial difference in irrigated area between those that are 50 or less relative to those that are older than 50, yet there is not a similar stark difference for water use (Q19c).

Finally, we wanted to investigate an issue closely associated with what the environmental economics literature refers to as *science literacy*. The idea here is that peoples' decisions are partly (or largely) based on what they perceive as the benefits and costs of an action. When it comes to water efficiency and adoption of particular water saving technologies, perceptions as to potential water and money savings may influence decisions. To this end, we wanted to investigate how responses to a single question (or "quiz") asking the respondent to identify the more efficient indoor conservation technology may be correlated with other water use decisions/responses. As indicated by the answers to Q20, we see that slightly over 80% of the respondents correctly chose "b" as their answer.[9] When we compare the water efficient program practices as identified in Question 5 above for those that answered the question correctly to those that did not, we do not see any systematic or significant difference in the rate of adoption across practices.

Further Insights

To further understand what might correlate with respondent responses to elements of Question 16, we analyzed how responses to six of the nine statements differed by irrigated area, water use, and other relevant factors. These results are presented in the Appendix, along with a summary of Question 16 in tabular form.

With respect to the statement, "There is a lot of water in California" (A2), we see that those that tended to disagree with this statement have, on average, more irrigated area than those that agreed (A2a), yet there is not as discernable differnce or pattern when it comes to water use (A2b). Relating responses to this statement to whether they would consider replacing their front lawn (A2c), we see that those who would consider replacing their front lawn where much more likely to disagree with the statement. For those respondents who feel water is more scarce, it seems reasonable they would consider engaging in more water efficient/conserving behavior, including replacing their front lawn with a more drought tolerant landscape, than those who do not feel this way (i.e. feel water is abundant). That said, out of the 166 respondents who indicated that they strongly disagreed or disagreed with this statement, nearly 40% (63) would still not consider replacing their front lawn.

A3 explores responses to the statement, "California will experience more severe drought in the future." As shown, there does not seem to be a linear relationship between either irrigated area or water use and the degree to which a respondent agreed or disagreed with this statement. Yet, and consistent with A2c, A3c suggests that those that agree with such a statement are more open to the possibility of replacing their front lawn with drought tolerant landscaping. Indeed, the only group which indicated a strong aversion to replacing their front lawn were those who strongly disagreed with this statement. Because of the low percentage of respondents who either disagreed or strongly disagreed with this statement, it would seem that messaging efforts are not needed to change people's perceptions about water scarcity, both now and in the future due to drought. Even though in the

[9] An objective with asking this question was to investigate how language may influence customer response. The survey was structured to allow for Spanish-speakers to take the survey, but they would be randomly assigned either a version of Spanish that was translated using Google Translate or a version of Spanish representative of the region.

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minority, there is a significant fraction of respondents who agreed that water is scarce and drought will worsen in California, but would still not consider replacing their front lawn.

In A4, the statement, "Water agencies are trying to profit from their customers" was analyzed in more detail. In terms of irrigated area, the small percentage of respondents who disagreed had, on average, slightly higher amounts of irrigated area relative to those who agreed with this statement. For water use, those that strongly disagreed used, on average, more water than respondents in the other groupings. Yet, again, the sample of respondents who disagreed were extremely small and thus we suggest caution in the robustness of these comparisons. In terms of consideration of replacing their front lawns, results in A4c indicate that for all categories of responses, the fraction of respondents who would consider replacing their front lawn was greater than the fraction that would not. Consequently, consideration of converting one's front yard from turf to, say, more drought tolerant landscape, does not seem to be influenced by one's perception of their water agency's motives.

To the statement, "Water agencies have to manage water better," (A5) again, we do not observe a strong discernable relationship between the degree to which respondents agreed or disagreed with this statement and either irrigated area or water use except that for those that strongly disagreed with this statement (only 3%), who had less irrigated area and water use, on average, relative to rest of the sample of responses. Yet, when looking at how agreement or disagreement with this statement is correlated with whether respondents would consider replacing their front lawns, we see evidence of a positive relationship. That is, there is a greater percentage of respondents who would consider replacing their front lawns for those groups that agree or strongly agreed with this statement, or were undecided, relative to respondents that did not agree with this statement. One interpretation here is that those respondents who expect the agency to do more to manage water are also willing to do more themselves.

Next we consider the statement "I feel my neighbors waste more water than I do" (A6). While the number of respondents who disagree is extremely small making comparisons difficult statistically, we do see that for those that were agnostic, or either agreed or strongly agreed, there was no appreciable difference in irrigated area or water use, on average, for responses associated with the other categories, although there is a slight negative relationship between the degree that respondents agreed with this statement and their water use. Indeed, respondents that strongly agreed with this statement at least 17% less water, as a group, then the average water use associated with the other groups, and nearly 45% less than those that strongly disagreed. As such, the perceptions of water use—at least for those respondents that expressed strong beliefs—were consistent with the group level averages. In A6c, we evaluate how responses to this statement might be associated with whether the respondent was willing to consider replacing their front lawn. Certainly for those that are undecided, agree, or strongly agree with this statement there seems to be a preference, on average for considering replacing their front lawns. Yet again, there is still a sizable, albeit less than 50%, percentage of respondents who would not consider replacing their front lawns.

Finally, we consider the statement, "I feel a personal obligation to save water because it is a scarce resource" (A7). While 80% of respondents agreed or strongly agreed with this statement, there was no noticeably significant difference in irrigated area relative to those who were unsure or disagreed, although those that strongly disagreed had considerably more irrigated area, on average (although this group comprises a very small—only 5%—of the responses). In terms of water use, there is no clear relationship between water use and responses to this statement. In A7c, we see that that respondents who agreed or strongly agreed with this statement were much more likely to consider

replacing their front lawn than others, which is consistent with what we would expect for people with a strong sense of personal responsibility. As possible evidence of such a commitment, those that had the strongest sense of personal responsibility—those that responded "strongly agree"—also had the lowest water usage, on average, relative to any of the other groups.

Analysis of Conservation Adoption by Millennials[10]

In considering the future of water conservation, efficiency, and water use in the district, it may be insightful to understand better how different generations have adopted water efficient practices relative to one another, as well as the drivers of such practices. Our analysis below addresses this question with a particular focus on explaining the degree to which millennials and baby boomers differ in their water efficiency adoption practices. Our analysis is designed to investigate the factors that seem to explain the adoption of the four water efficient practices identified in Q5—turfgrass / lawn replacement (Turf), weather-based irrigation controllers (WBIC), drip irrigation (Drip), and high efficiency sprinkler nozzles (Sprinklers). While many different specifications were tried, the factors we investigate include respondent answers to the attitude and belief questions, age category, number of kids, irrigated area, whether they have a nonhousehold member take care of their landscaping/gardening or if their home is in an HOA.

Table A8 provides a description and summary statistics for each of the variables in the analysis. We also provide an assignment of the type of variable. For instance, for "Conservation_Good", which represents whether the respondent answered "agree" or "strongly agree" to the question "Water conservation at home is good for the environment," we assume this question captures a respondent's attitude toward sustainability, particular water sustainability. Alternatively, "Neighbors_Water" identifies those respondents that answered "agree" or "strongly agree" to the question, "I feel my neighbors waste more water than I do," and is intended to represent a subjective norm of the respondents. To see if there are any generational effects surrounding adoption of water efficient practices, we create a Millennial variable that represents respondents in the 31 to 40 year old age category, and a Baby_Boomers variable that represents respondents in the 61 to 70 year old age category.[11] Finally, to highlight how the role of kids in influencing household water use differences across generations, we generated a variable "Kid_Mil" for the number of kids associated with a Millennial's household, and "Kid_Boomers" for the number of kids associated with a Baby Boomer's household.

Table A9 presents the estimation results for each of the four water efficiency practices (columns).[12] For the purposes of this report, our focus will be on the sign and statistical significance of coefficient estimates associated with each factor in each column. A positive (negative) sign on the coefficient indicates that the factor is positively (negatively) associated with the probability that the average household will adopt the particular practice. In the first column of results (***Turf***), we observe the determinants of Turf replacement. The results indicate that respondents who state that water agencies are trying to profit from their customers (Profit_customer) are less likely to replace their

[10] The number of observation for this analysis decreases from 462 down to 447 due to a number of households not providing any information regarding the number of children in the home.
[11] Differences in age categories could be correlated with differences in socio-economic factors, including income.
[12] Our estimation is based on a Probit model, which defines the outcome of interest as a binary variable. The estimated coefficients indicate the degree to which the determinant is related to an increase (positive sign) or decrease (negative sign) in the probability of a particular outcome.

turfgrass/lawn.[13] Regarding the variables related to the respondents' generation, we observe that millennials are less likely to replace their turf, while baby boomers show a higher probability of adoption, both of which are statistically significant at least the 5% level. We see no statistically significant impact of kids on turfgrass replacement, being in an HOA, or size of irrigated area. We do observe that those respondents that had a gardener were more likely to have replaced some of their turfgrass, although again we are not sure whether the turfgrass replacement led to the need for a gardener or not, or whether perhaps having a gardener might have a positive impact on the ease to which a household is able to convert their lawn into a more drought-friendly landscape.

In the second column of results, ***WBIC***, only whether the resident was in an HOA showed a statistically significant outcome, with a negative impact on the probability of adopting a weather-based irrigation controller. The lack of statistically significant results are likely a function of the fact that WBIC had the fewest number of people adopting this strategy. Alternatively, in the third column of results, ***Drip***, we see that respondents who are millennials have a lower probability of adopting drip irrigation, although less so for millennials with kids (the positive and statistically significant coefficient related to Kids_Mil). Baby Boomers have a positive and statistically significant impact on the probability of adoption of drip irrigation, as does the size of the area requiring irrigation (i.e., those respondents with more irrigated area are more likely to adopt drip irrigation than those respondents with less irrigated area). For the last column of results, ***Sprinklers***, again we see that Millennials are less likely to adopt high efficiency sprinkler nozzles, although that less so for Millennials with kids (which has a positive impact on the probability of adopting high efficiency sprinkler nozzles); similarly, Baby boomers with children in their homes are also more likely to adopt high efficiency sprinkler nozzles. Finally, households that have gardeners are less likely to adopt high efficiency sprinkler nozzles than households with gardeners.

The main conclusion that we can draw from our results is that with the exception of weather-based irrigation controllers, millennials in general are less likely to adopt outdoor water efficient technologies relative to other age groups except if they have kid. That is, millennial with kids are more likely to have drip irrigation and high efficiency sprinkler nozzles; millennials—with or without kids—are less likely to have replaced their turfgrass/lawn. While we caution against drawing any strong conclusions from this result given the limited sample size and potential endogeneity concerns, one potential explanation is that millennials want to maintain their lawns for their kids to use. Baby boomers, alternatively, are more likely than other age groups to have replaced their turfgrass or lawn with some other type of landscape, and to have installed drip irrigation.

CONCLUSIONS AND TAKEAWAYS

Based on the analysis above, a summary of some of the main findings are as follows.

Gardeners/Landscapers. We observed that annual water use was greater for households who indicated they have a landscaper / gardener manage their watering needs than households without a gardener / landscaper, even though the former had less irrigated area, on average.

HOAs. Approximately 40% of the respondents that live in HOAs feel restricted in their outdoor water use and landscape choices. Given the significant fraction of households that live in HOAs, to

[13] While those that feel that their neighbors waste water are also more likely to replace their turfgrass/lawn is also statistically significant (similar to Profit_customer) yet positive, it may be because they replaced their turfgrass. In this case, there is a question of "causality" and the estimate may be biased.

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the degree there is misinformation on water and landscape choice, there may be opportunities for further efficiency and conservation adoption in these neighborhoods

Water Use Perceptions. Over 50% of the sample felt they can save more water indoors than outdoors or were unsure. To the extent such perceptions are not representative of potential water savings through outdoor water conservation, educational campaigns related to outdoor water conservation opportunities may prove useful.

Water Efficient Practices. While a significant portion of the respondents have adopted water efficient technologies, e.g., nearly 60% use drip irrigation on some part of their landscape, nearly 20% of the sample indicated not using sprinklers or drip irrigation, weather-based irrigation controllers, or having replaced any of their turfgrass / lawn. While these households, on average, have less irrigated acreage and lower annual water use than households who have adopted at least one of outdoor conservation practices, there may be opportunities for additional low-cost water-saving practices by these households.

Potential money savings was listed as the most important factor that households consider in their decision to adopt any of the four outdoor water efficient practices we presented (drip irrigation, high efficiency sprinkler nozzles, weather-based irrigation controllers (WBIC), and turfgrass / lawn replacement). For those respondents who indicated not having replaced any turfgrass/ lawn, cost was the main factor, although nearly 20% of the sample listed aesthetics / looks as the second most important factor.

Surprisingly, many respondents indicated being unaware of WBIC or high efficiency sprinkler nozzles. This suggests that while agency efforts to reduce costs is an important strategy to incentivize outdoor water conservation program adoption, so is continuation of targeted information campaigns that inform customers of the wide range of alternative technologies available to reduce outdoor water use and save money.

A positive finding of the study was the significant fraction of respondents who have engaged, and still engage, in a variety of behavioral actions that reduce water use, including reduced irrigation timing and/or allowing lawn to turn brown. Such households may be amenable to low-cost technologies that allow them to reduce water use but keep their yard aesthetically pleasing.

Respondents indicate that numerous factors were highly important in their consideration of replacing their green lawn with a more drought-tolerant landscape. As such, it seems that anything the agency can do to reduce the burden to households, whether it be financial, timewise, or in terms of the "look" of the landscape, will likely be met with a positive uptake. The other factors considered, i.e., duration/length of project, recreation potential, awareness by friends/neighbors, and the opportunity to set an example, were considered less important in influencing a respondent's decision to consider turf replacement. Interestingly, our results suggest that people are swayed very little by peer effects and setting an example for others.

Survey results suggest that respondents feel strongly that they have reduced front yard watering to a minimum and any additional reductions in watering will have implications for the look of their front lawn, which they think about often.

Front lawn possibilities. Based on responses to the survey, approximately 60% of respondents have lawn or turf in their front yard. While respondents with front lawns have, on average, less irrigated area than those without front lawns, their annual water use (in 2017) was higher on average than those without lawns.

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Of the over 270 respondents that indicated they have a front yard with green grass on some or all of it, approximately 60% indicated they would consider replacing their front lawn with some other type of landscape. While a majority of respondents were amenable to a desert landscape, similar to that often found in Palm Springs' neighborhoods, as a substitute for their lawn, few would consider concrete or gravel. From a marketing perspective, to the degree that WMWD single family residential households consider concrete or gravel as the only alternatives to lawn/turfgrass replacement, it would likely be useful to inform them otherwise.

In terms of the single most important characteristics of a front yard landscape, respondents responded with *low maintenance* (46%), while the *color and functionality* (e.g., sit or play on it) were nearly equally attractive with 28% and 26% responding, respectively. Respondents indicated that while having a colorful front yard is important, it needn't be green. In terms of the types of assistance they'd request/consider to convert their front lawns to more tolerant-landscaping, respondents were amenable to assistance is all of the categories offered (i.e., choosing plants, landscape design, financing, project management, installation), although over 70% specified help in *choosing plants*. Given that financing was an option, with only 45% of the respondents indicating a willingness to accept help, it is interesting that plant choice was category that garnered the highest percentage of respondents indicating a willingness to accept help. These results raise one possible reason for the lack of participation in turf replacement programs: people are very uncertain about what will substitute for their turf. They seem adverse to concrete or gravel, and they are very uncertain about what sort of plants should be considered and this uncertainty extends into plant watering needs and maintenance requirements. This uncertainty is likely to lead to inaction.

Beliefs/Attitudes. A significant majority of the respondents feel water is a scarce resource and that drought will become more severe in the future. As such, messaging campaigns highlighting or informing customers of future water scarcity are likely to be more useful as reminders than as new information to customers. Furthermore, those customers that indicated concern over water scarcity and who felt the future will consist of more severe drought were, on average, more likely to consider replacing their front lawn than those respondents who felt the opposite.

A similarly high fraction of respondents feel their water agency is trying to profit from them, that the agency needs to better manage the water, yet are somewhat split over whether the agency spends a lot of time and effort planning for future drought. An interpretation of these results might be that customers are unhappy over recent water price increases and do not completely understand how their conservation efforts lead to such prices increases, but most likely attribute the price increases to poor management. Interestingly is the fact that the majority of respondents are unsure as to the planning efforts of the agency, with an equal, albeit lesser, amount somewhat split between believing the agency does and does not spend much effort in planning for drought. One concern regarding these results is whether respondents who feel their agency is trying to profit from them are less likely to engage in water efficiency programs. Our results suggest that consideration of converting one's front yard from turf to, say, a more drought tolerant landscape does not seem to be influenced by one's perception of their water agency's profit motives, yet it does seem related to one's perception of whether they feel the agency is managing their water well. That is, those respondents who do not feel their agency is managing water well are also less likely to consider replacing their front lawns with more drought-tolerant landscaping.

Survey results suggest that respondents both feel obligated to save water and see a connection between saving water and the environment, information that may be useful in terms of agency messaging about the importance of conservation from both a personal and societal perspective.

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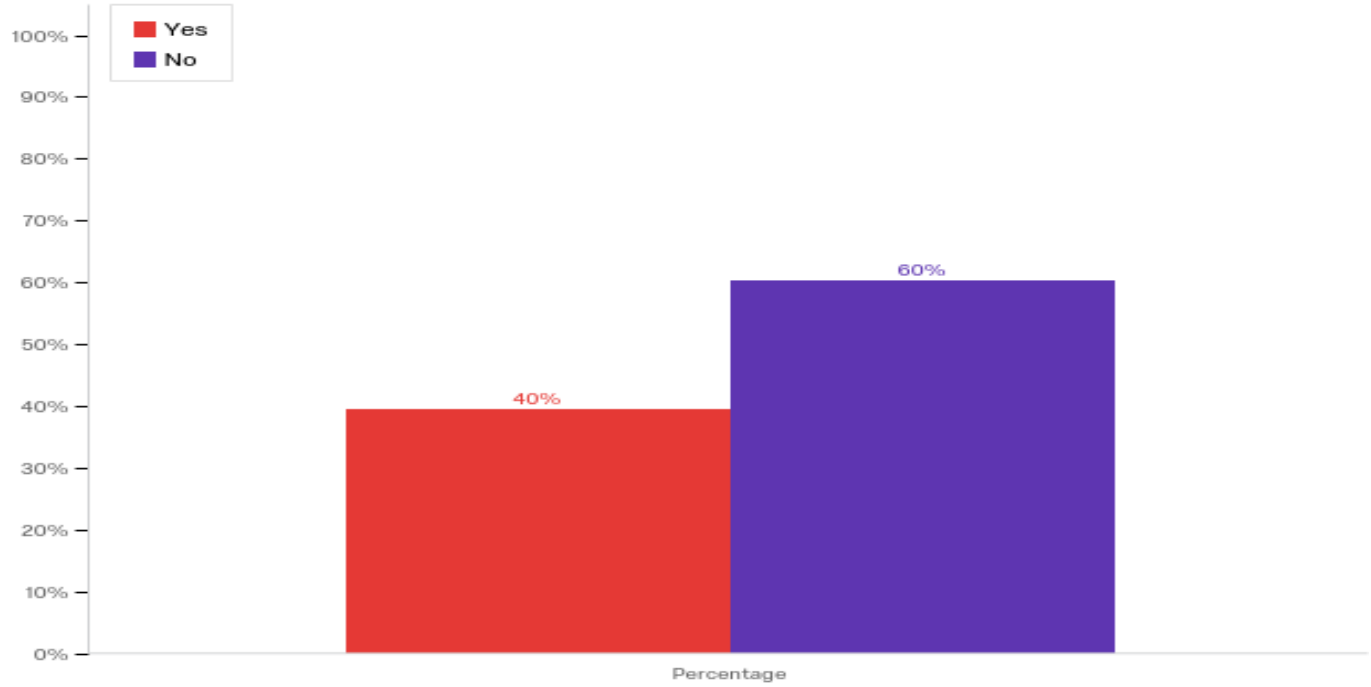
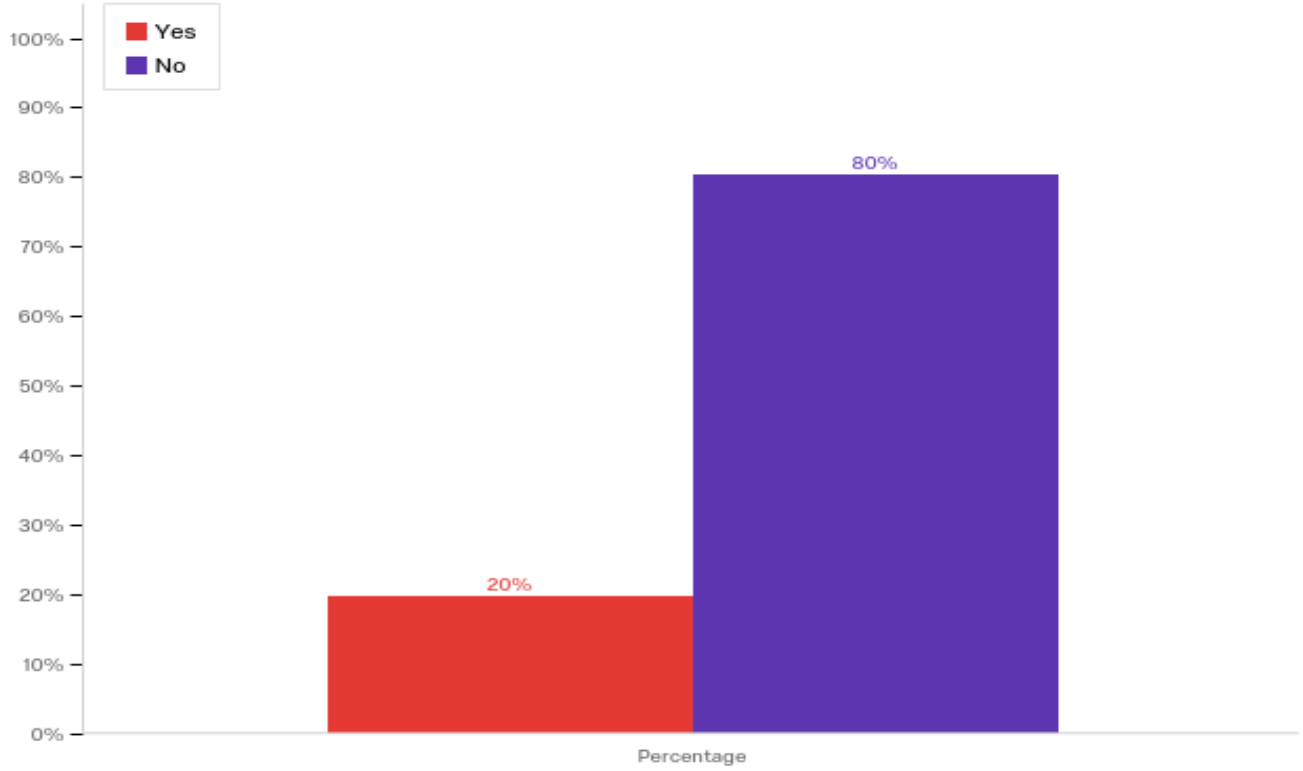
Similar to outcomes from previous questions, peer effects that encourage conservation are weak, and there seems to be a tendency for people to believe they waste less water than their neighbor.

Generational differences. The main conclusion that we can draw from our regression results is that millennials with kids tend to adopt technologies that help them save water while maintaining their lawn. That is, millennials with kids are more likely to have drip irrigation and high efficiency sprinkler nozzles; millennials—with or without kids—are less likely to have replaced their turfgrass/lawn. While we caution against drawing any strong conclusions from this result given the limited sample size and potential endogeneity concerns, one potential explanation is that millennials want to maintain their lawns for their kids to use.

Q1a - Do you have a gardener and/or someone who is not a member of your household who is in charge of maintaining your lawn and/or garden?[14]

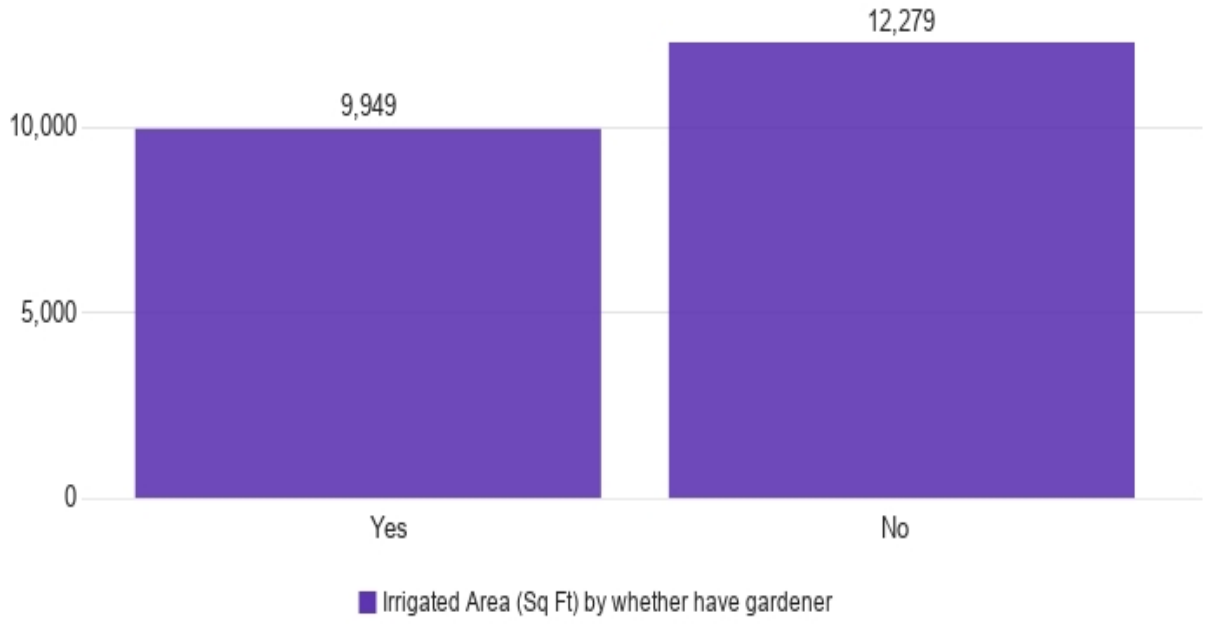


Q1b - Is this person in charge of maintaining your lawn/garden watering needs and scheduling?[15]

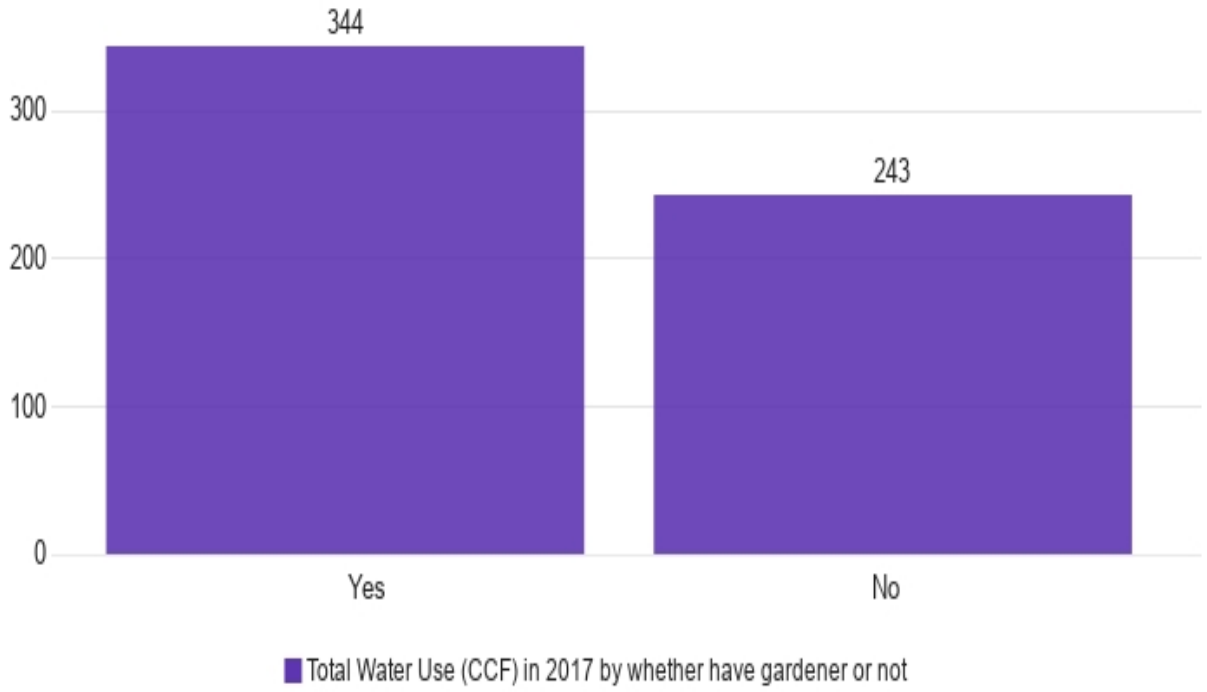


[14] p-value=0.000
[15] p-value=0.000

Q1c. Irrigated Area (ft^2) by whether respondent has gardener or landscaper (Q1a)[16]

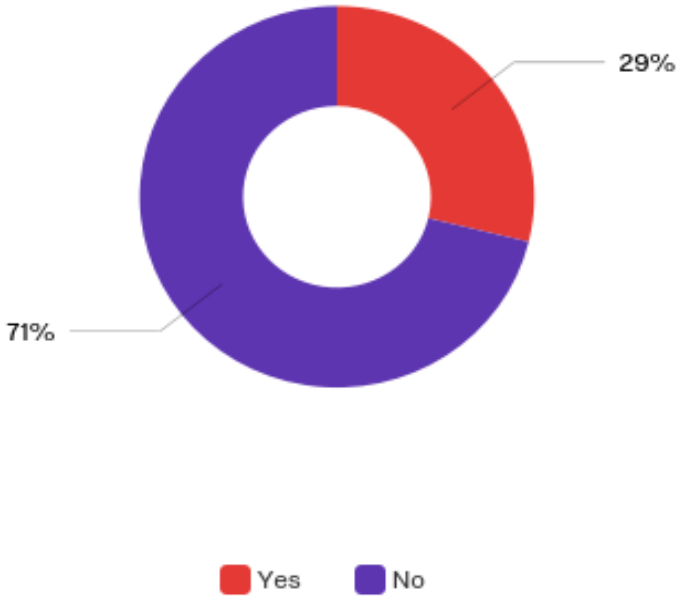


Q1d. Water Use (CCF) in 2017 by whether respondent has gardener or landscaper (Q1a)[17]

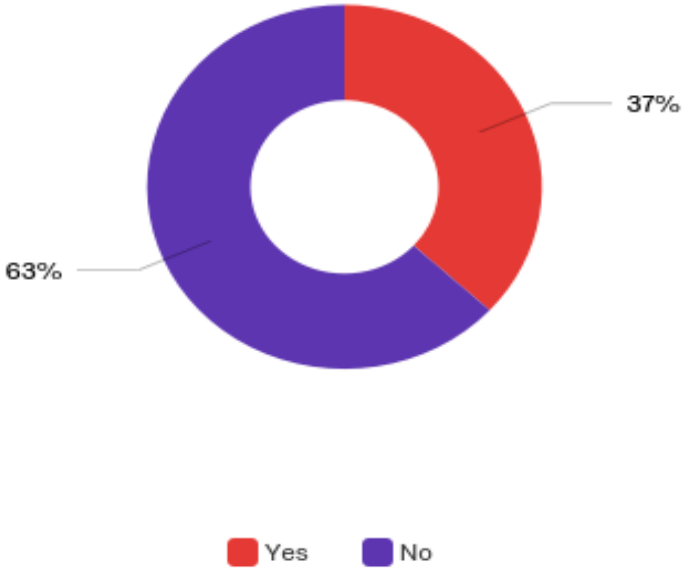


[16] p-value=0.107
[17] p-value=0.00

Q2a - Is your residence located in a Home Owners Association (HOA)?[18]

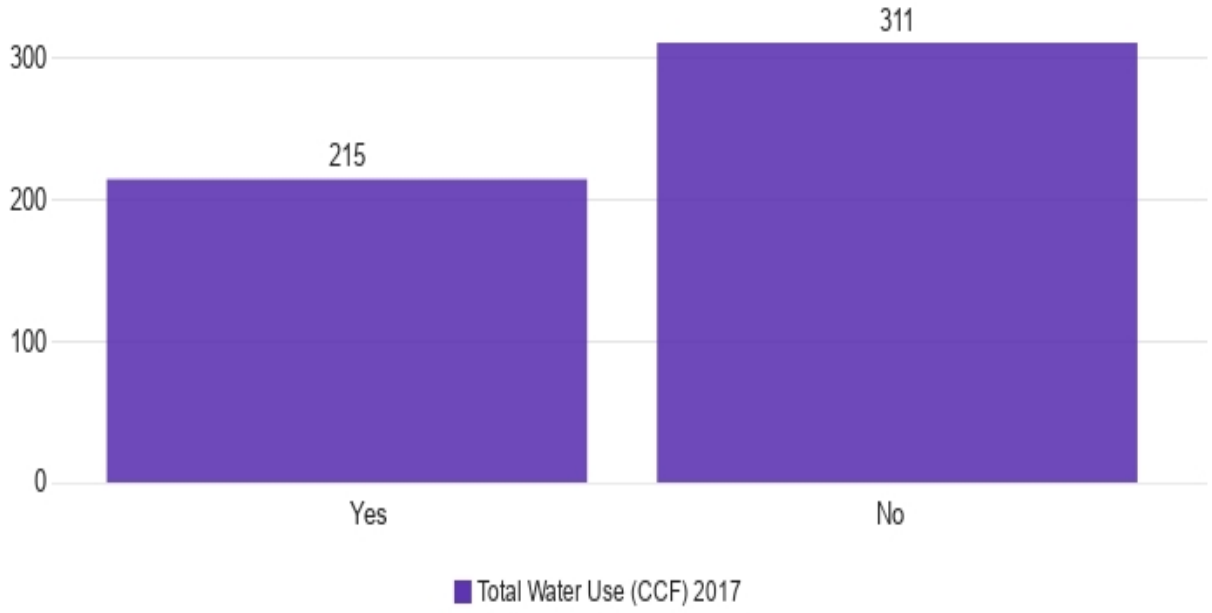


Q2b - Does your HOA have any restrictions that would prevent you from installing water efficient landscaping (such as a rock garden or native plants) or otherwise reducing your outdoor water use below its current level?[19]

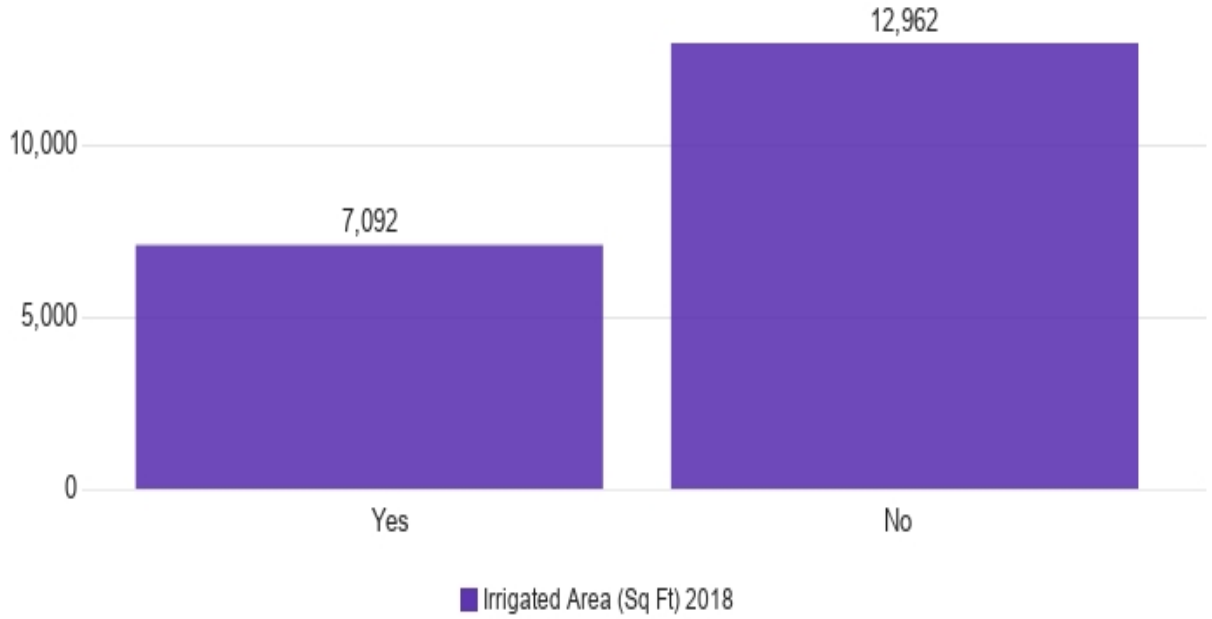


[18] p-value=0.000
[19] p-value=0.001

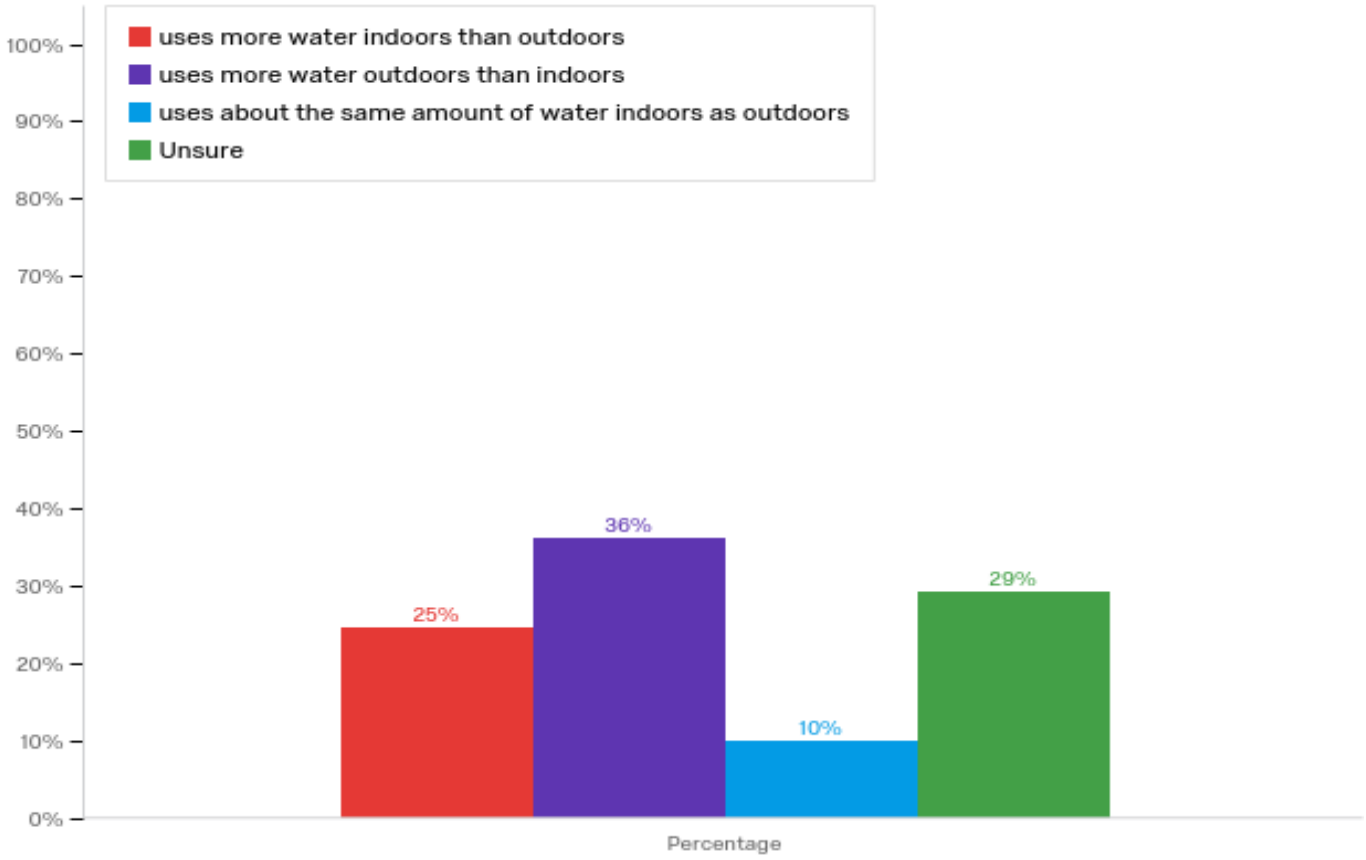
Q2c – Water Use Comparison based on whether resident is in an HOA



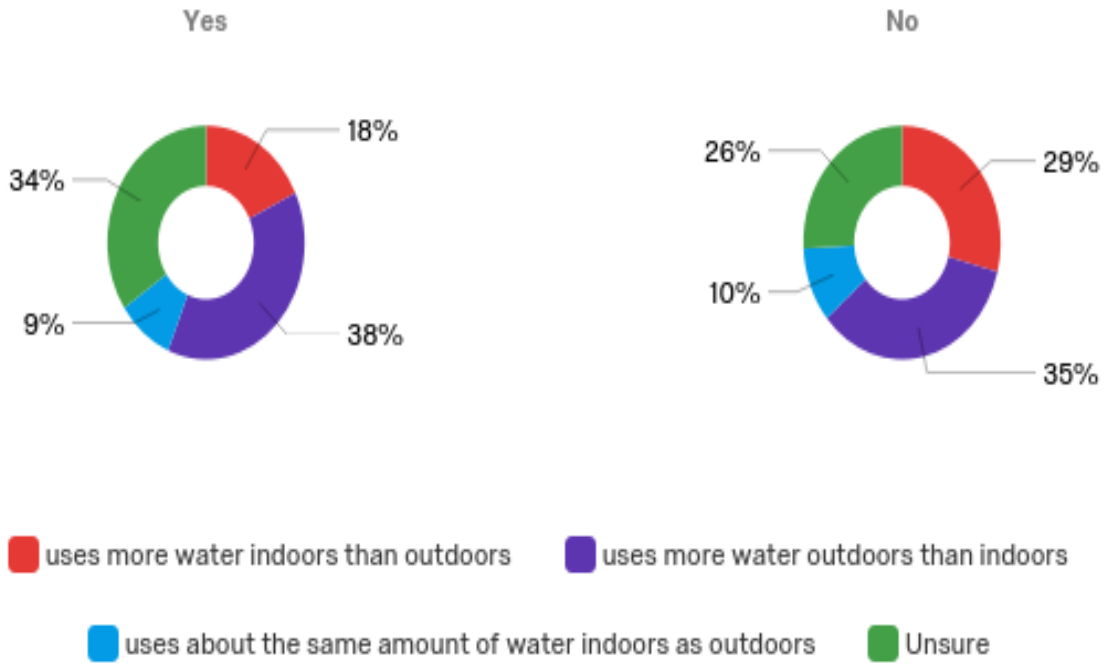
Q2d – Irrigated Area Comparison based on whether resident is in an HOA



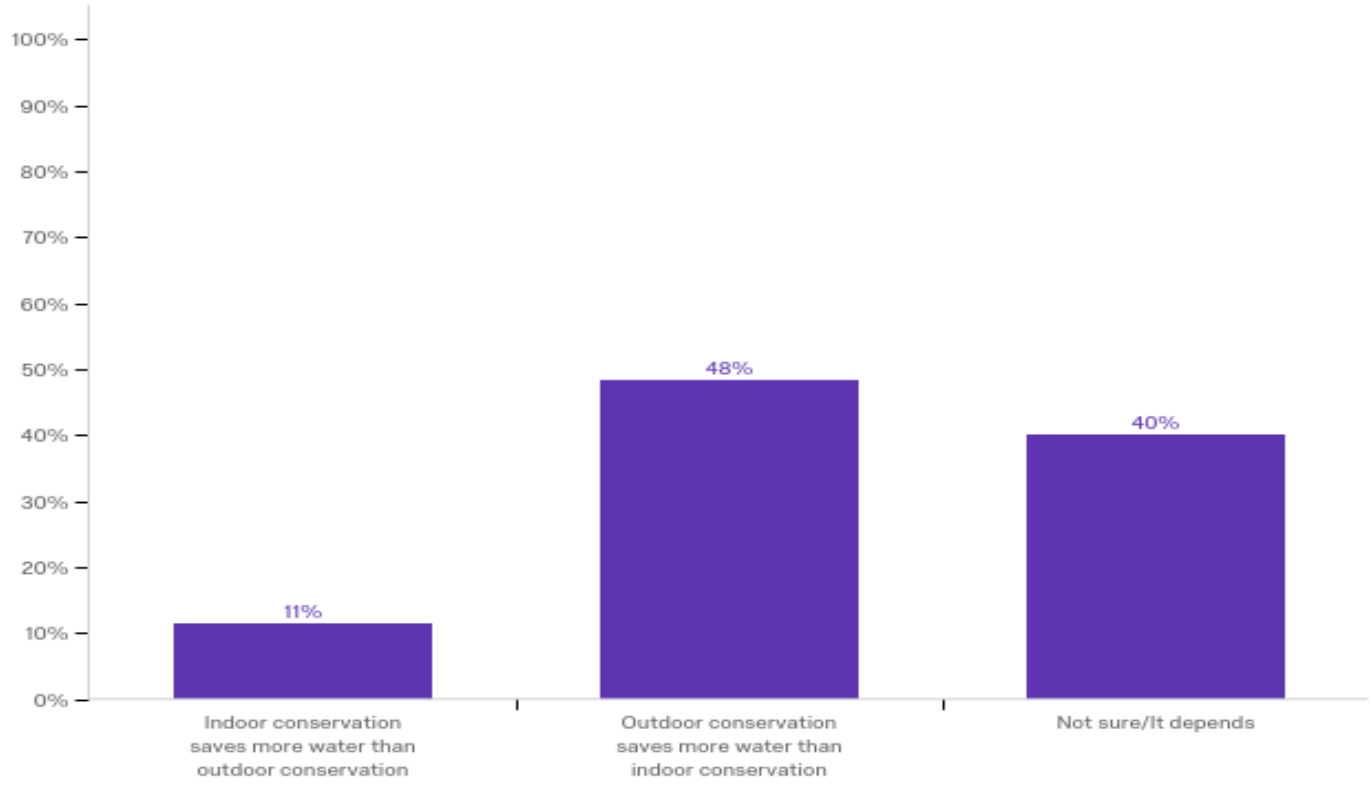
Q3a - Choose the best answer: Throughout the year, my household...



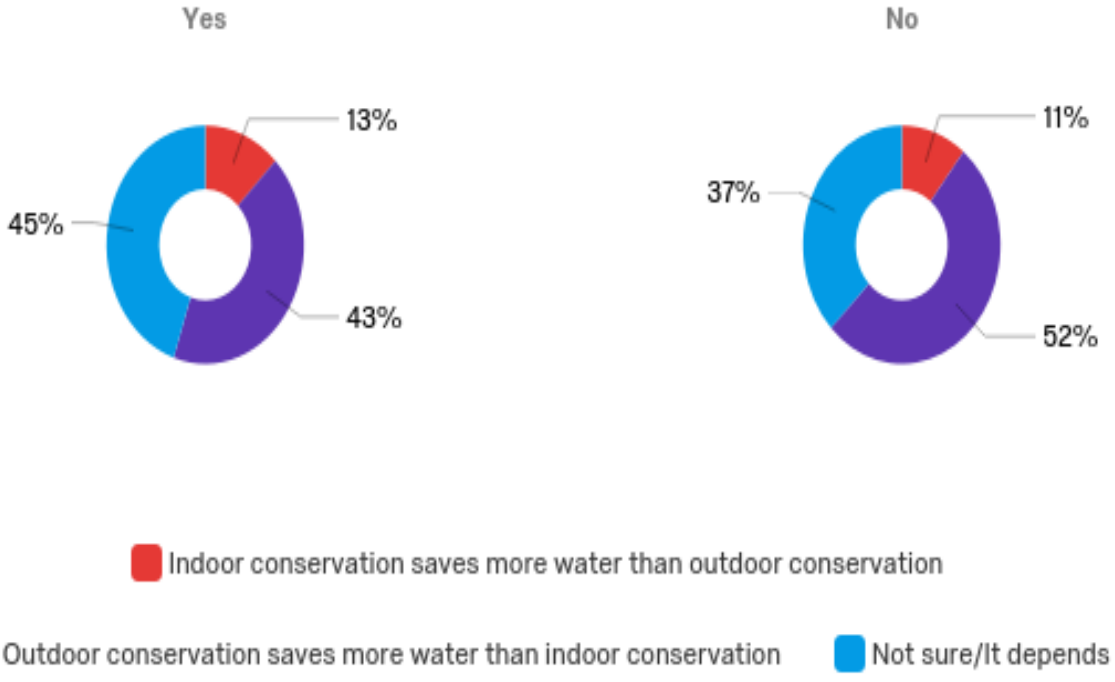
Q3b. Respondent perceptions about indoor and outdoor water use (Q5) sorted by if they have a gardener or someone else in charge of maintaining lawn (Q1)



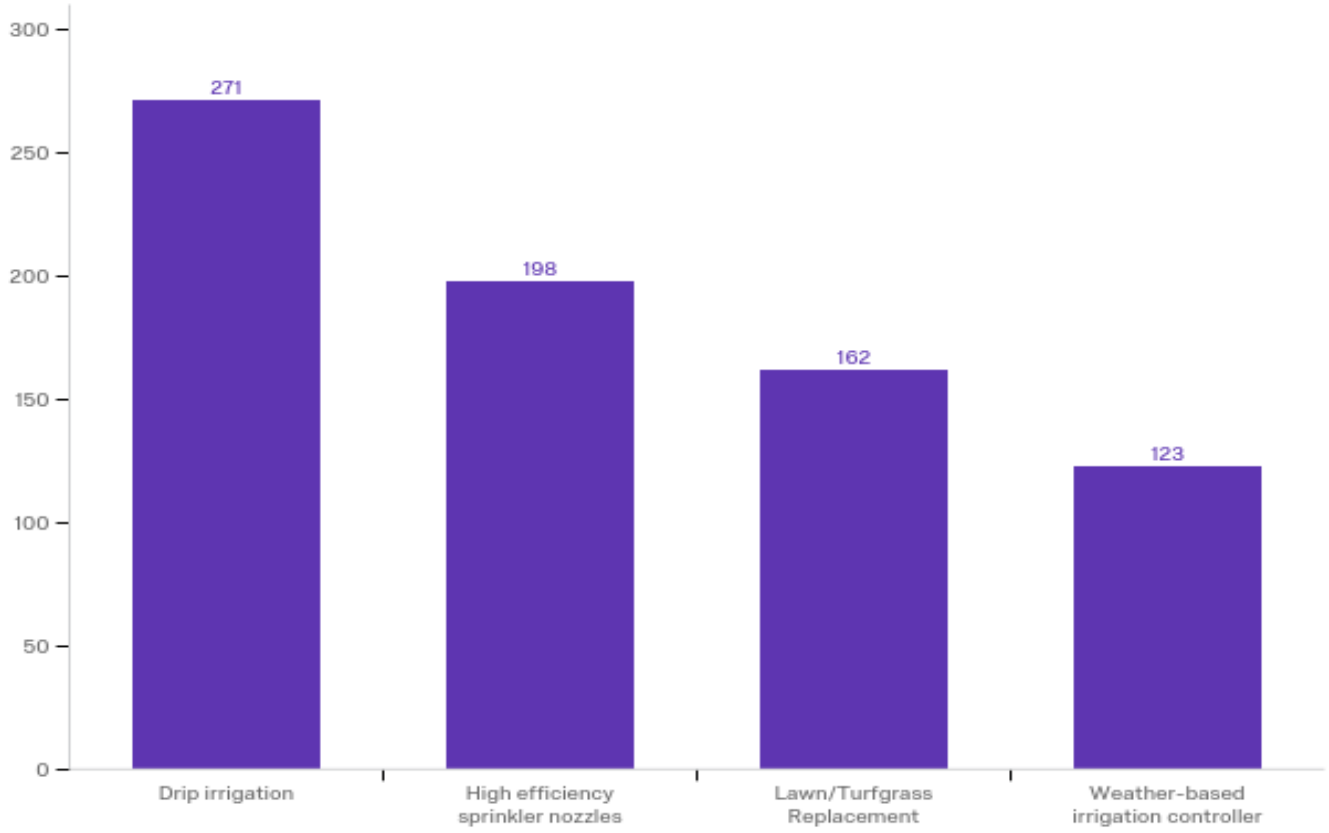
Q4a - Choose the best answer that applies to your household:



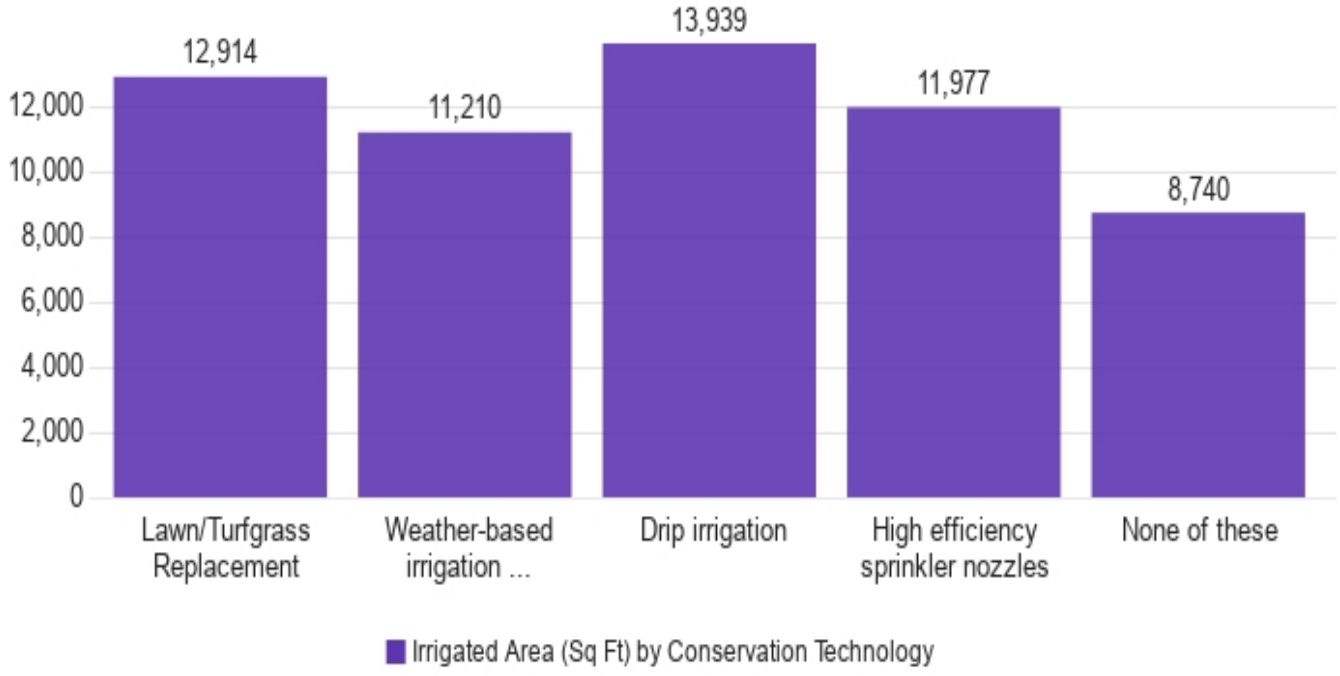
Q4b – Indoor vs Outdoor Perceived Conservation Potential by whether household has gardener



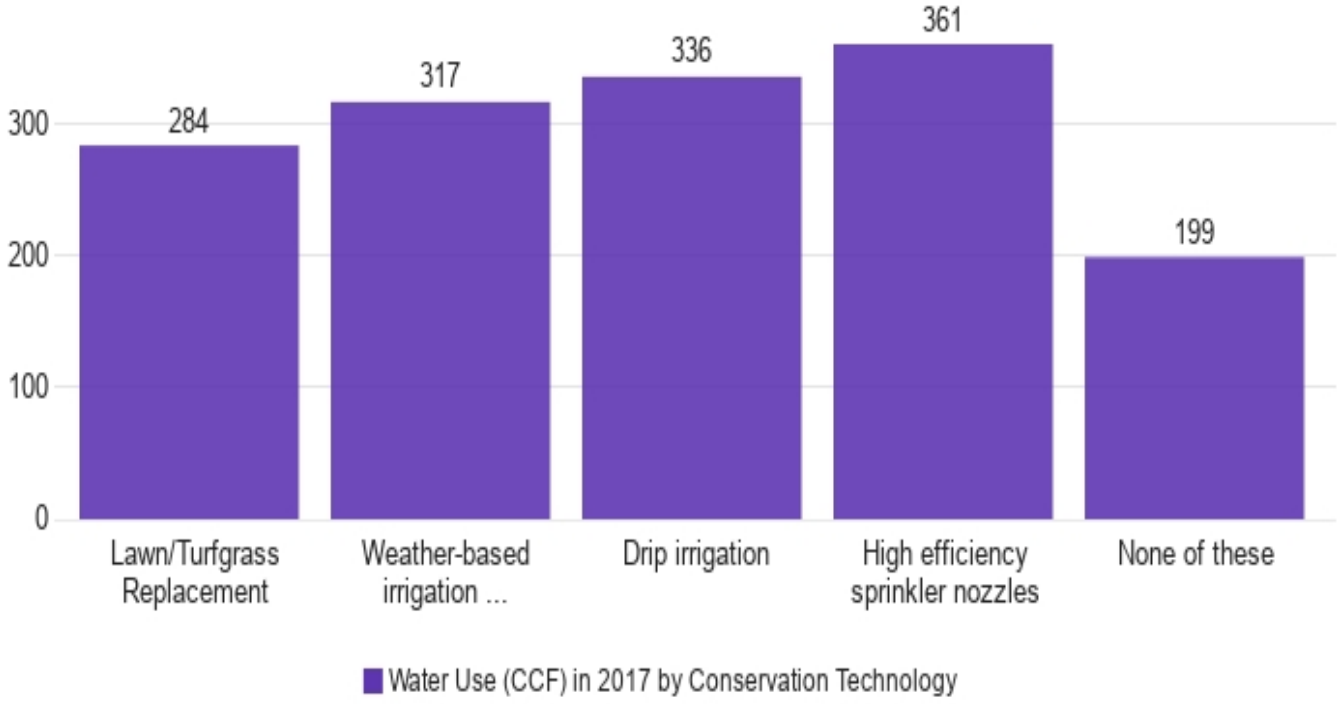
Q5a - Which of the following conservation strategies have you installed or are using? Please select all that apply.



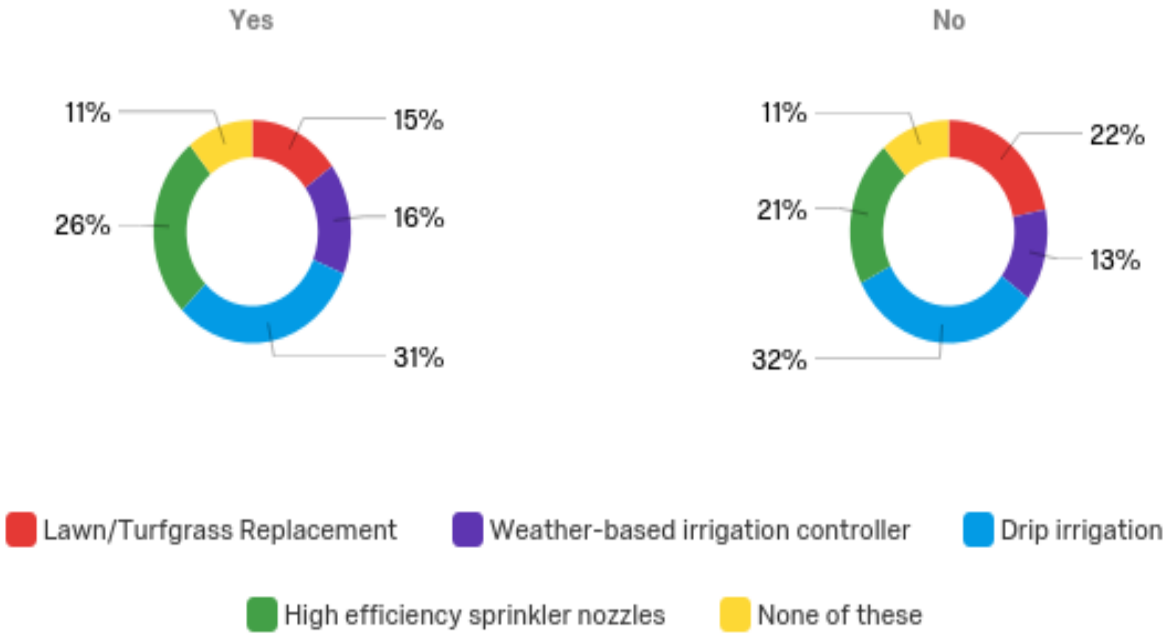
Q5b – Average Irrigated Area (ft^2) by conservation strategy



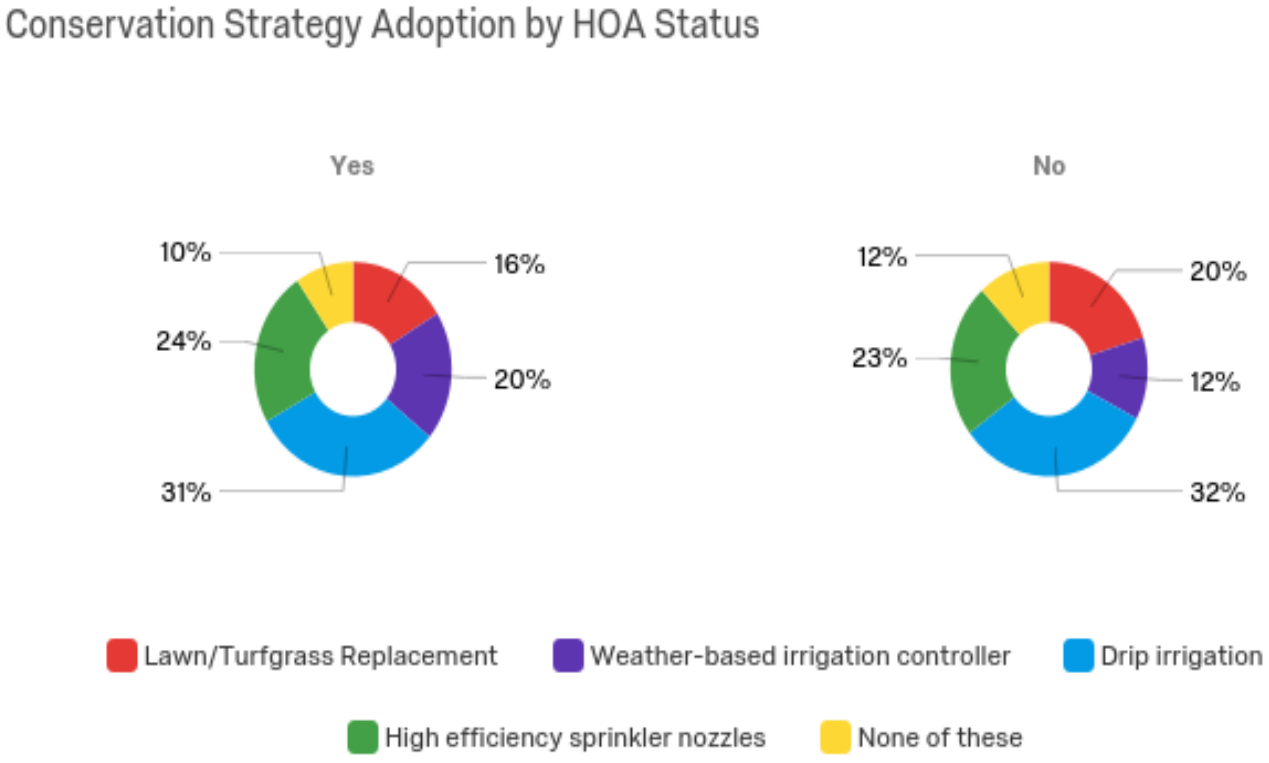
Q5c – Average Water Use (CCF) in 2017 by conservation strategy



Q5d - Conservation strategies installed or using by whether have a gardener or not?



Q5e – Conservation Strategy Adoption Comparison based on whether resident is in an HOA



Q5f - Conservation strategies by belief surrounding indoor vs outdoor water use

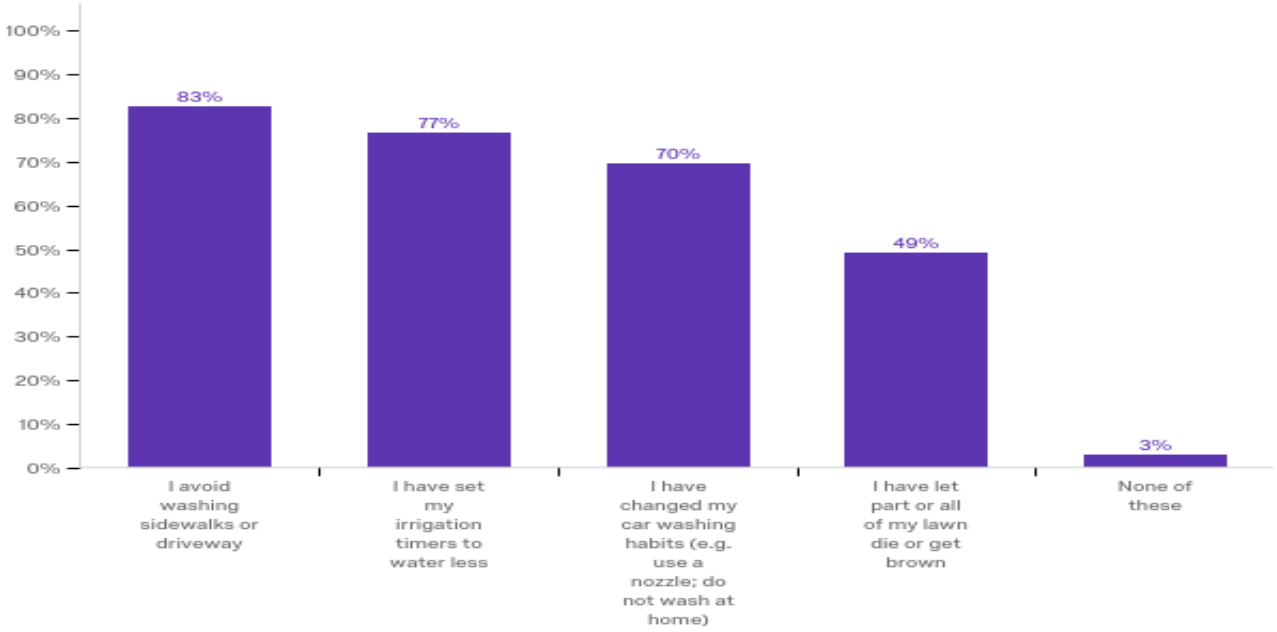
Q6 - For each column, what was the single most important factor that influenced your decision to adopt/use the following strategies? (Choose only one factor per column)

Question	Lawn/Turf Replacement	WBIC	Drip Irrigation	High Efficiency Sprinkler Nozzles
Potential money savings on water bill	**43%**	**37%**	**35%**	**34%**
Inexpensive to implement	1%	3%	7%	8%
Water savings potential	28%	24%	37%	27%
Relative ease of implementation	1%	6%	7%	9%
Rebate program offered by agency	9%	7%	0%	11%
Neighbors/other people are doing it	1%	0%	3%	1%
Already installed (or came with house)	4%	17%	8%	8%
I like the look / aesthetics	7%	1%	1%	1%
Other	6%	4%	1%	4%
Total Responding	162	123	271	198

Q7 - For each column, what was the single most important factor that influenced your decision to *not adopt/use* the following strategies? (Choose only one factor per column)

Question	Lawn/Turf Replacement	WBIC	Drip Irrigation	High Efficiency Sprinkler Nozzles
Too expensive	**56%**	19%	7%	10%
Too difficult to implement	3%	9%	19%	10%
Too difficult to maintain (operate)	3%	4%	7%	1%
Lack of time	1%	5%	5%	9%
Unaware / Didn't know about	1%	**22%**	11%	22%
Other peoples' experiences / outcomes	1%	2%	1%	4%
Don't feel it will save enough water	4%	20%	10%	14%
I don't like the look	19%	1%	5%	0%
Other	11%	18%	**30%**	**31%**
Total Responding	209	246	99	170

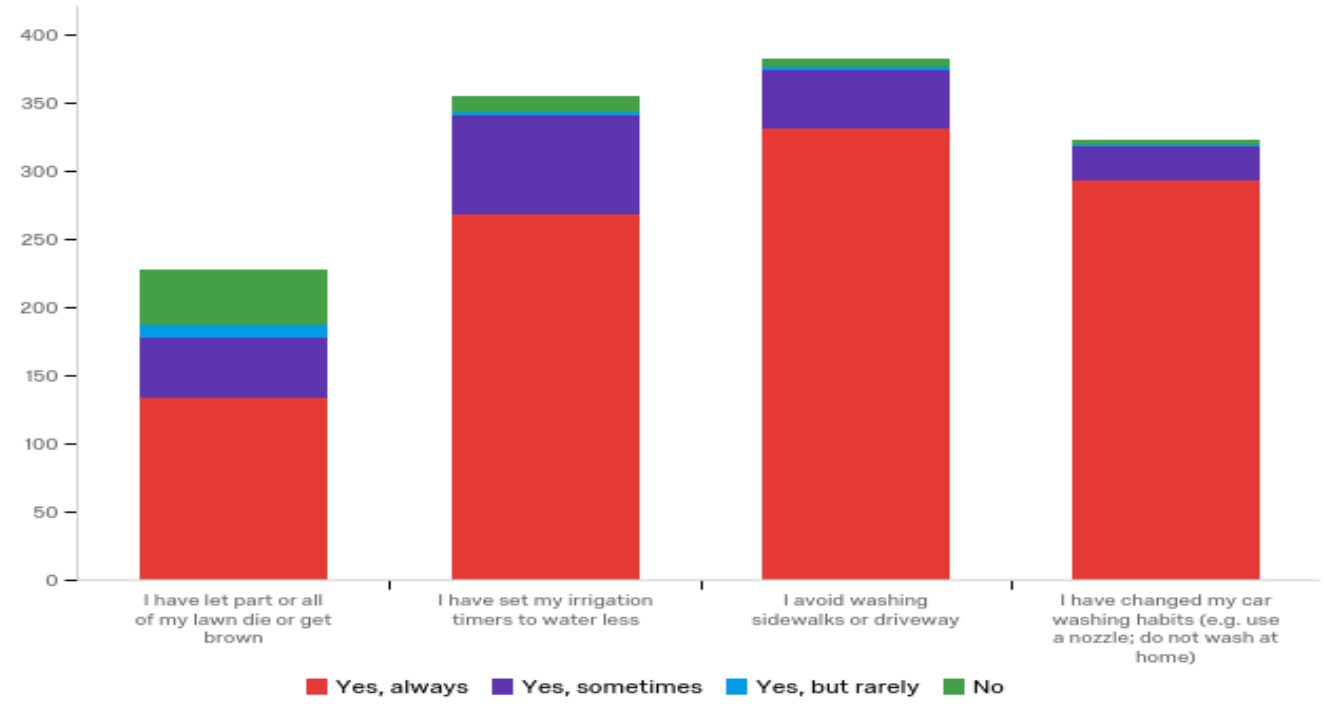
Q8 - Do you OR have you regularly practiced any of the following outdoor conservation actions to save water over the past 5 years? Please select all that apply.



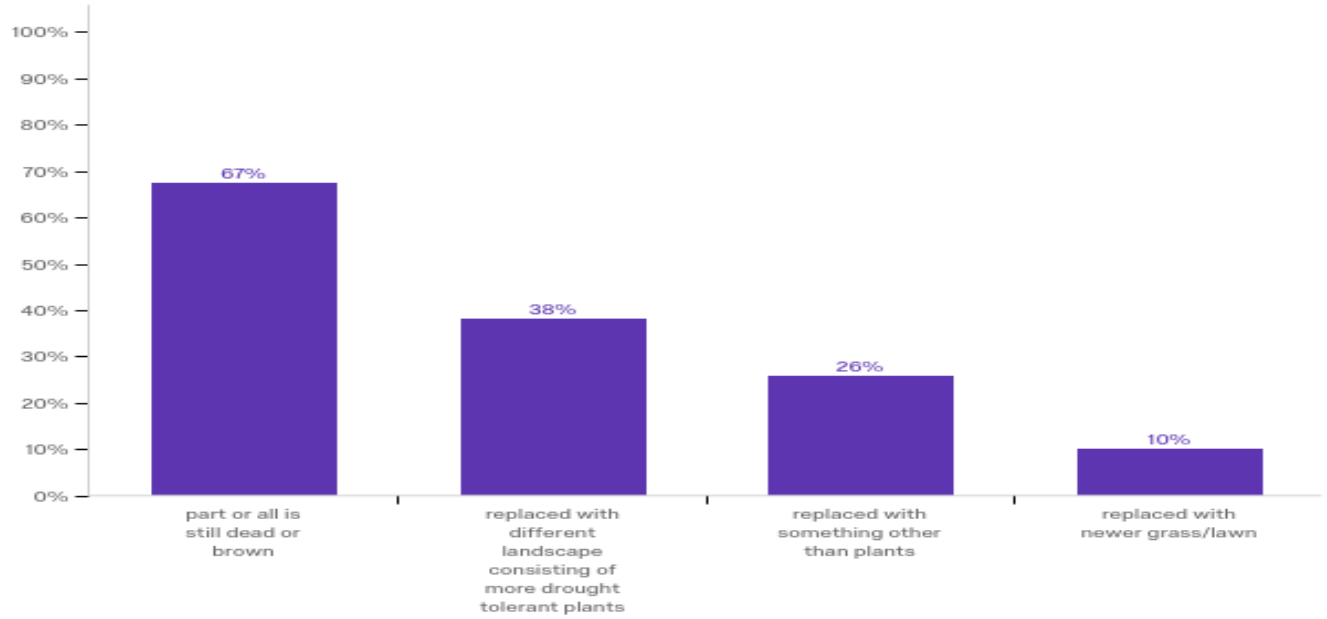
Q9 - For those actions you have done, when did you start?

Action	Within last year	During the last major drought (1 to 5 years ago)	Prior to the last major drought (> 5 years ago)	Total Responses
I have let part or all of my lawn die or get brown	22%	**63%**	14%	225
I have set my irrigation timers to water less	16%	**59%**	22%	354
I avoid washing sidewalks or driveway	11%	**40%**	48%	381
I have changed by car washing habits (e.g., use a nozzle; d/n wash at home)	13%	**40%**	46%	321

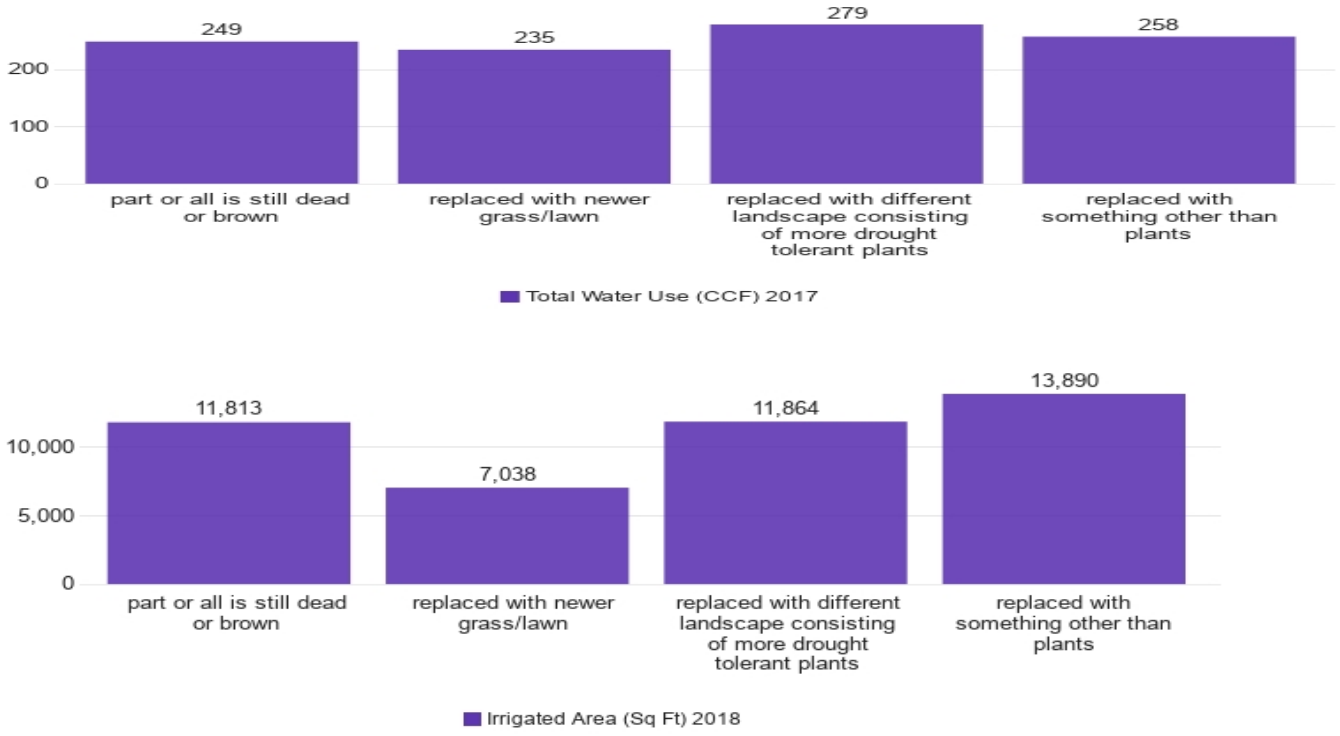
Q10 - For those actions that you have done, do you still do these?



Q11a - Which of the following best represents the status of your lawn now (select all that apply):

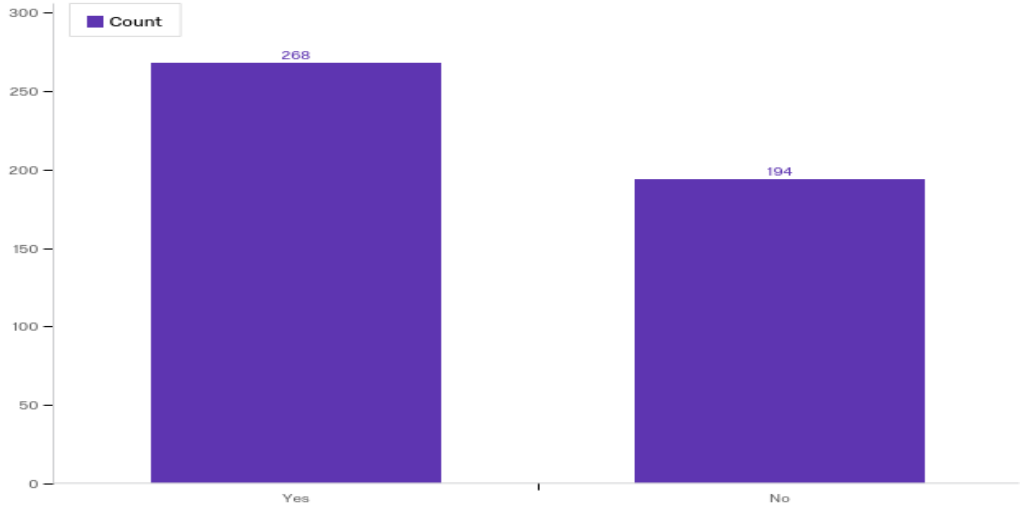


Q11b. Total Water Use (CCF) and Irrigated Area (ft^2) by current status of lawn:[20]

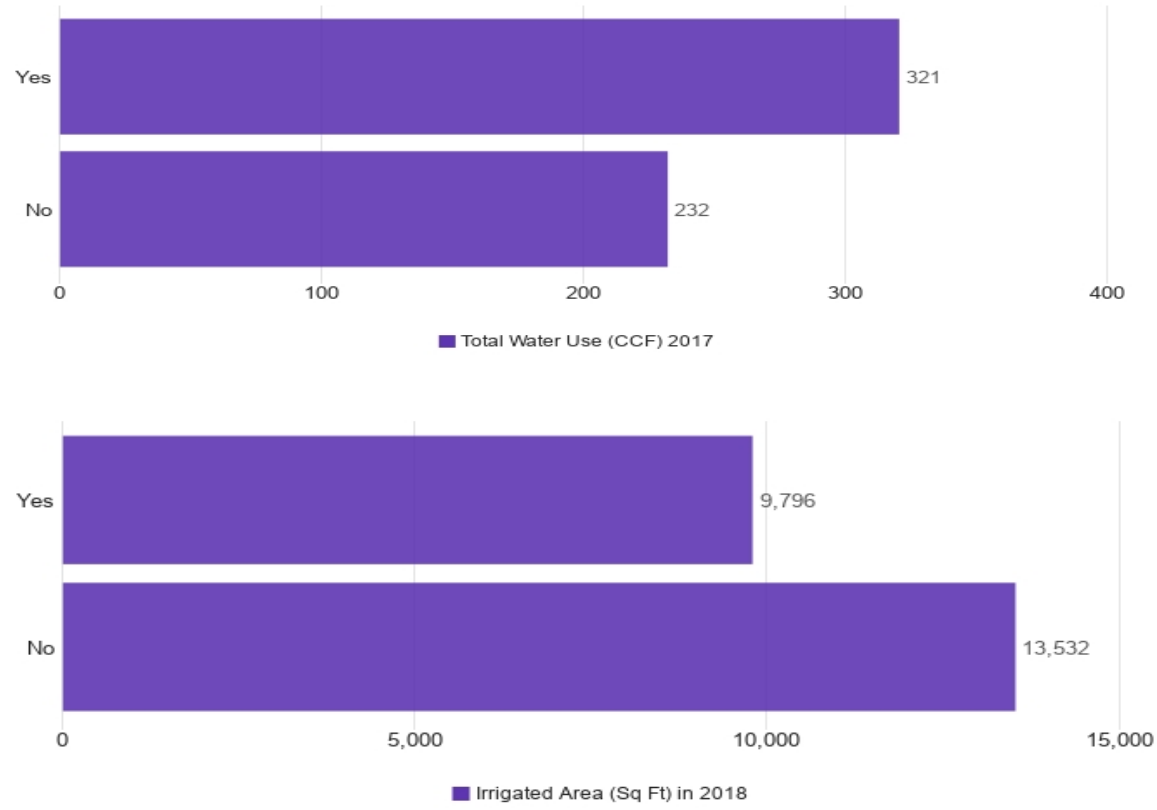


[20] Categories for Q11b are restrict outcomes to only those respondents that indicated a single option. The number of respondents for each option in Q11b for the first through fourth category are 141, 21, 80, and 54, respectively.

Q12a - Now we'd like to focus on just your front yard. Do you have a front yard with green grass (turf) on it?[21]



Q12b. Total Water Use (CCF/2017) and Irrigated Area (Ft^2/2018) by whether respondent has a front yard[22]



[21] p-value=0.000

[22] p-value=0.009; p-value=0.000, respectively

Q13 - Please rate the relative importance of each factor below on influencing whether you would replace part of your green grass (turf) with a more drought-tolerant landscape?[23]

Factor	Very Low	Low	Moderate	High	Very High
Initial/upfront cost	10%	1%	16%	24%	**48%**
Water Savings	8%	6%	28%	27%	**31%**
Money savings (on your monthly bill)	9%	10%	28%	21%	**32%**
Initial/upfront investment of your time	15%	7%	23%	**28%**	**28%**
Appealing overall look / Aesthetics / Color	15%	7%	24%	25%	**29%**
Rebate level	17%	11%	22%	19%	**30%**
Time and effort to maintain (weeding, trimming)	13%	15%	**31%**	23%	19%
Recreation potential or area for family/kids/pets to use	**27%**	17%	22%	14%	20%
Duration/length of the project	16%	19%	**37%**	15%	13%
Awareness of friends/neighbors who have done it	**36%**	18%	28%	10%	9%
Opportunity to set an example for others	**37%**	19%	30%	8%	7%

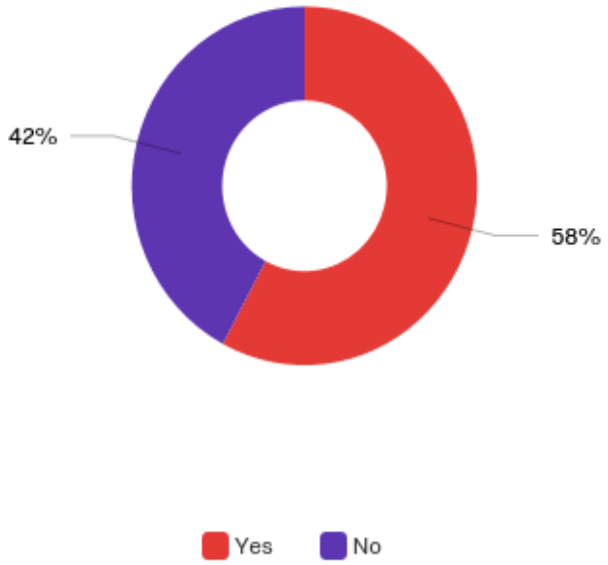
[23] Respondents=268. Rounding of fractions and converting to percentages may lead to row sums that do not add to exactly 100%.

Q14 - To what extent do you agree or disagree with the following statements regarding your front yard[24]

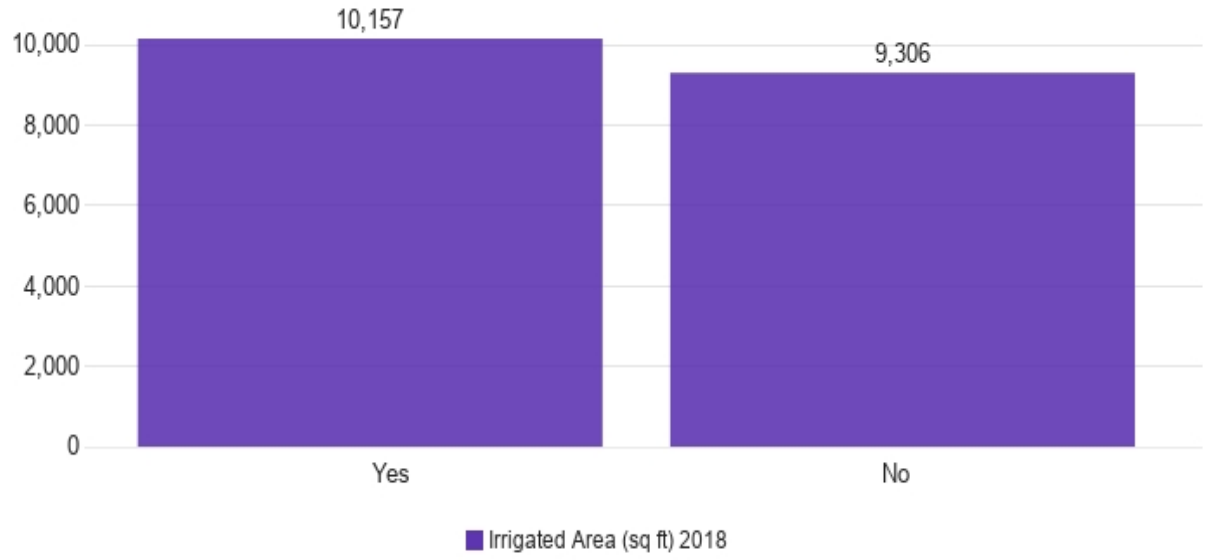
Question	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
It is important to me to have a green front yard/lawn	4%	11%	18%	**47%**	21%
I care about what other people think about my front yard	23%	15%	24%	**28%**	11%
I don't need green grass in my front yard as long as it is colorful	16%	24%	25%	**28%**	8%
I need part of my front yard to have green grass because we use it	12%	22%	**30%**	29%	7%
I need all of my front yard to have green grass because we use it	15%	30%	**35%**	13%	6%
It could be watered less and still look fine	23%	**46%**	17%	10%	4%
I do not think about my front yard alot	30%	**38%**	20%	10%	2%

[24] Each row consists of 268 observations (n=268). Rounding of fractions and converting to percentages may lead to row sums that do not add to exactly 100%.

Q15a - Would you consider replacing your front lawn with some other type of landscape?[25]

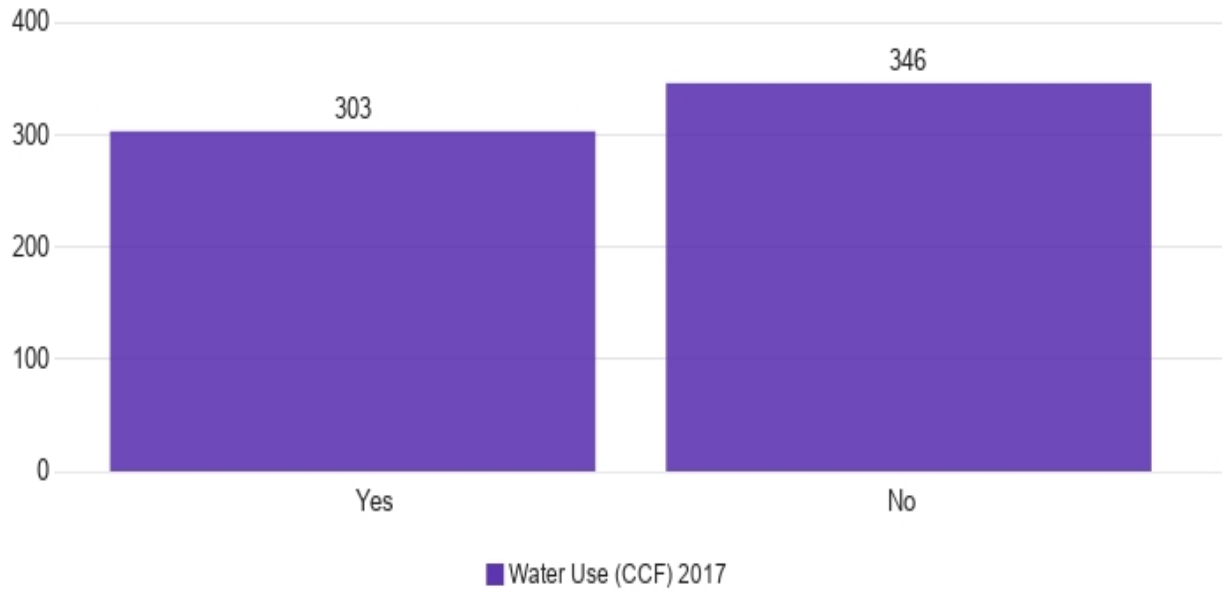


Q15b - Would you consider replacing your front lawn with some other type of landscape by Irrigated Area (ft²) in 2018?[26]



[25] p-value=0.002
[26] p-value=0.608

Q15c - Would you consider replacing your front lawn with some other type of landscape by Water Use (CCF) in 2017?[27]

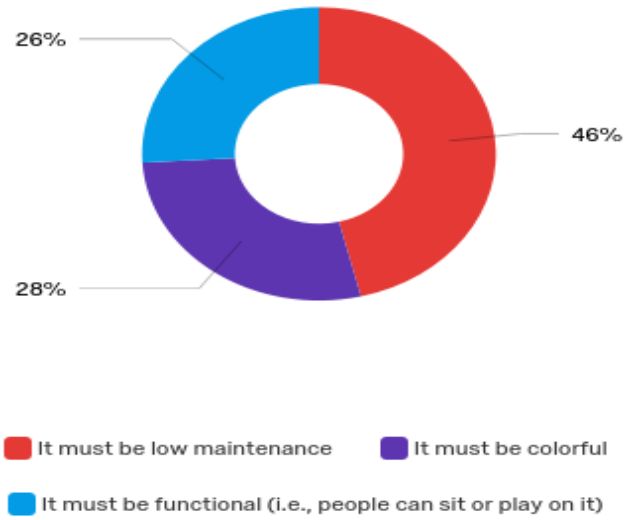


Q15d - To what degree would you consider any of the following as a replacement for your front lawn?[28]

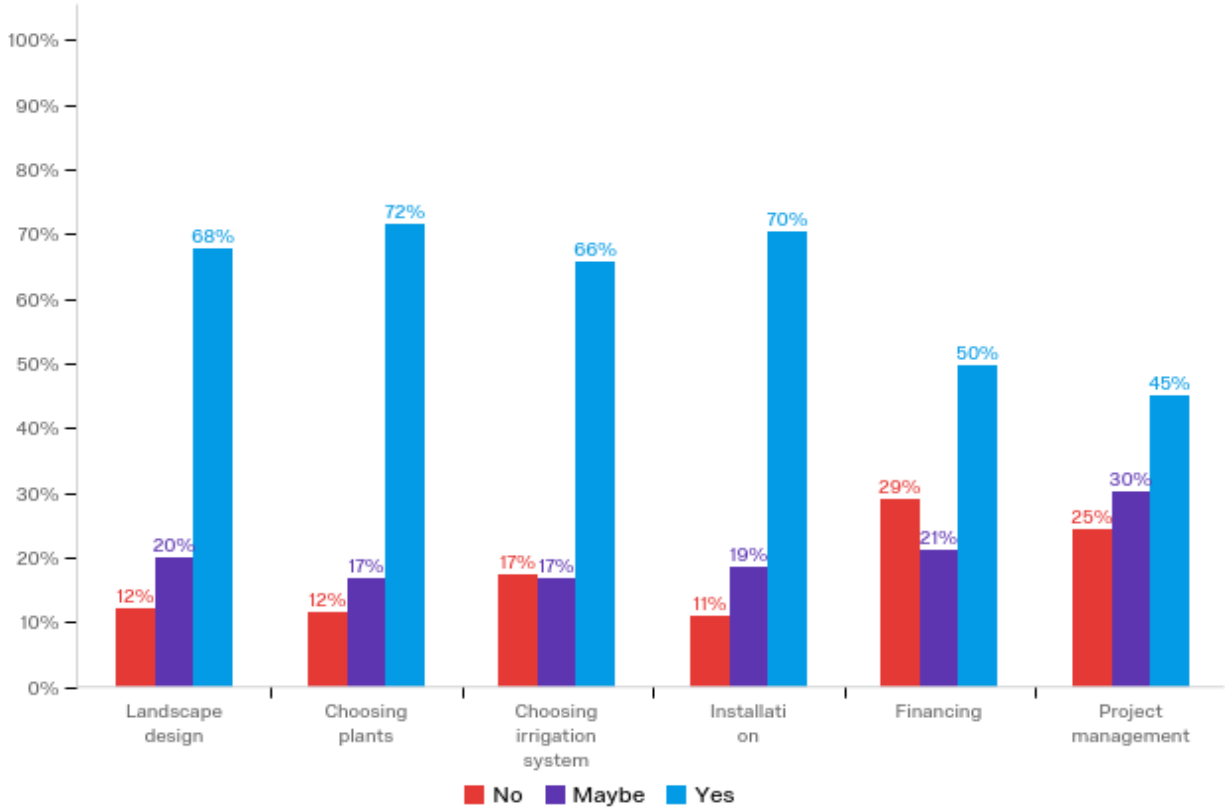
Replacement Option	Definitely Not	Probably Not	Unsure	Probably	Definitely
Concrete	**66%**	17%	7%	8%	2%
Gravel	**48%**	23%	14%	13%	1%
A desert landscape (like Palm Springs)	11%	12%	16%	**46%**	15%
Artificial Turf	21%	15%	17%	**37%**	10%

[27] p-value=0.211
[28] Each row is based on 155 responses

Q15e - If you were to replace part or all of your front yard, which one of the three factors below would be the most important?" Choose the single most important factor listed.

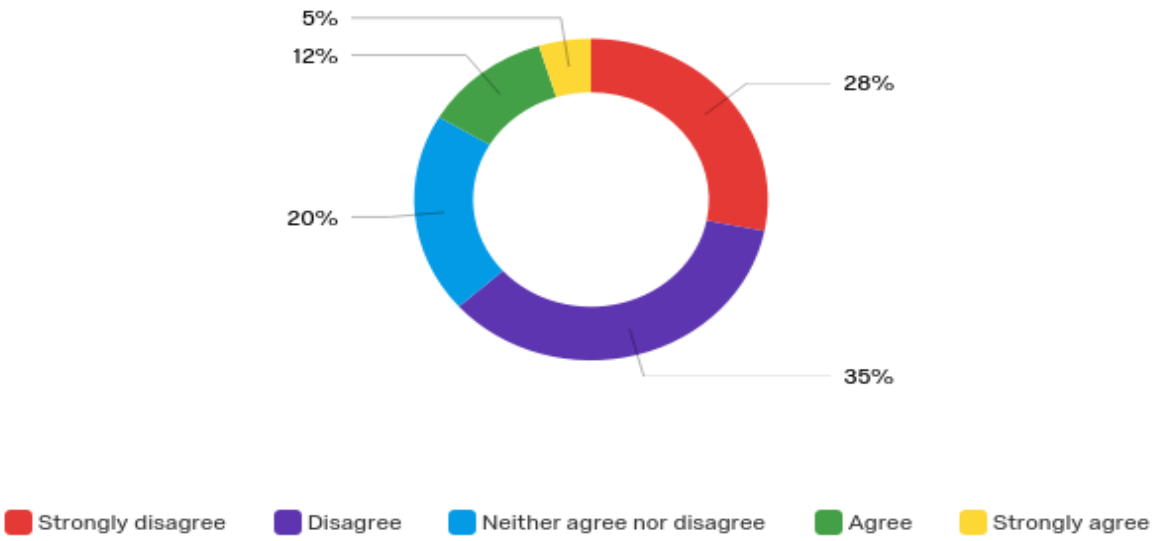


Q15f - If you were to replace your lawn with another type of landscape, would you want help with:

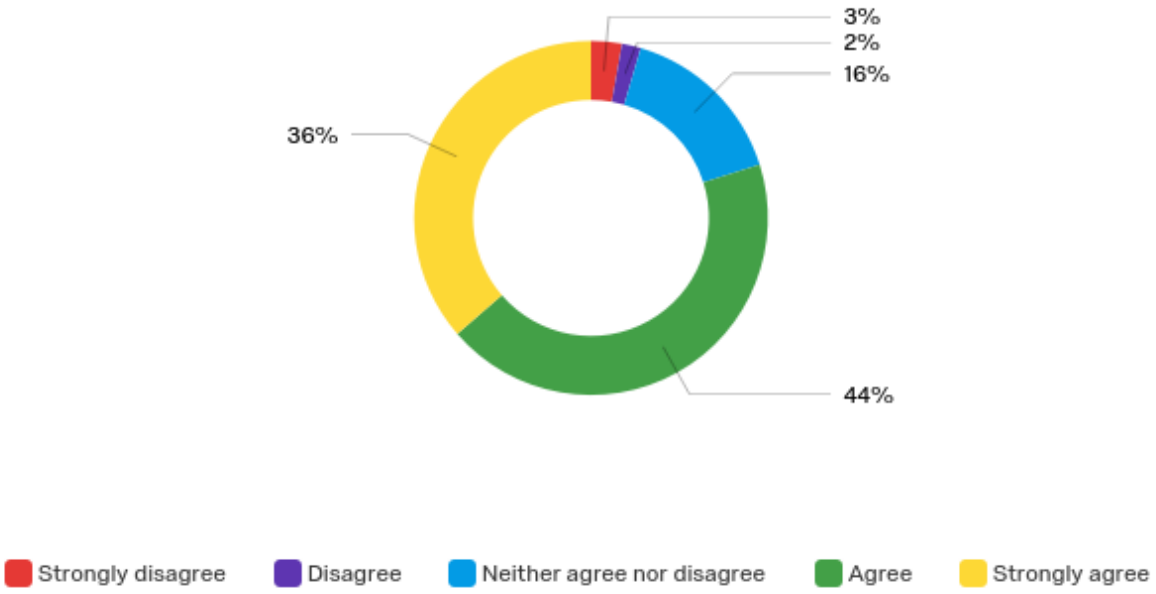


Q16 - Please indicate the extent to which you agree or disagree with the following statements: [29]

There is a lot of water in California



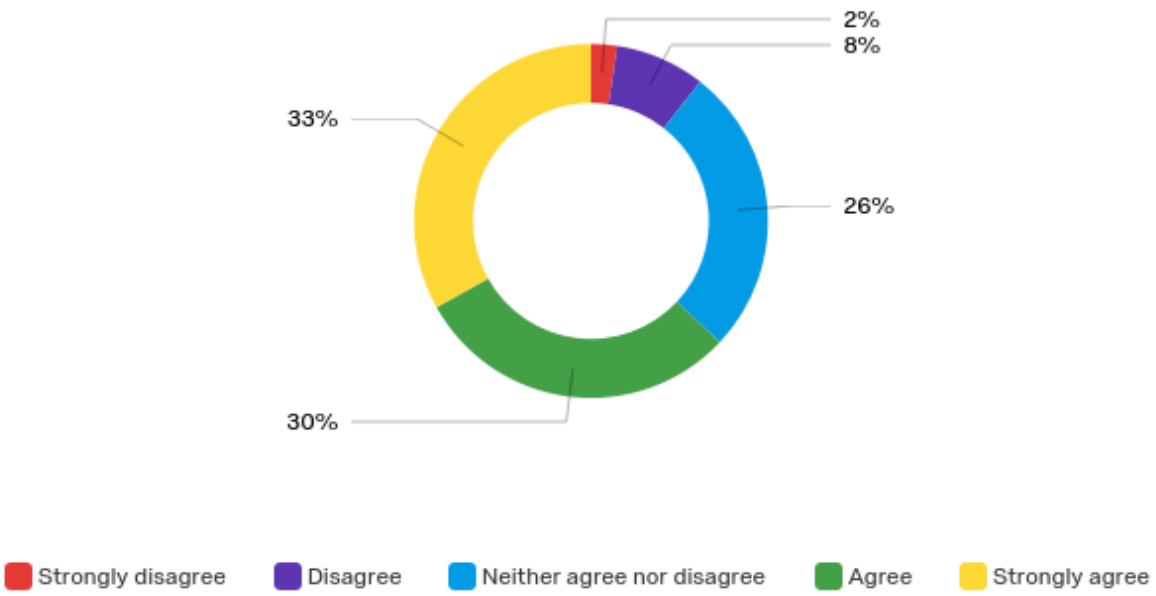
California will experience more severe droughts in the future



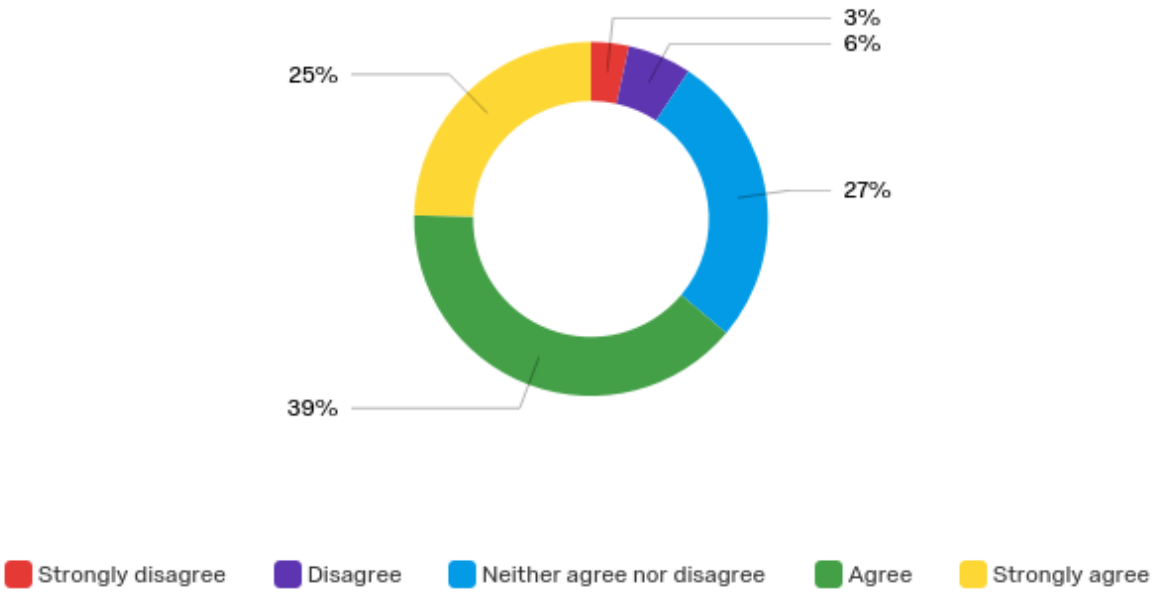
[29] Results from Question 16 in tabular form are in the appendix

Q16 (continued). Please indicate the extent to which you agree or disagree with the following statements:

Water agencies are trying to profit from their customers

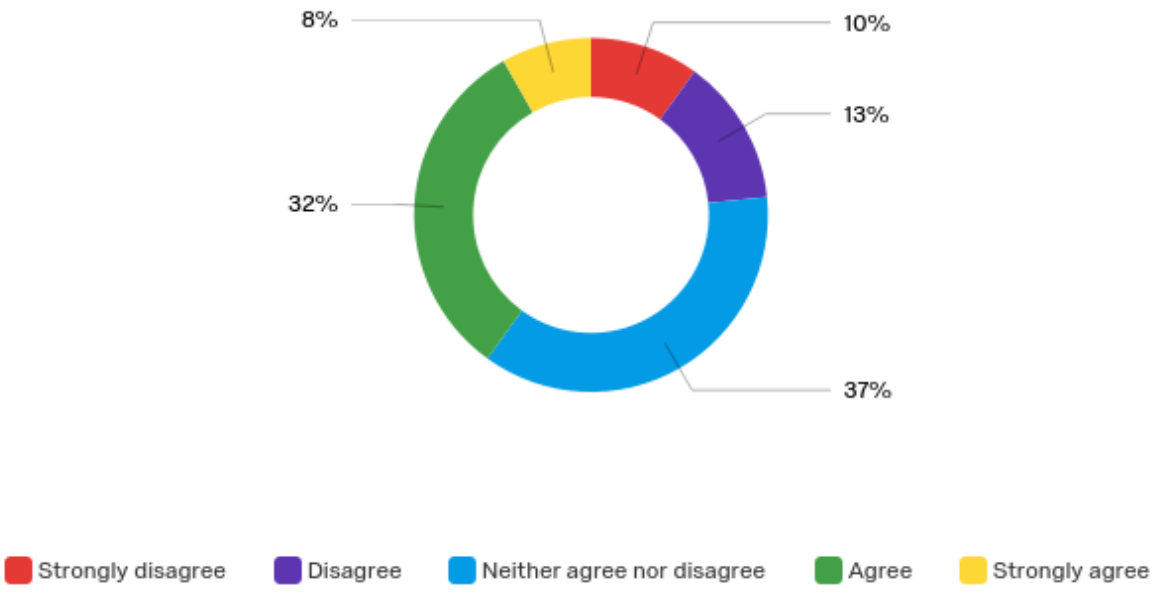


Water agencies have to manage water better

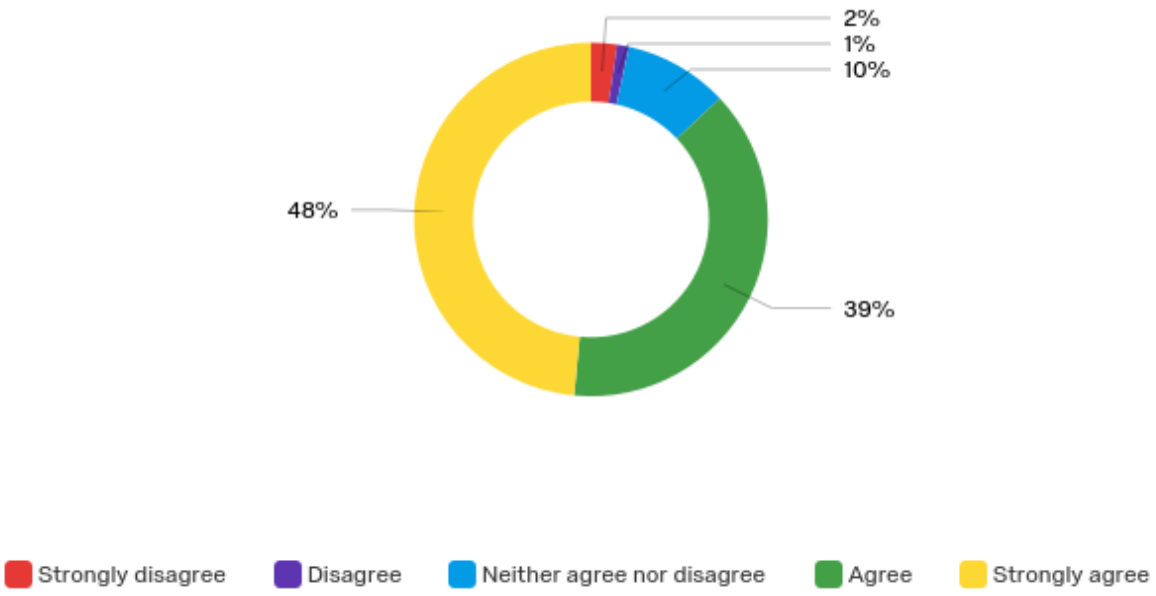


Q16 (continued). Please indicate the extent to which you agree or disagree with the following statements:

Water agencies have spent a lot of time and effort planning for future drought

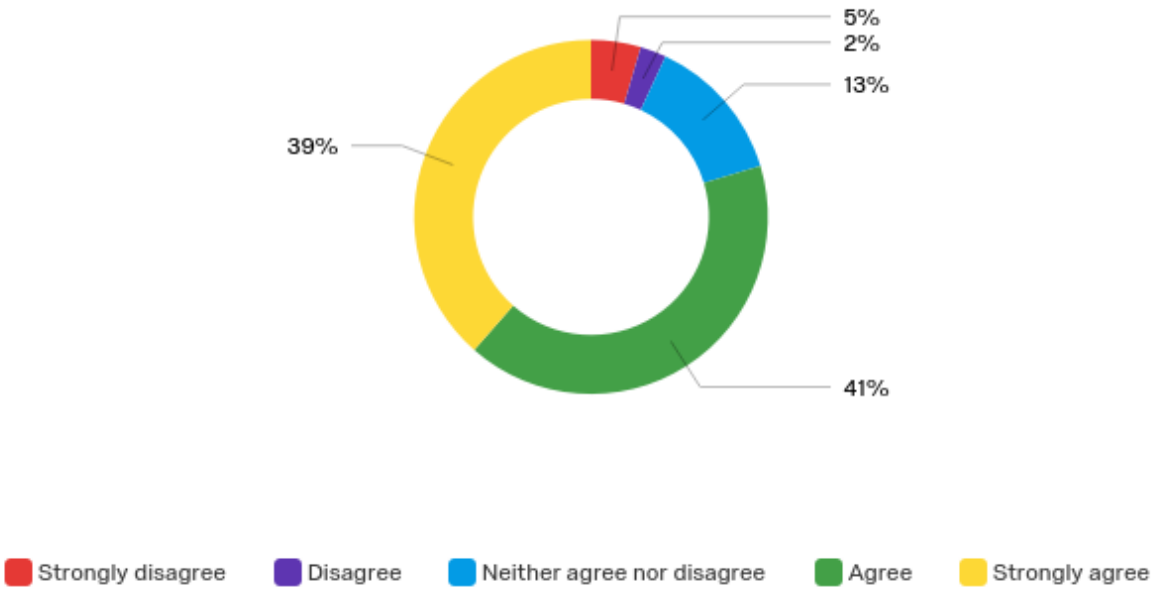


Water conservation at home is good for the environment

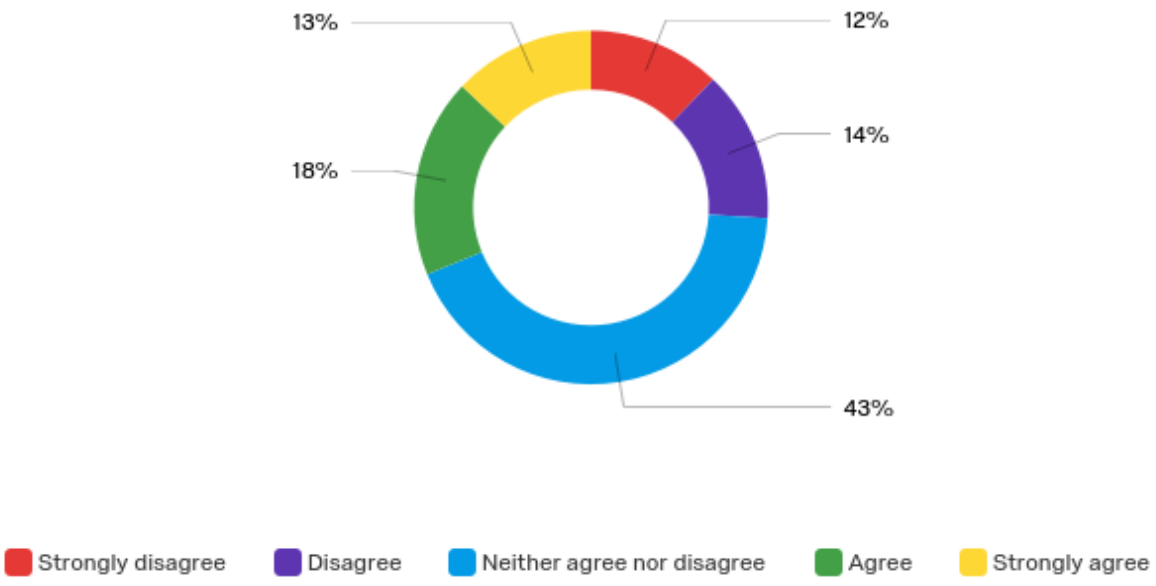


Q16 (continued). Please indicate the extent to which you agree or disagree with the following statements:

I feel a personal obligation to save water because it is a limited resource

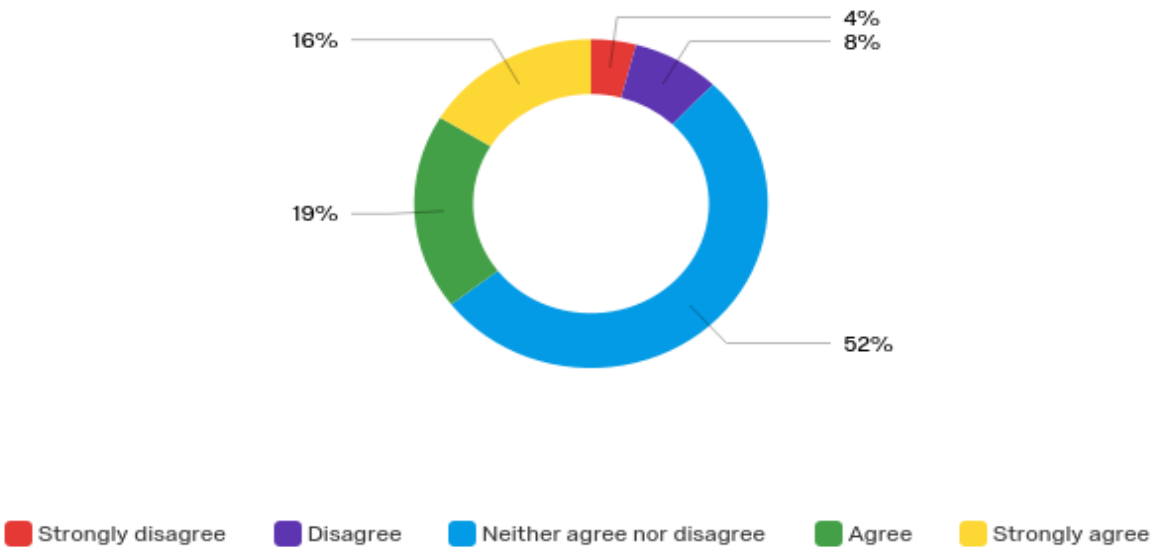


People who are important to me think I should conserve water

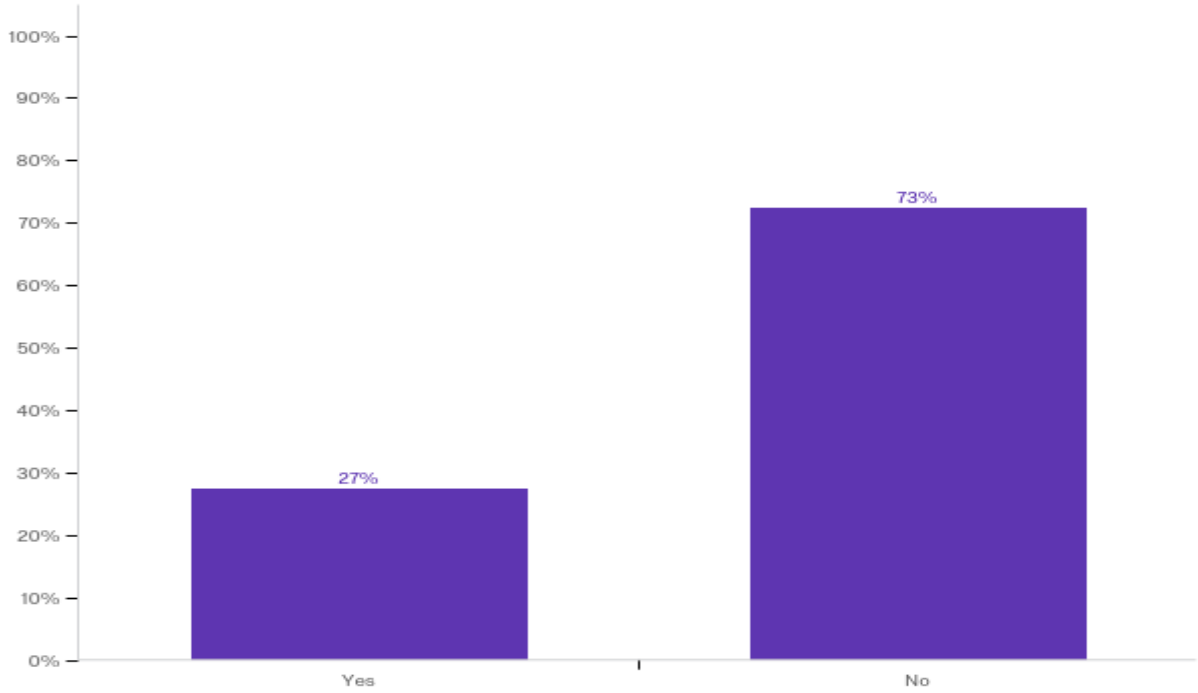


Q16 (continued). Please indicate the extent to which you agree or disagree with the following statements:

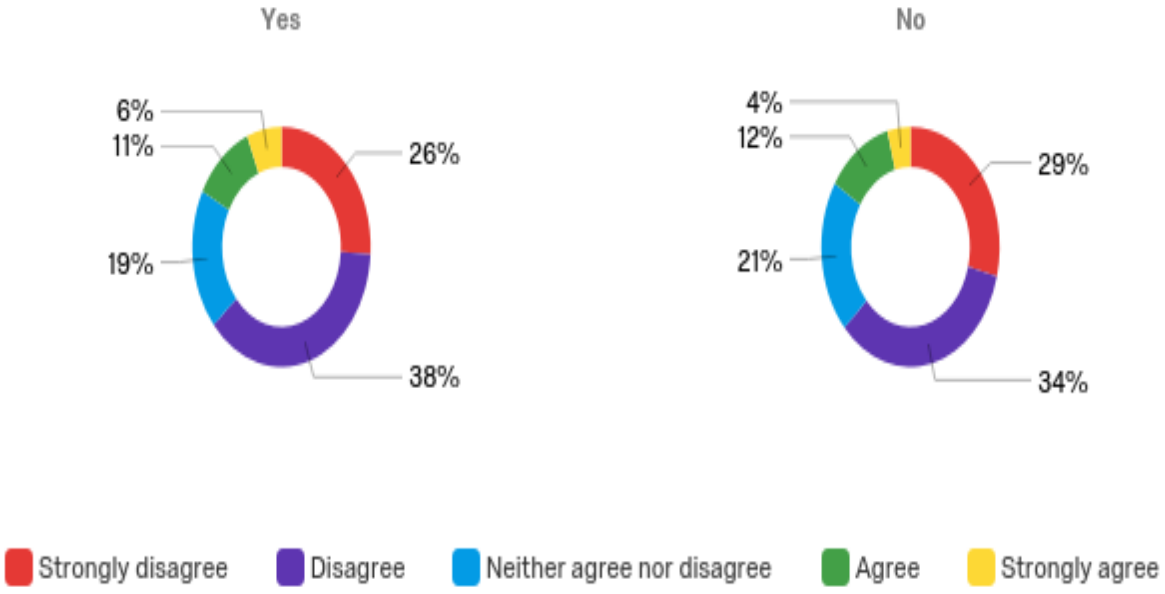
I feel my neighbors waste more water than I do



Q17a - Do you regularly engage in outdoor activities at or around lakes, rivers, or streams?[30]

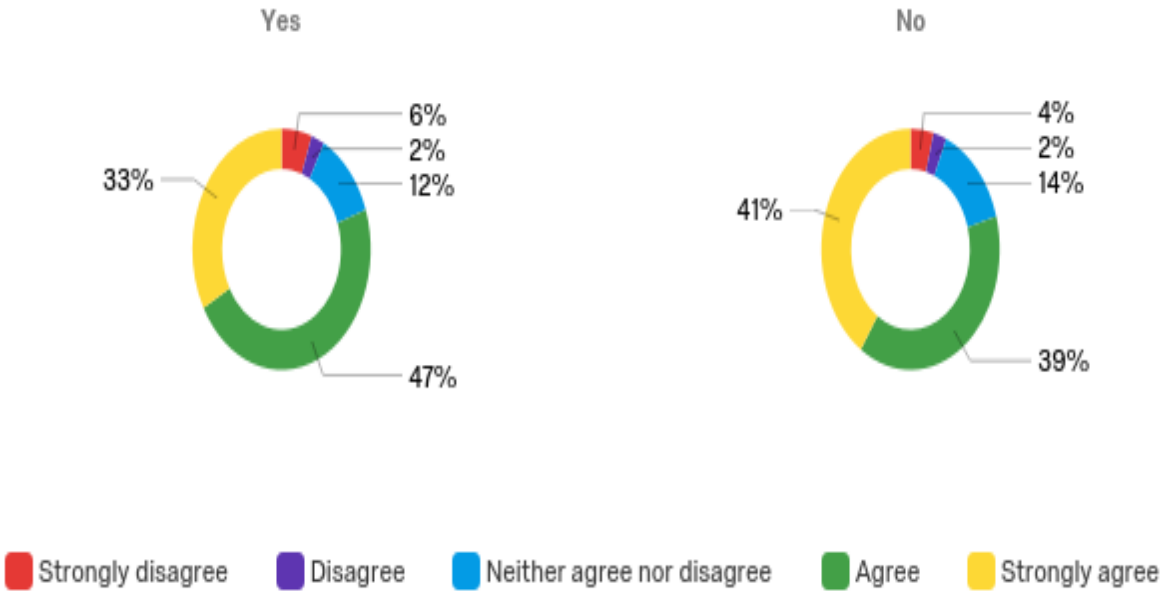


Q17b – Response to Q17a by degree to which respondents agree with the statement, "There is a lot of water in California"?

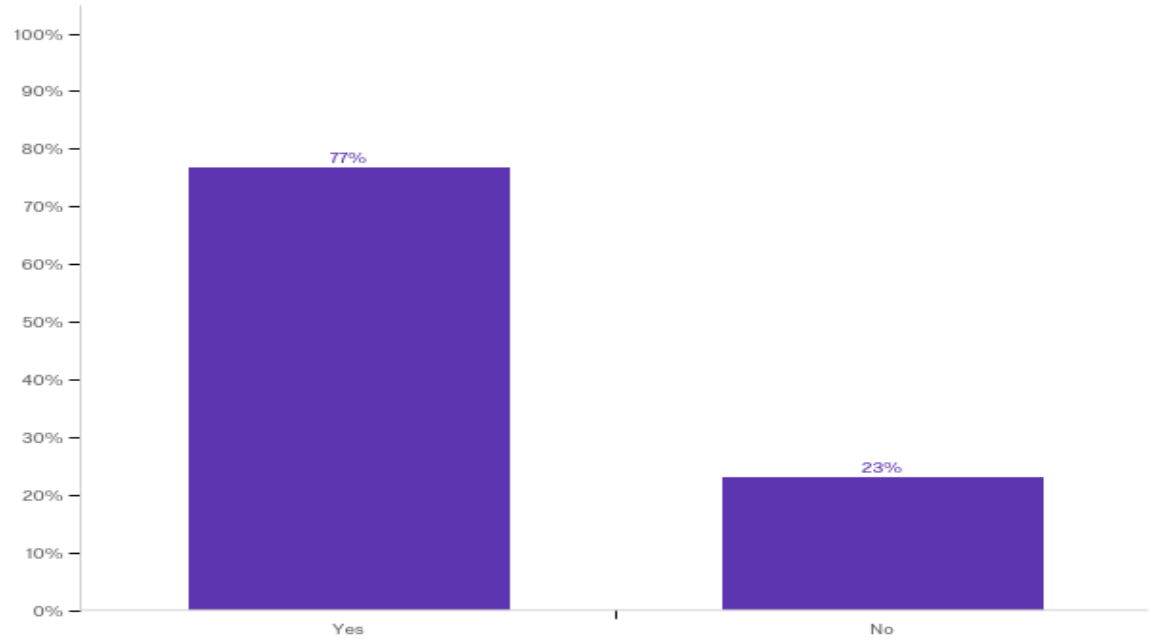


[30] p-value=0.000

Q17c – Response to Q17a by degree to which respondents agree with the statement, "I feel a personal obligation to save water because it is a limited resource."

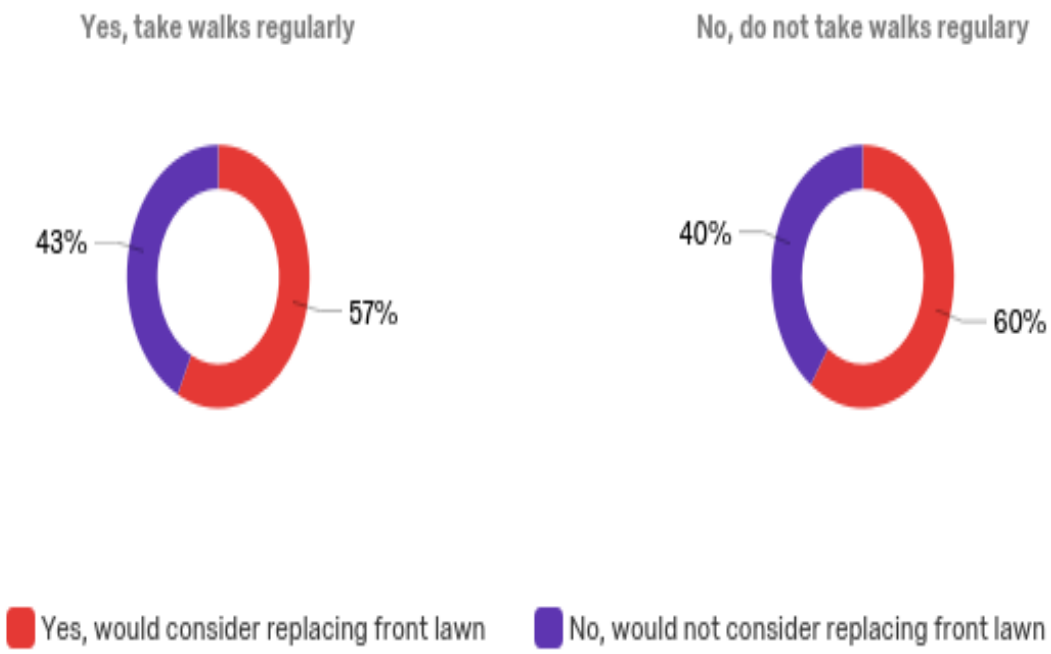


Q18a - Do you regularly take walks in or around your neighborhood?[31]

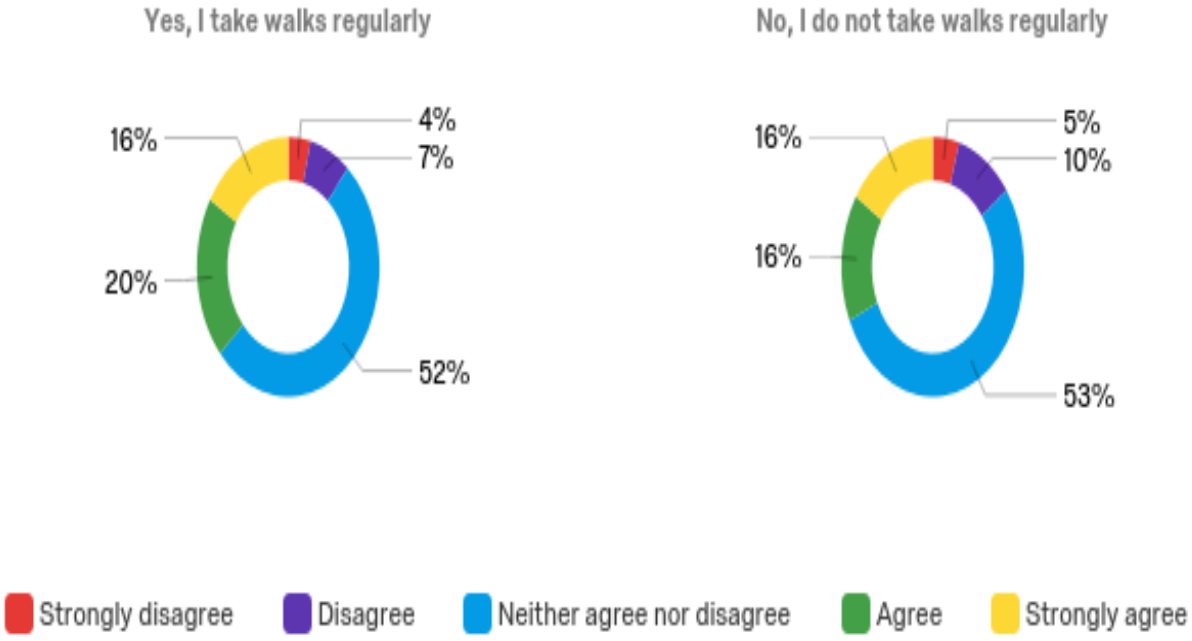


[31] p-value=0.000

Q18b – Response to Q18a by whether respondent would consider replacing front lawn[32]

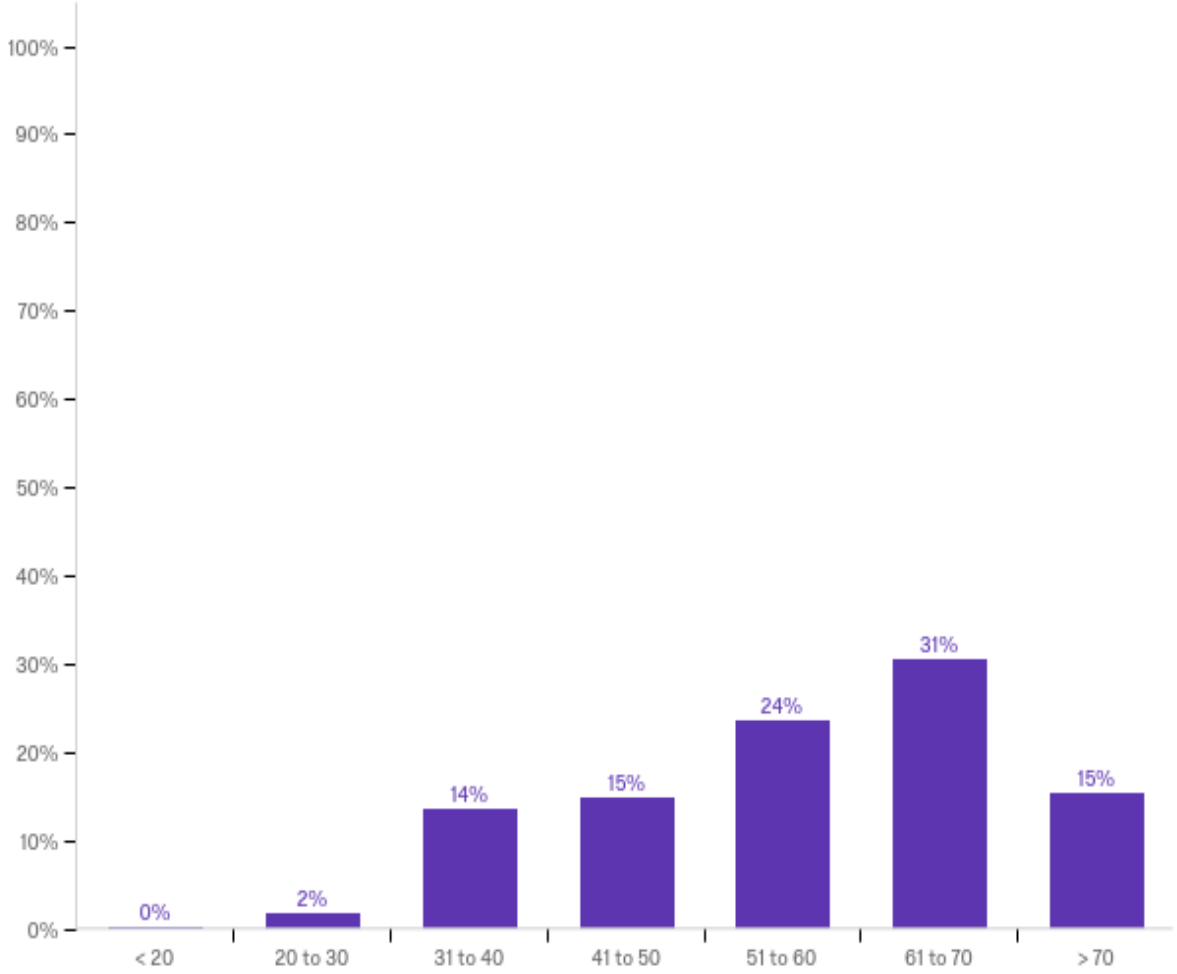


Q18c – Response to Q18a by degree to which respondents agree with the statement, "I feel my neighbors' waste more water than I do."

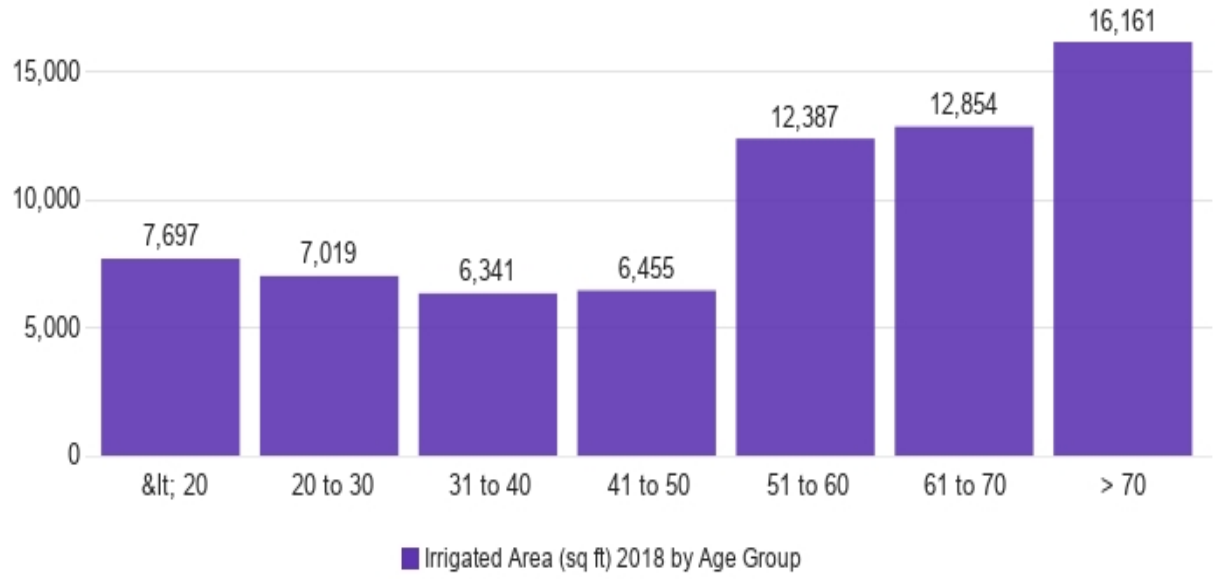


[32] p-value = 0.011 ("yes") and p-value = 0.09 ("No"), respectively.

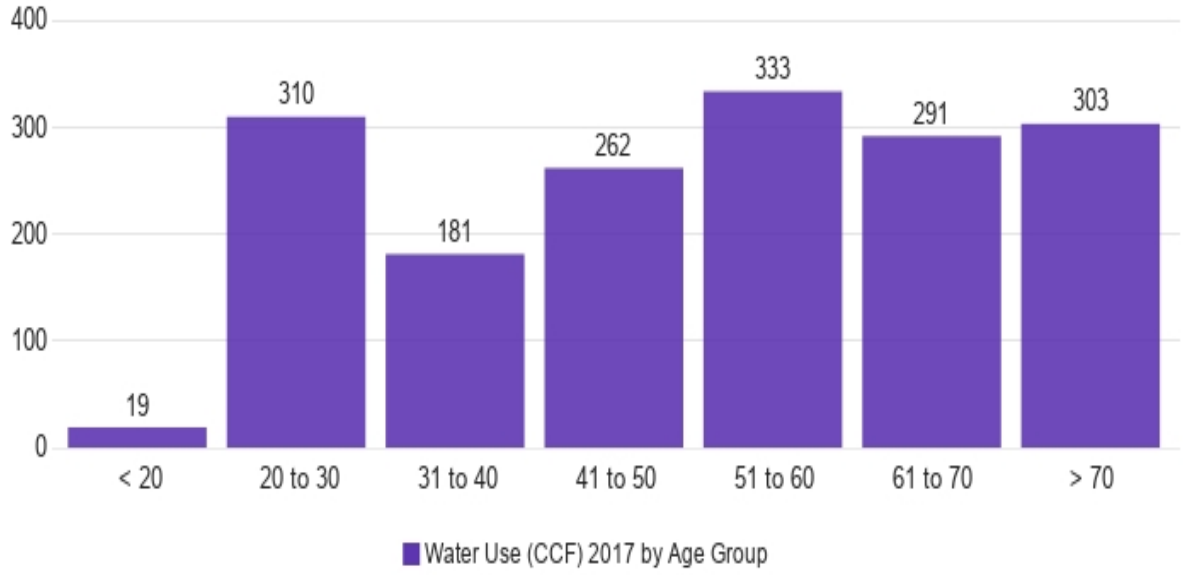
Q19a - What is your age?



Q19b – Irrigated Area (ft) 2018 by Age Group

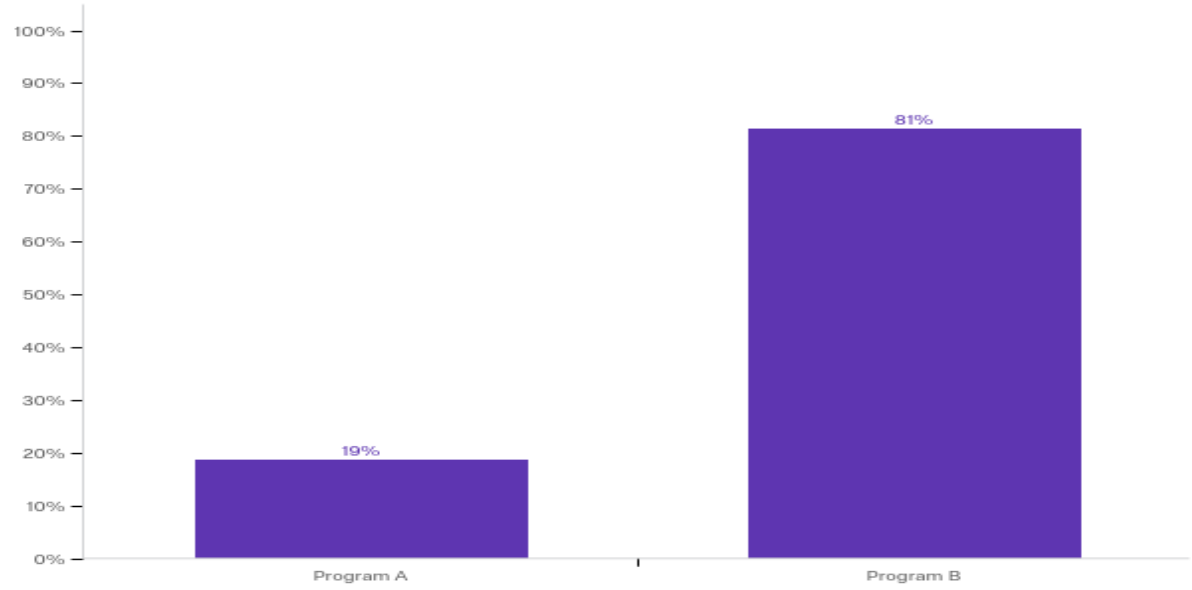


Q19c – Water Use (CCF) 2017 by Age Group

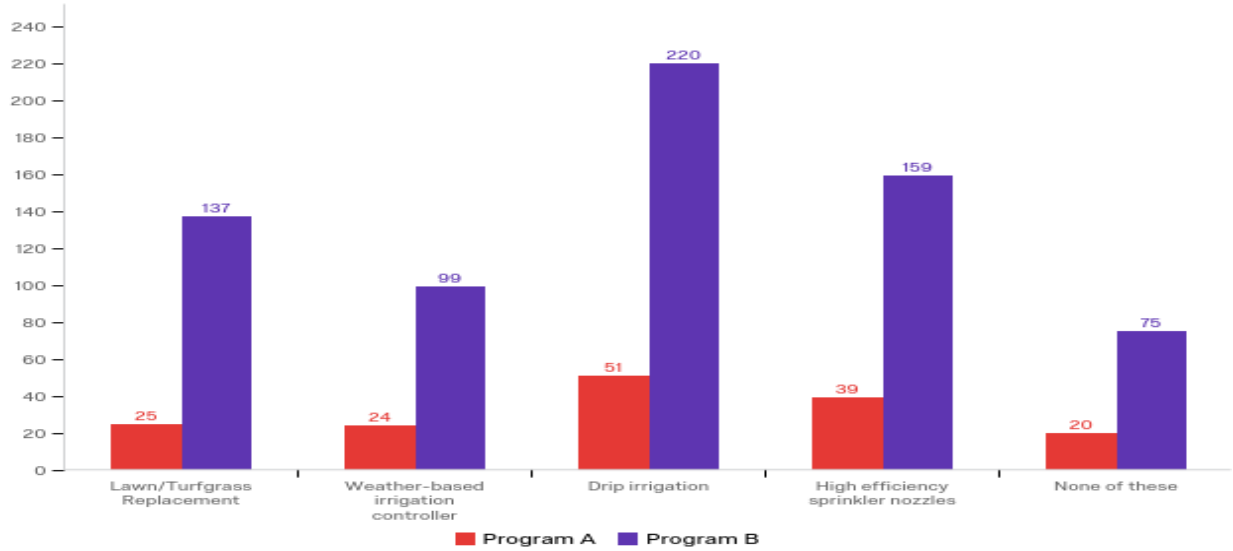


Q20 - Finally, as our last question, we'd like to give you a "quiz" to better understand how customers consider different water conservation opportunities.

> **Quiz: Suppose "Pat" owns a home and is considering two possible conservation programs to reduce household water use offered by the water district. The two programs are:**
>
> **Program A. Replace old shower head with a new efficient (low flow) shower head. The old shower head uses 5 gallons per minute, while the new low-flow showerhead uses only 2 gallons per minute.**
>
> **Program B. Replace old toilet with new efficient (low flush) toilet. The old toilet uses 3 gallons per flush, while the new low-flush toilet uses only 1 gallon per flush.**
>
> **If Pat's family showers for 5 minutes per day, and flushes the toilet 10 times per day, which program would save Pat the most water?**[33]



Q21 - Differences in Conservation Program Practice by response to quiz



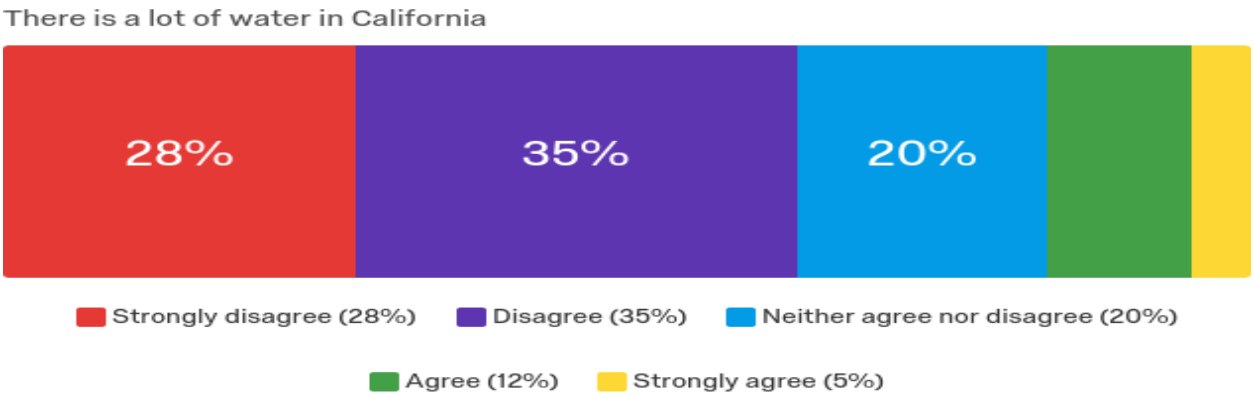
[33] Note: The correct answer is "Program B"; p-value=0.000

Appendix

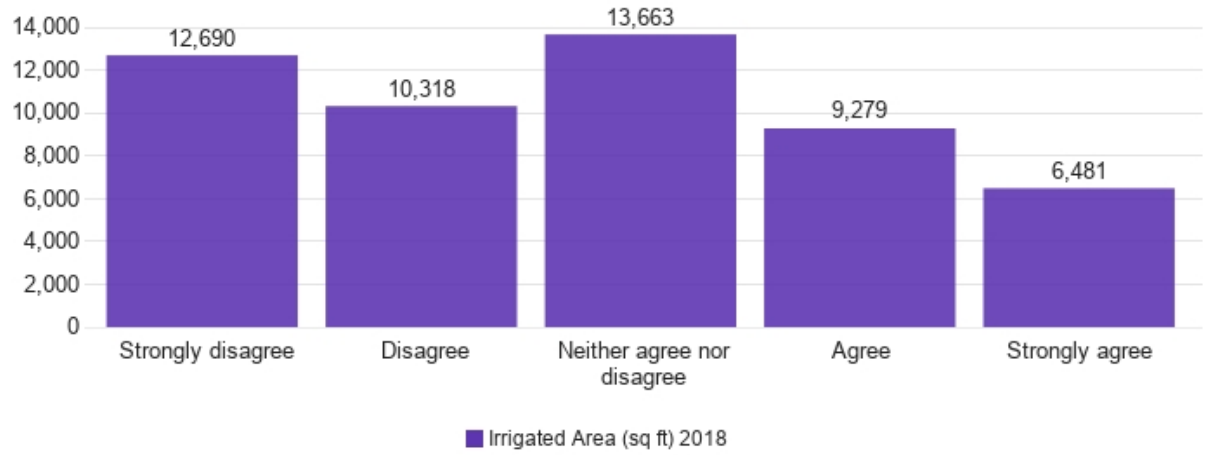
A1. Responses to Question 16 ("Please indicate the extent to which you agree or disagree with the following statements")

Question	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
There is a lot of water in California	28%	35%	20%	12%	5%
California will experience more severe droughts in the future	2%	2%	16%	44%	36%
Water agencies have to manage water better	3%	6%	27%	39%	25%
Water agencies are trying to profit from their customers	2%	8%	26%	30%	33%
Water agencies have spent a lot of time and effort planning for future drought	10%	13%	37%	32%	8%
Water conservation at home is good for the environment	2%	1%	10%	39%	48%
People who are important to me think I should conserve water	12%	14%	43%	18%	13%
I feel a personal obligation to save water because it is a limited resource	5%	2%	13%	41%	39%
I feel my neighbors waste more water than I do	4%	8%	52%	19%	16%

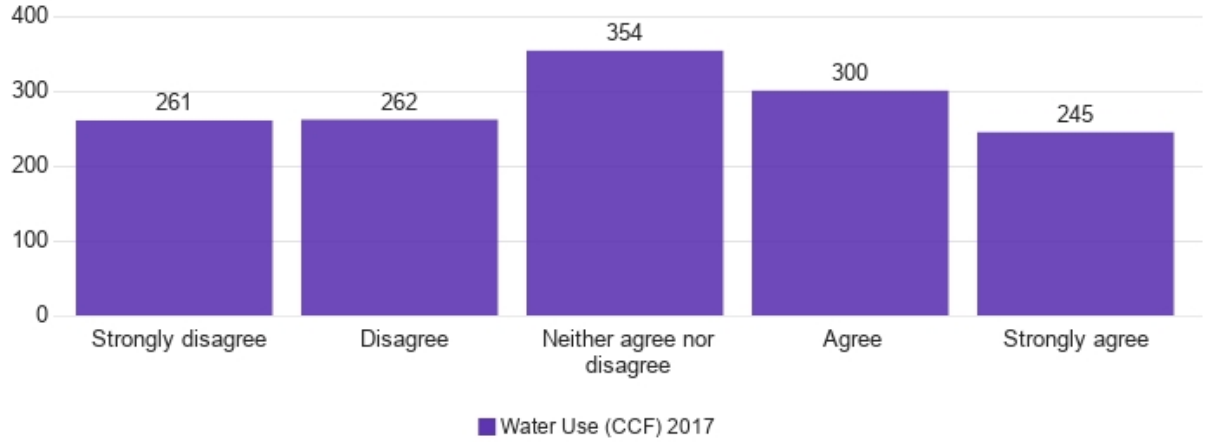
A2. Analysis of response to “There is a lot of water in California



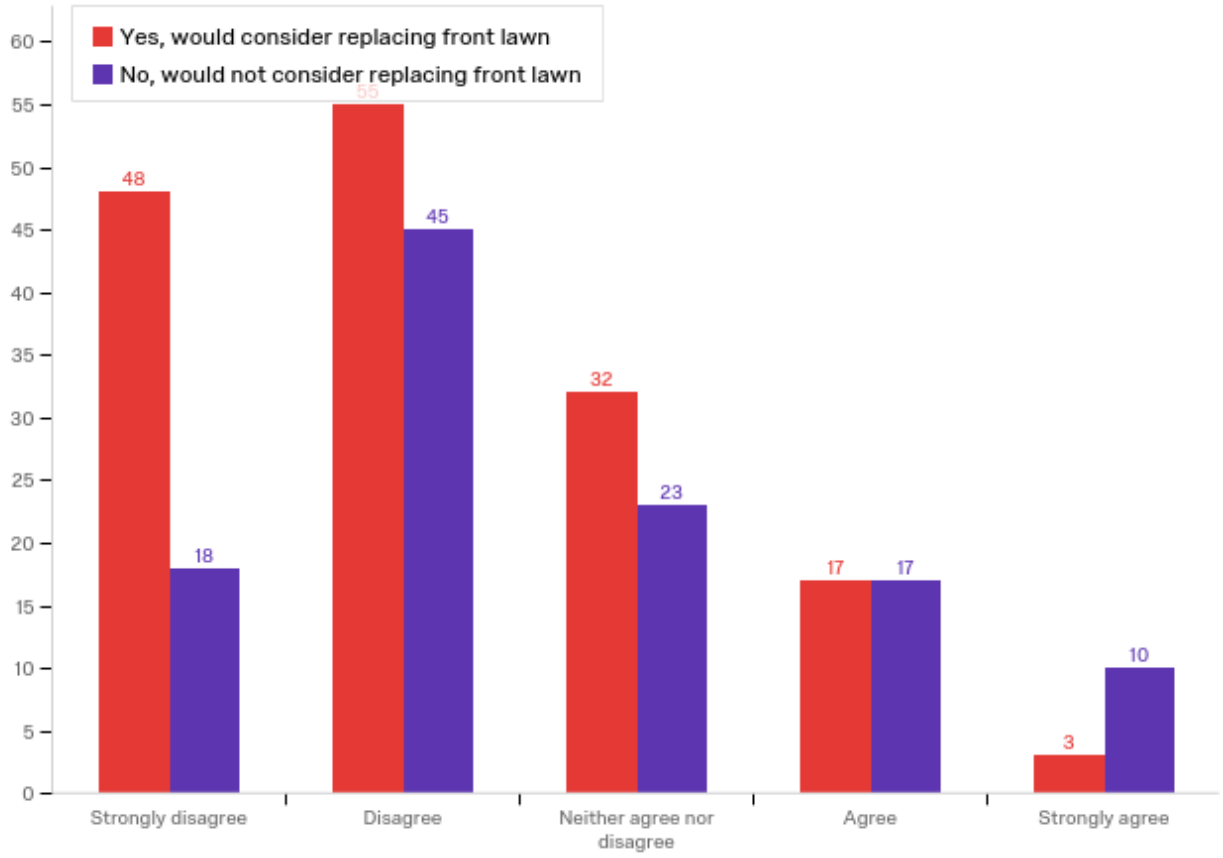
A2.a) By Irrigated Area (ft^2) 2018



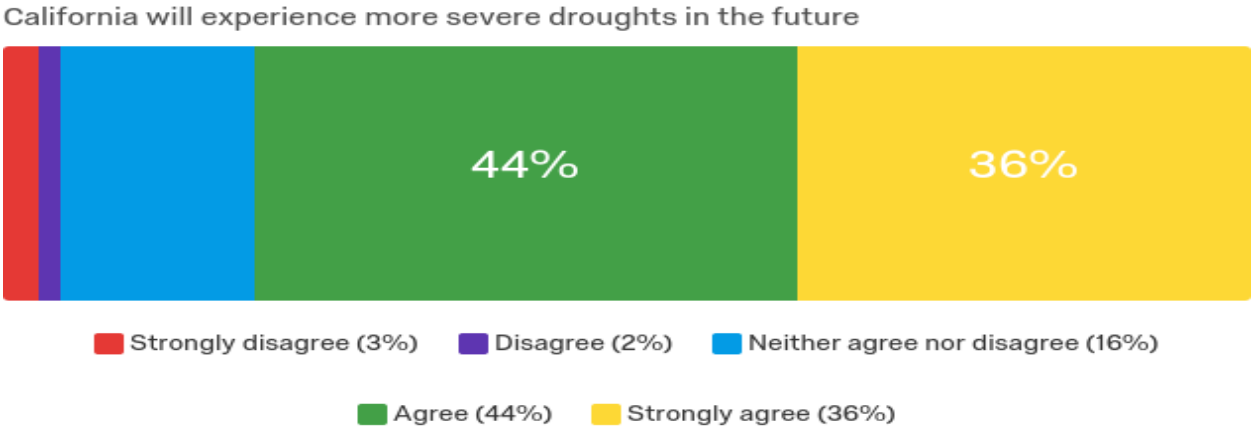
A2.b) By Water Use (CCF) 2017



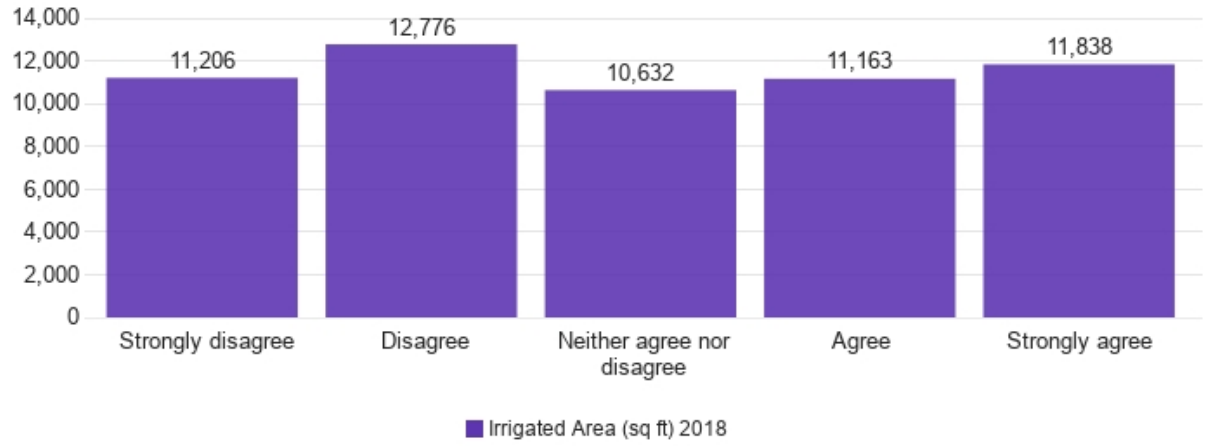
A2.c) Response to whether they would consider replacing front lawn by degree to which they agree with, "There is a lot of water in California"



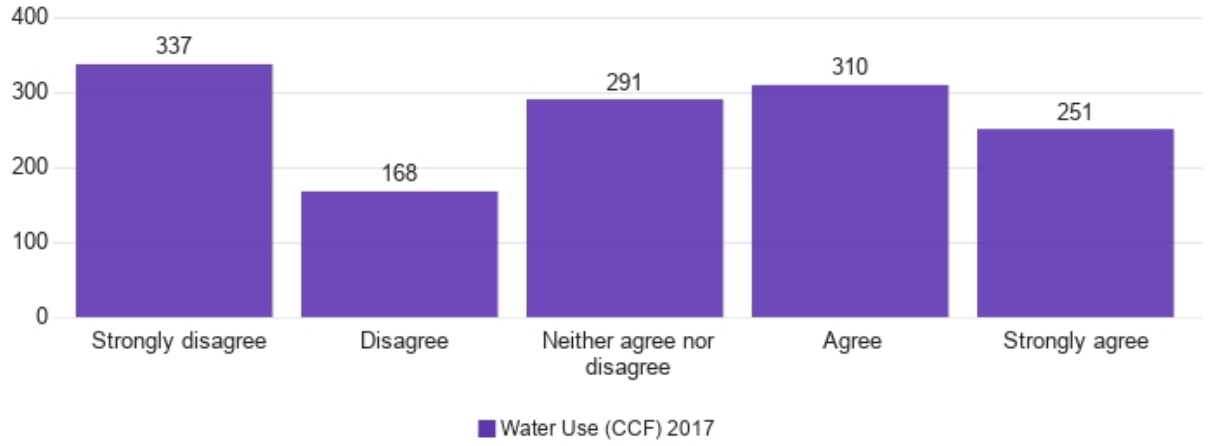
A3. Analysis of response to "California will experience more severe drought in the future"



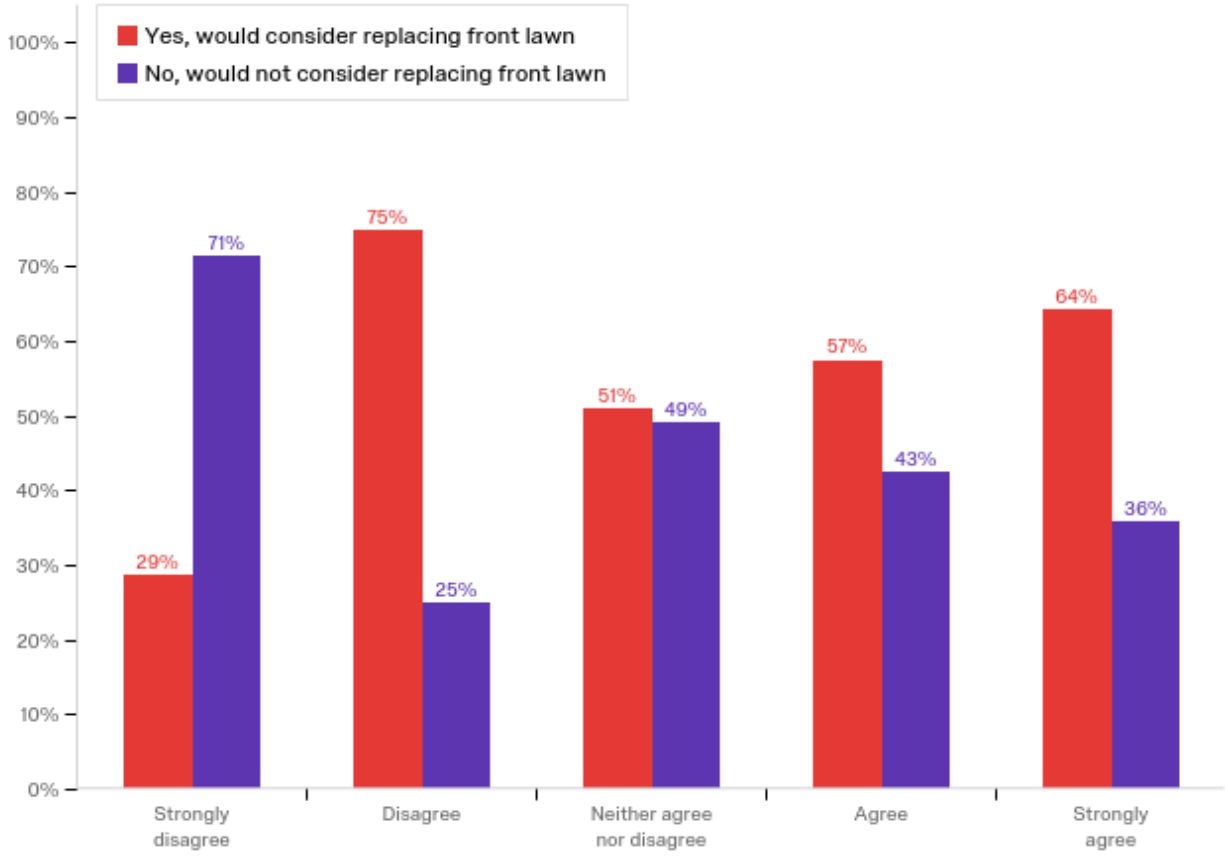
A3.a) By Irrigated Area (ft^2) 2018



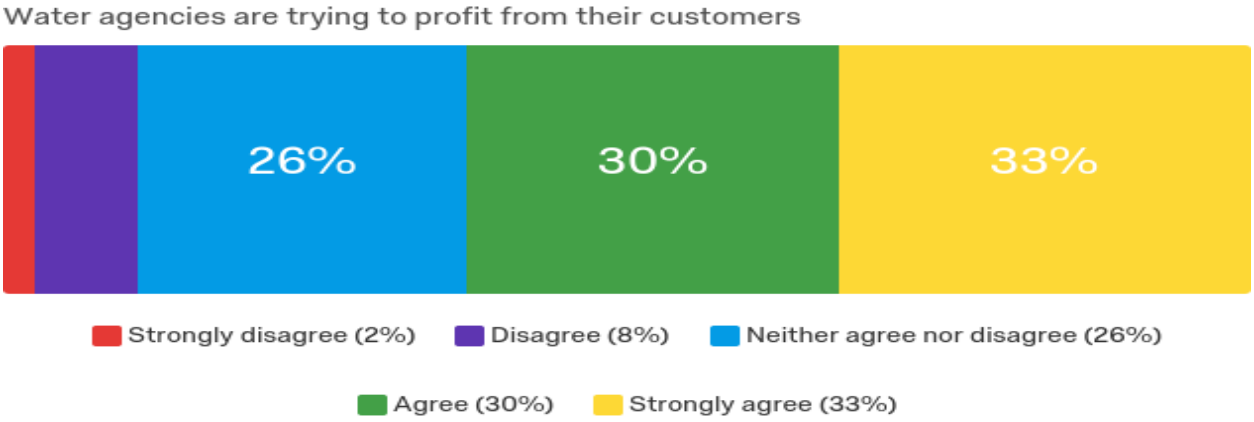
A3.b) By Water Use (CCF) 2017



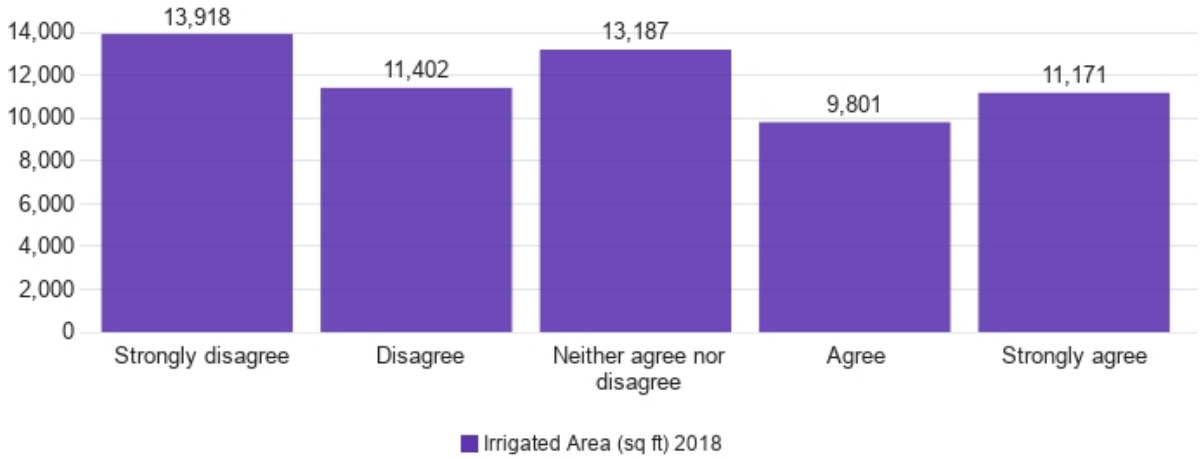
A3.c) Response to whether they would consider replacing front lawn by degree to which they agree with, "California will experience more severe drought in the future"



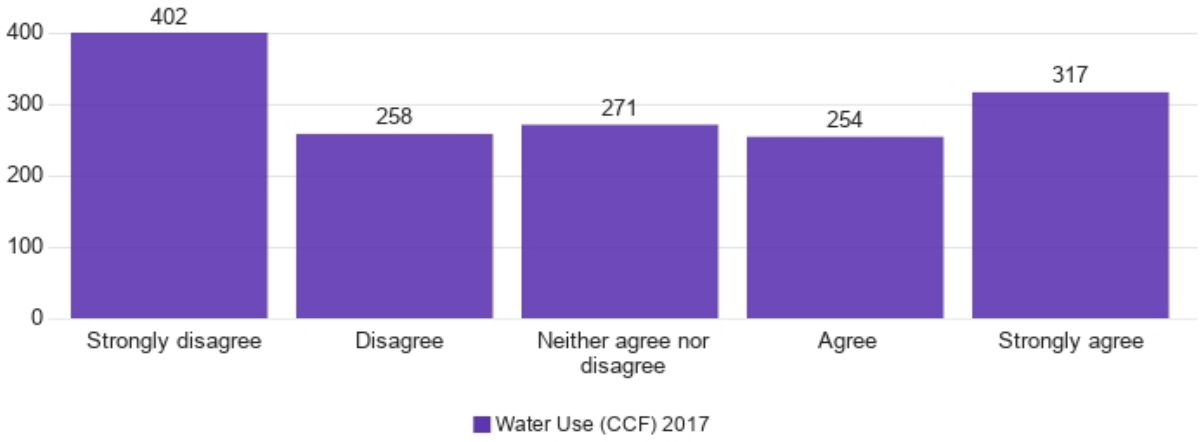
A4. Analysis of response to "Water agencies are trying to profit from their customers"



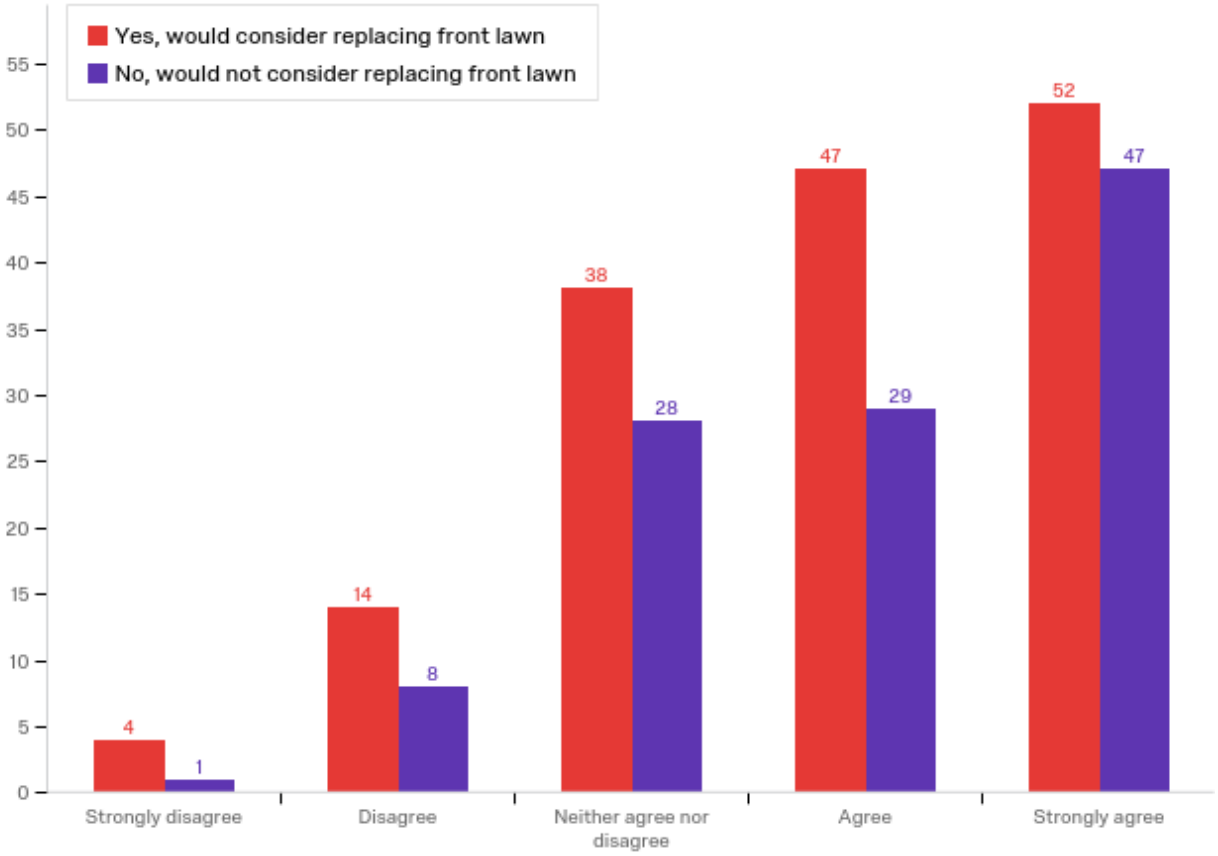
A4.a) By Irrigated Area (ft^2) 2018



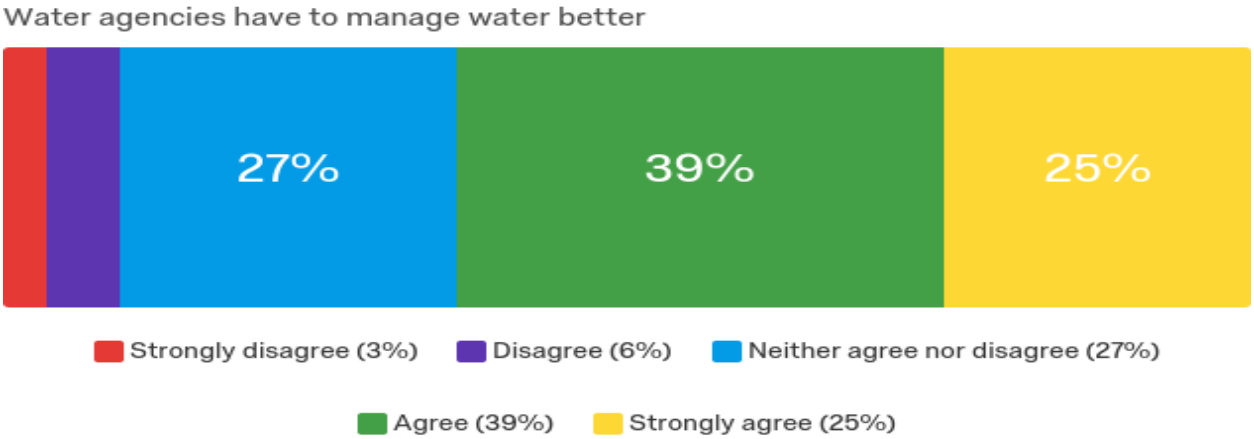
A4.b) By Water Use (CCF) 2017



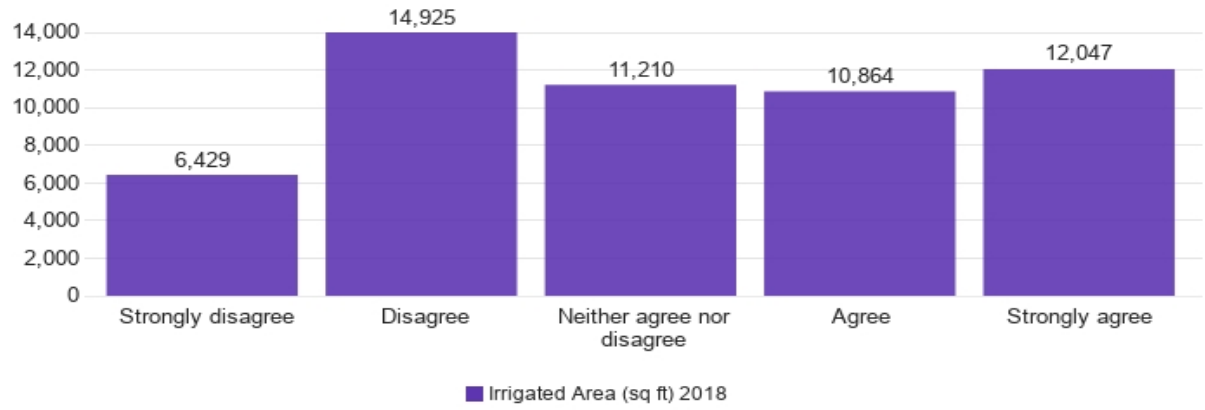
A4.c) Response to whether they would consider replacing front lawn by degree to which they agree with, "Water agencies are trying to profit from their customers"



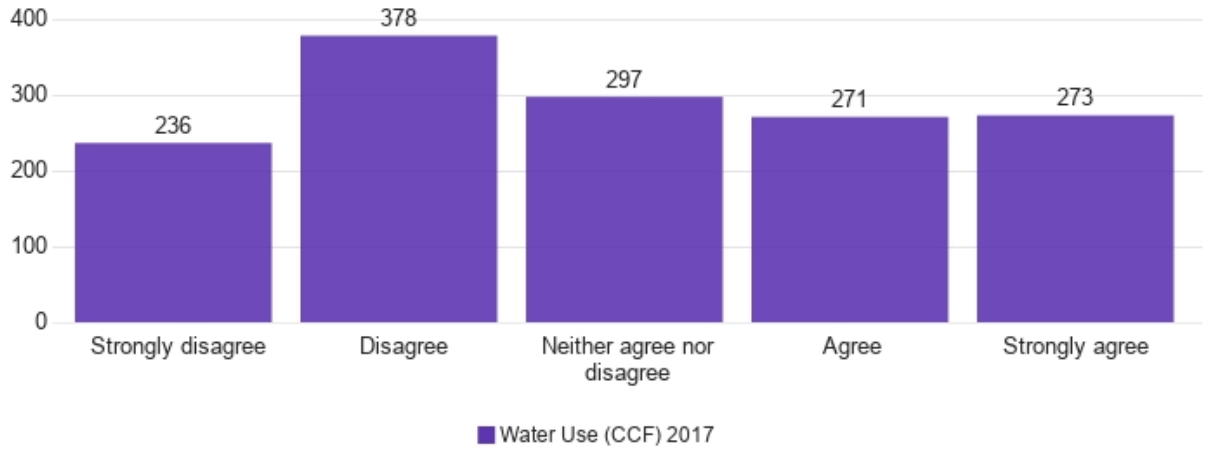
A5. Analysis of response to "Water agencies have to manage water better"



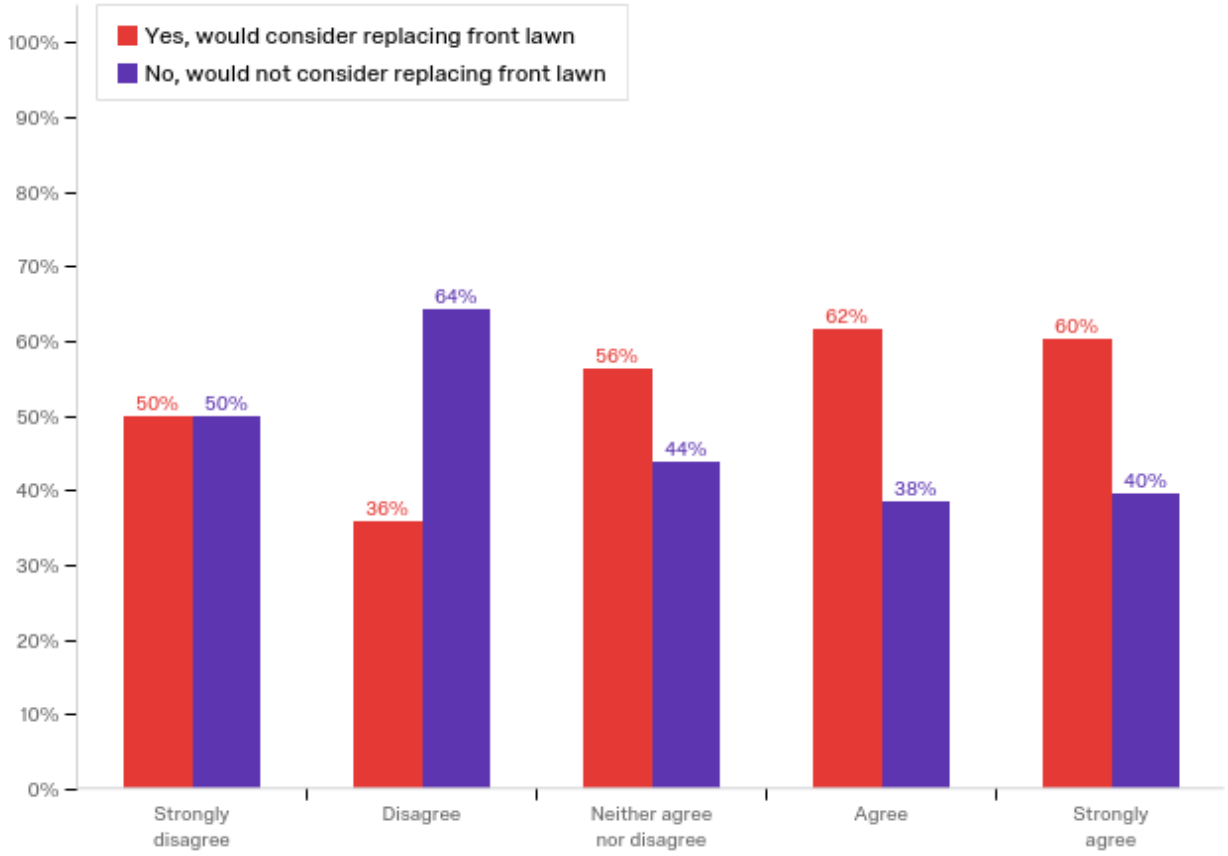
A5.a) By Irrigated Area (ft^2) 2018



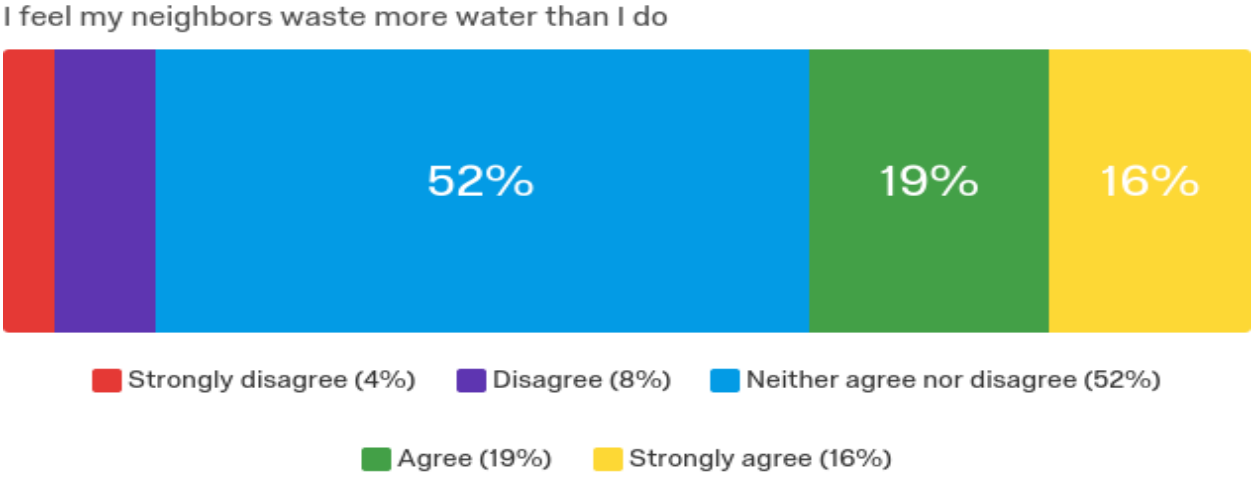
A5.b) By Water Use (CCF) 2017



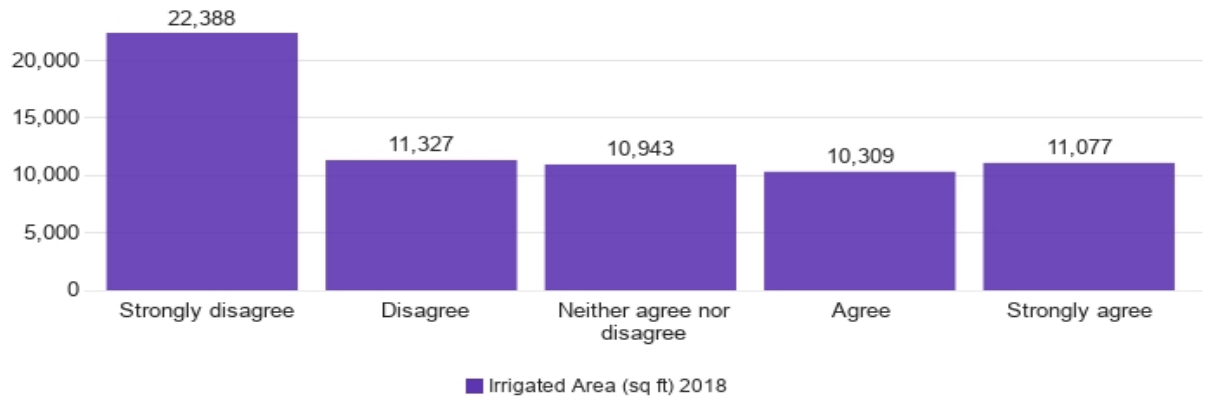
A5.c) Response to whether they would consider replacing front lawn by degree to which they agree with, "Water agencies have to manage water better"



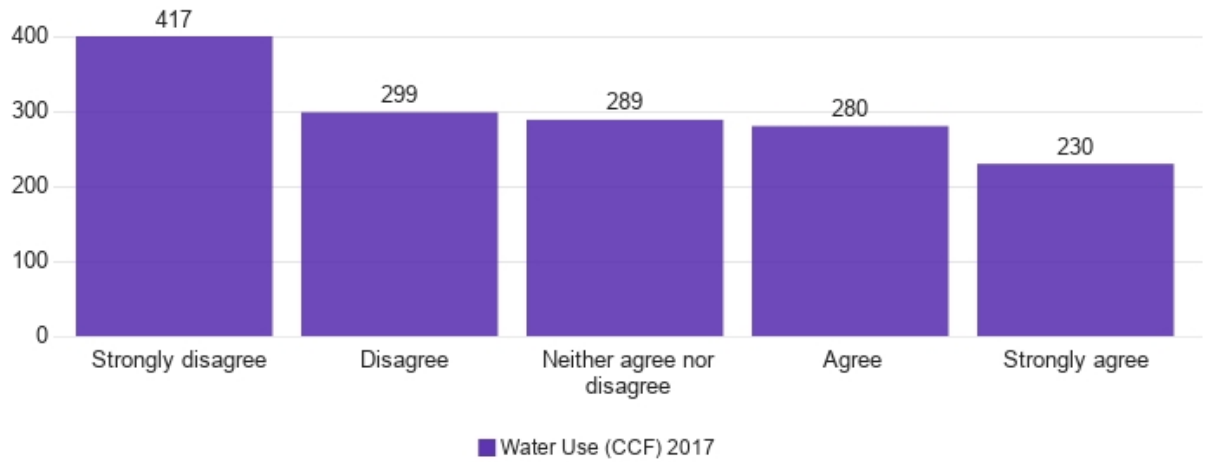
A6. Analysis of response to "I feel my neighbors waste more water than I do"



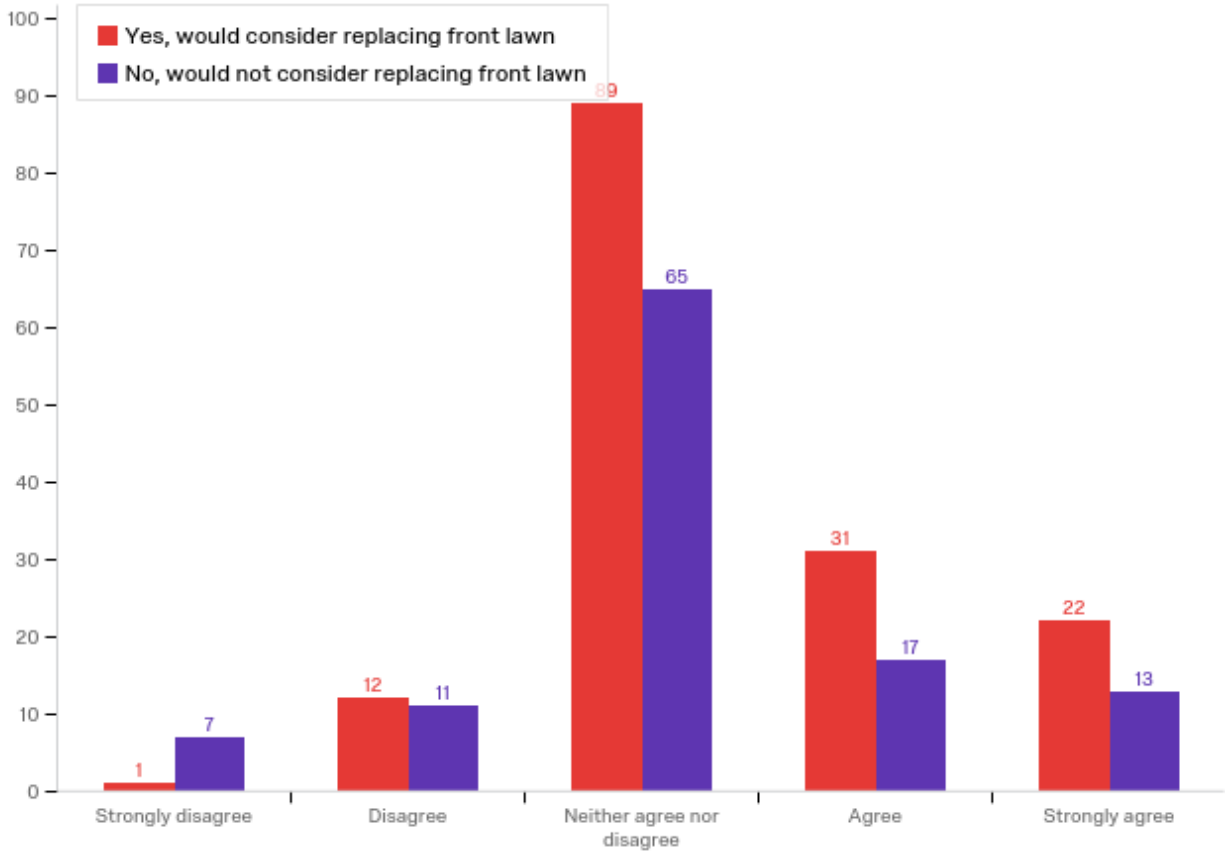
A6.a) By Irrigated Area (ft^2) 2018



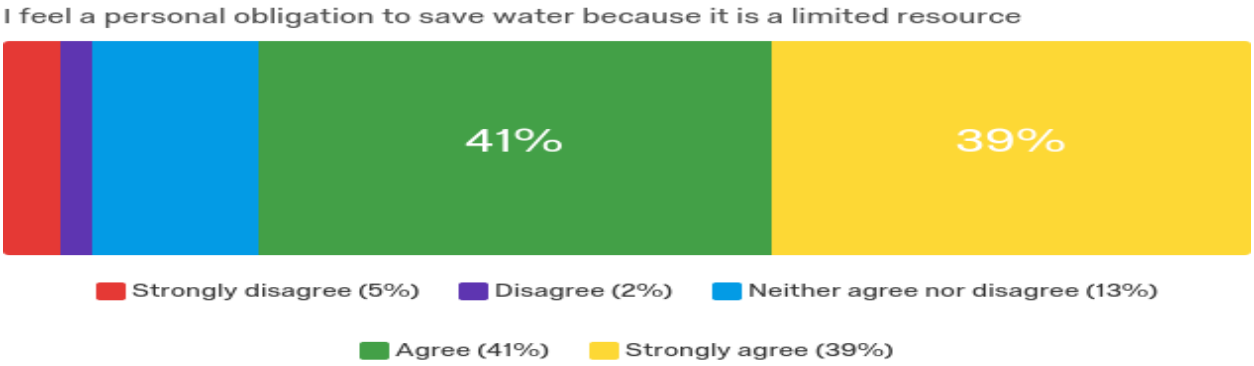
A6.b) By Water Use (CCF) 2017



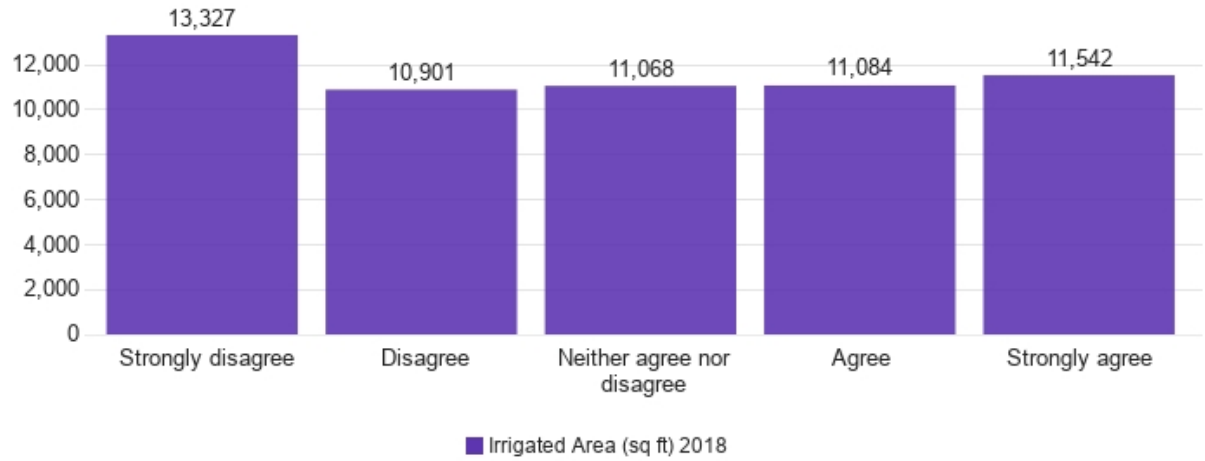
A6.c) Response to whether they would consider replacing front lawn by degree to which they agree with, "I feel my neighbors waste more water than I do"



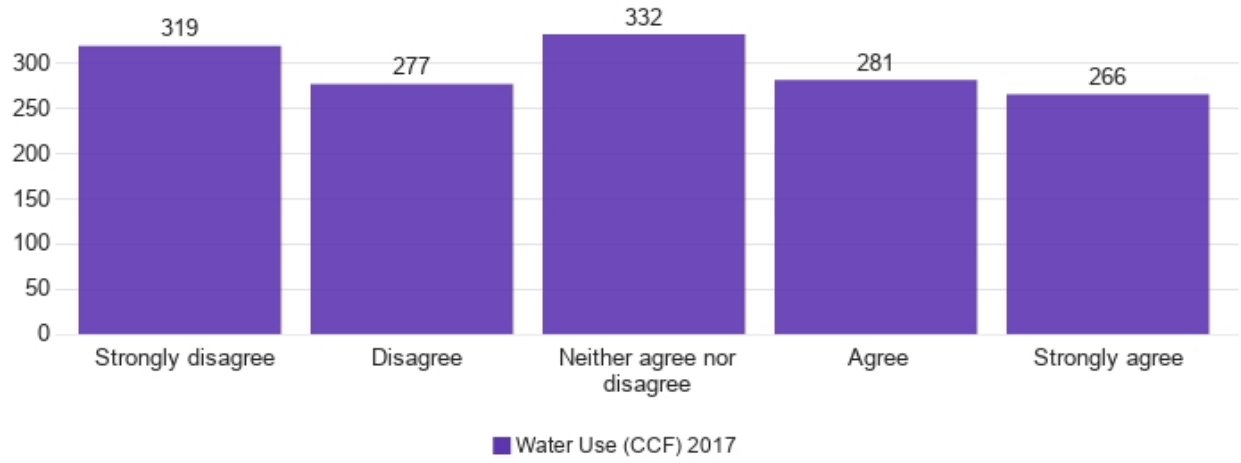
A7. Analysis of response to "I feel a personal obligation to save water because it is a limited resource"



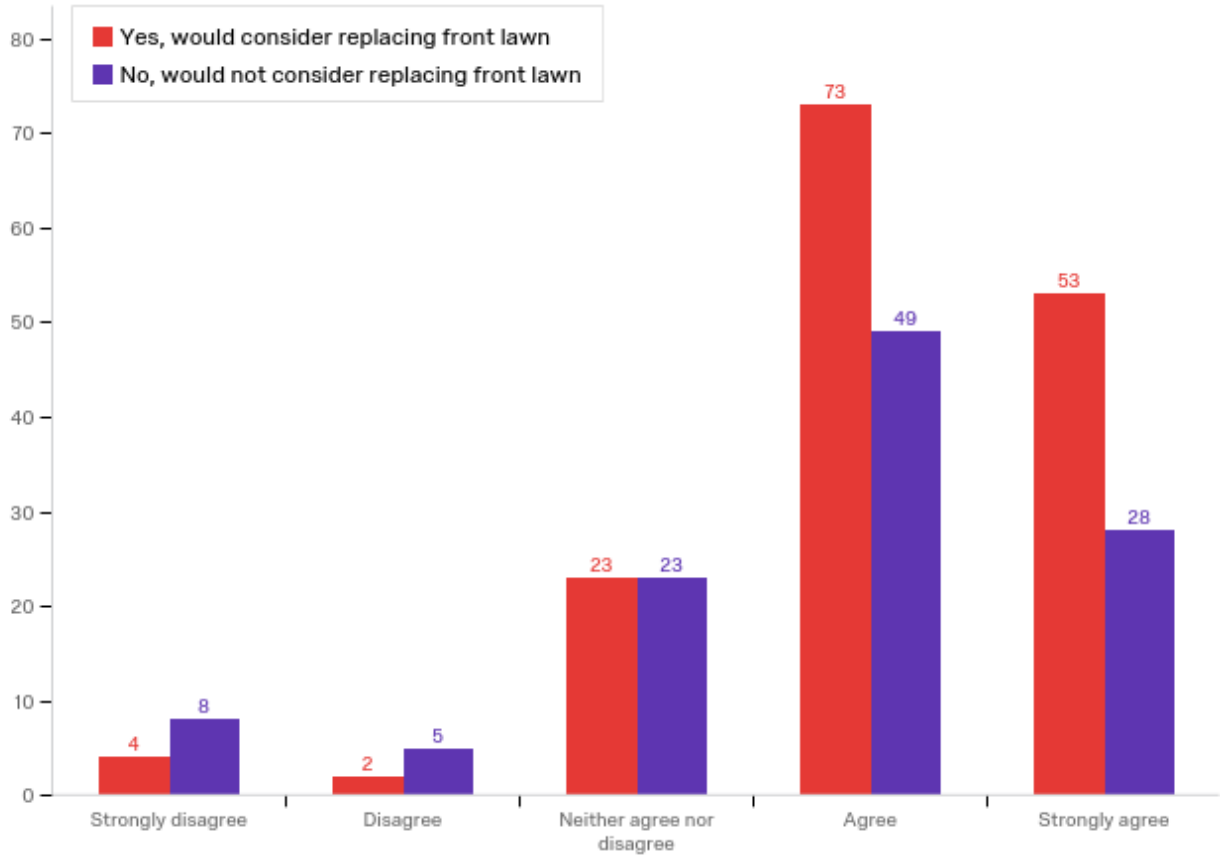
A7.a) By Irrigated Area (ft^2) 2018



A7.b) By Water Use (CCF) 2017



A7.c) Response to whether they would consider replacing front lawn by degree to which they agree with, "I feel a personal obligation to save water because it is a limited resource"



A8. Descriptive Statistics for Millennial Analysis[34]

	Type of variable	Description	Mean	SD	Min	Max
Turf	Dependent variable	Binary indicator takes value 1 if respondent has replaced turfgrass; 0 otherwise	0.351	0.478	0	1
WBIC	Dependent variable	Binary indicator takes value 1 if respondent has installed a weather-based irrigation controllers (WBIC); 0 otherwise	0.266	0.442	0	1
Drip	Dependent variable	Binary indicator takes value 1 if respondent has installed drip irrigation; 0 otherwise	0.587	0.493	0	1
Sprinklers	Dependent variable	Binary indicator takes value 1 if respondent has installed high-efficiency sprinkler nozzles; 0 otherwise	0.429	0.495	0	1
Conservation_Good	Sustainable water consumption attitude	Binary indicator takes value 1 if respondent "agreed" or "strongly agreed" to the statement: "Water conservation at home is good for the environment"; 0 otherwise	0.870	0.336	0	1
Profit_Customer	Utilitarian water belief	Binary indicator takes value 1 if respondent "agreed" or "strongly agreed" to the statement: "Water agencies are trying to profit their customers"; 0 otherwise	0.629	0.483	0	1
Neighbors_Water	Subjective norm	Binary indicator takes value 1 if respondent "agreed" or "strongly agreed" to the statement: "I feel my neighbors waste more water than I do"; 0 otherwise	0.355	0.479	0	1
Kids	Contextual factor	Number of kids in the household	0.673	1.104	0	6
Millennials	Personal capability	Binary indicator takes value 1 if the respondent is a Millennial (31 to 40 year old); 0 otherwise	0.136	0.344	0	1
Kids_Mil	Personal capability and contextual factor	Interaction between the Millennial indicator & number of kids	0.223	0.716	0	5
Baby_Boomers	Personal capability	Binary indicator takes value 1 if the respondent is a Baby Boomer (61 to 70 years old); 0 otherwise	0.305	0.461	0	1
Kids_Boomers	Personal capability and contextual factor	Interaction between the Baby Boomer indicator and the number of kids	0.069	0.378	0	4
HOA	Contextual factor	Binary indicator takes value 1 if in HOA; 0 otherwise	0.712	0.453	0	1
Gardener	Contextual factor	Binary indicator takes value 1 if non-household member takes care of gardening / landscaping; 0 otherwise	1.604	0.490	1	2
Irrigate_Area	Contextual factor	Irrigated Area (1000 ft^2)	11.357	14.970	1.22	174.24

[34] Two respondents listed having two kids part-time kids, which we treated as one child in the household; One respondent listed "too many kids" as the number of children in their household, which we listed as a single child in the household.

A9. Regression Analysis of Conservation Adoption and Millennials[a]

	Turf	Weather-based Irrigation Controllers (WBIC)	Drip	Sprinklers
Conservation_Good	0.284	0.0766	0.212	0.0166
Profit_Customer	-0.375***	-0.113	0.00818	-0.0587
Neighbors_Water	0.295**	0.00626	0.109	0.0848
Kids	-0.00987	-0.0759	-0.118	-0.0495
Millennials	-0.683*	0.107	-0.572*	-0.581*
Kids_Mil	0.0666	0.270	0.333*	0.338**
Baby_Boomers	0.356**	0.0738	0.273*	-0.0857
Kids_Boomers	-0.263	0.297	0.228	0.322*
HOA	0.106	-0.278*	-0.0723	-0.00884
Gardener	0.367***	-0.174	-0.0221	-0.249**
Irrigate_Area	0.00210	0.00282	0.0249***	0.00414
Constant	-1.228***	-0.305	-0.213	0.198
# of Observations[b]	447	447	447	447

[a] *t* statistics in parentheses (* p<0.10, ** p<0.05, *** p<0.01). [b] Observations dropped from main survey given a few respondents did not answer question regarding number of children in home.