Fort Hays State University

Hays Residential Water Survey, 2018

Report of Findings

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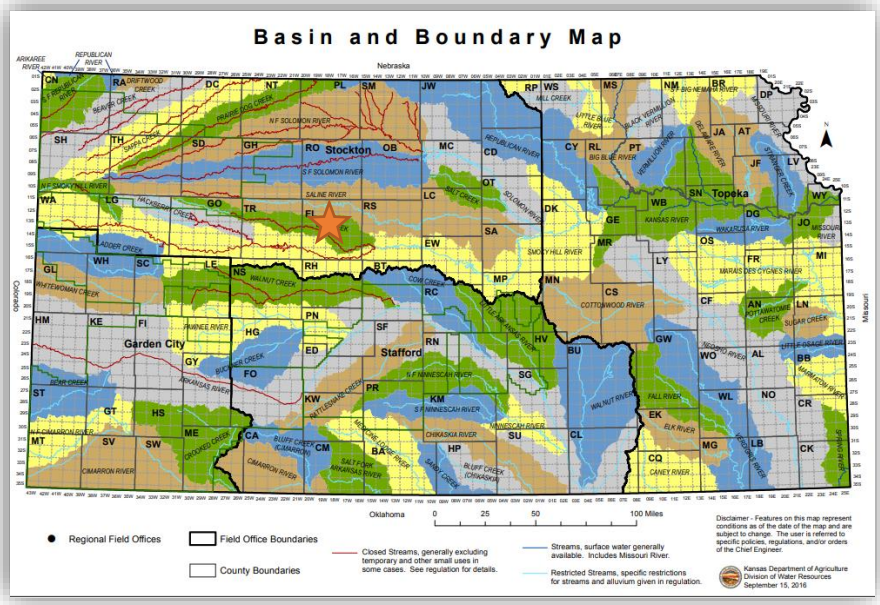
The City of Hays has served as a trailblazer in western Kansas in its efforts to promote water conservation. The City provides many opportunities for residents to participate in programs intended to promote sustainable use of water resources, even offering financial incentives to increase participation in select programs. The City clearly believes that water conservation is an important local priority, but do its residents? We examine factors associated with participation in city-sponsored water conservation initiatives and attitudes about the importance of water conservation among Hays residents, using results from a drop-off/pick-up survey of a selection of Hays households.

Located in the semi-arid plains region, water resources in Hays, Kansas pose a considerable challenge for economic growth. Major surface water sources near Hays - Big Creek and the Smoky Hill River - do not supply sufficient quantities of water to meet municipal needs, and Hays does not have direct access to a deep aquifer (Heinrichs 2006).



Prolonged drought during the late 1980s prompted the City to take action to protect its water resources. In 1985, the Kansas Division of Water Resources established an Intensive Groundwater Use Control Area in Hays, which enables the City to regulate water wells on private property (La Pierre 2015). In 1992, the City of Hays implemented a conservation plan, which combines mandatory water restrictions with incentive programs to encourage residents to reduce their household water consumption (Lowry 2016). The City updated its conservation plan in 2014 to impose limitations on planting cool-season grasses and updated building codes to promote efficient use of water resources (Leiker 2013).

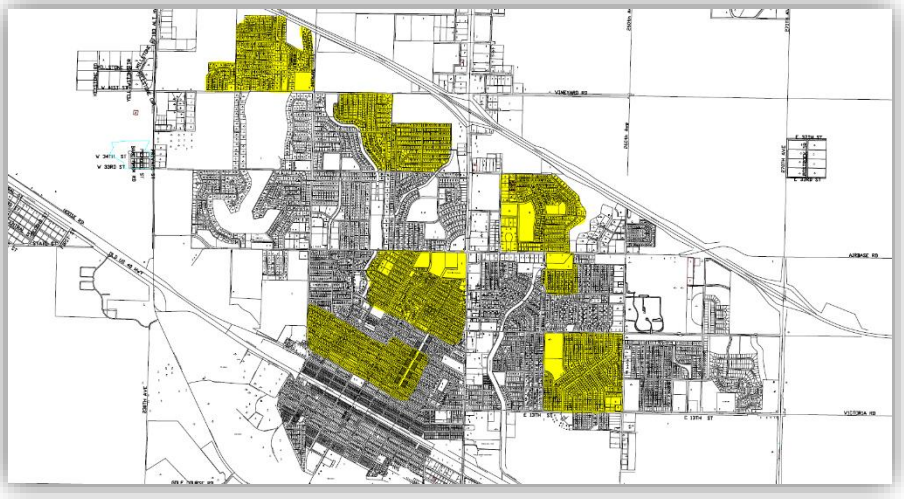
Regarding conservation incentive programs, Hays residents may exchange an old showerhead for a new, low flow showerhead free of charge. The City also offers rebates on installation of high efficiency washing machines, gravity-flush (low flow) toilets, and high efficiency urinals. Finally, the City offers a turf conversion program, through which residents may receive a $1 rebate for every square foot of cool-season turfgrass they replace with drought tolerant turfgrass or landscaping.

Existing research finds mixed results regarding the ability of city-sponsored water conservation initiatives to compel reduced water consumption. Financial incentives are consistently cited as important for motivating water conservation behavior. In a study of support for municipal water reclamation, Laura Garcia-Cuerva (2016) and colleagues find that a decrease in participants' monthly water bill increases respondents' willingness to participate in a reclaimed water program.

Likewise, Brian Hurd (2006) finds that raising municipal water rates can help reduce water demand, although it is an unpopular approach. Hurd also finds that public education programs are helpful for encouraging residents to plant drought-resistant landscaping in drought prone regions. Outside of municipal programs, individual values and pro-environmental beliefs are important for motivating water conservation behaviors (Adams 2014), and belief that one's neighbors are conservation savvy is also positively associated with conservation behaviors (Fielding et al. 2016). While sociodemographic factors do shape attitudes about water conservation, existing research suggests that the effect of values and beliefs is often a stronger motivator, particularly during acute drought episodes (DeLorme et al. 2003; Garcia-Cuerva et al 2016).

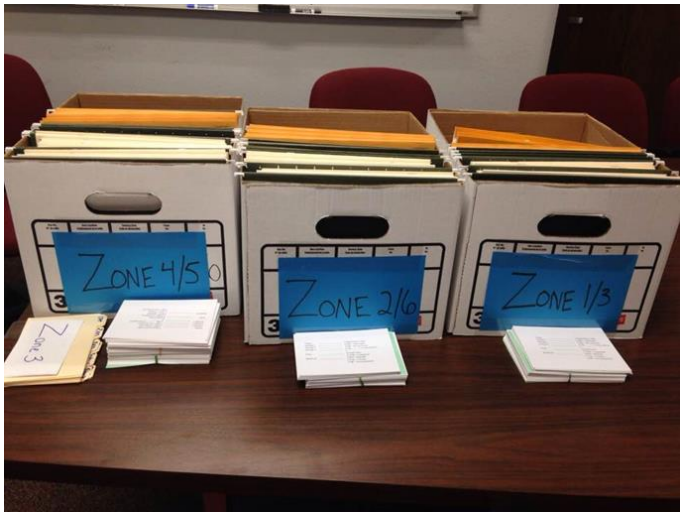
Our research examines factors associated with participation in city-sponsored water conservation initiatives and attitudes about the importance of water conservation among Hays residents. We assess the relationship between residents' perceptions of the importance of municipal water conservation and their engagement in various water reducing behaviors, including the use of water reducing devices in their households. Additionally, we evaluate the relationship between residents' satisfaction with the City's management of water resources and their perceptions of municipal water quality.

Research Methods



To investigate our research questions, we conducted a drop-off/pick-up survey of a selection of Hays households (Steele et al. 2001). To select our survey sample, we broke the city into six residential zones, purposively sampling neighborhoods to ensure that our zones represented a diverse cross-section of Hays households. We drew the zone boundaries such that each zone contained approximately 400 houses. We then randomly selected 66 houses in each zone, using a sampling interval of six, to target for participation. The initial sample of 396 Hays households was designed to achieve a 5% margin of error at a 95% confidence level. For the current project, our sample did not include student housing at FHSU.

Eight fieldworkers spent six weeks distributing surveys to the randomly selected target houses, working in pairs. After explaining the purpose of the survey, fieldworkers instructed residents who agreed to participate to have the adult in the household who most recently had a birthday fill out the questionnaire. Respondents left completed questionnaires hanging on their front door in a plastic door-hanging bag that we provided. Fieldworkers then returned to pick up the surveys a day or two later. In the event that a house was obviously vacant, or that a resident declined to participate in the study, students "replaced" that target house with the residence on the immediate left. Likewise, if students could not make contact with a resident after three attempts at a household, they replaced the household. We used a file card system to track the status of each attempt to deliver a survey at targeted households.



We obtained a total of 312 completed surveys. We had strong cooperation and response rates of 77% and 59.5%, respectively, with zone cooperation rates ranging from 71.6% to 91.5% and zone response rates ranging from 54.9% to 67.5%. Household replacement rates varied from as low as 33% to a high of 49.5%, with the latter attributed to a very high rate of vacancies in zone five.

	Zone 1 (n=54)	Zone 2 (n=50)	Zone 3 (n=60)	Zone 4 (n=45)	Zone 5 (n=53)	Zone 6 (n=49)	Total (N=312**)
Cooperation rate*	91.5%	80.6%	73.2%	72.6%	71.6%	77.7%	**77.4%**
Response rate	67.5%	62.5%	60.0%	54.9%	60.2%	65.3%	**59.5%**
Replacement rate	33.3%	38.3%	40.0%	48.3%	49.5%	37.2%	**41.5%**

* Rates calculated as follows:

Cooperation = completions / (completions + refusals)

Response = completions / (completions + refusals + no contacts)

Replacement = (refusals + no contacts + vacancies) / (completions + refusals + no contacts + vacancies)

**The total number of usable questionaires is 312. The zone identifier was removed from one questionnaire returned by mail.

Analysis

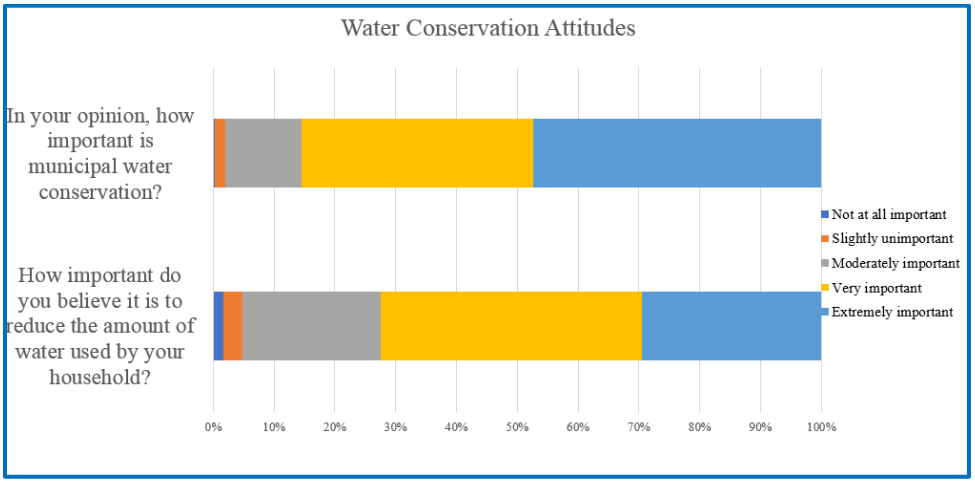
Our sample population roughly approximated the 2016 American Community Survey population estimates for Hays on most demographic measures, but did considerably under-represent FHSU students. Additionally, college educated residents and residents aged 60 and older are over-represented in our study sample.

Socio-Demographic Indicators		*Survey Sample %*	*Study Population %*
Gender	Female	57.1%	**50.0%[a]**
	Male	42.9	**50.0[a]**
Hispanic Origin		1.0	**5.5[b]**
Racial Background	African American or Black	.3	**1.4[b]**
	American Indian or Alaskan Native	.3	**.2[b]**
	Asian or Pacific Islander	1.3	**1.7[b]**
	Caucasian or White	96.7	**93.8[b]**
	Multiracial	1.3	**2.6[b]**
	Other Race	0	**.3[b]**
Marriage Status	Married	69.7	**42.1[c]**
	Single	30.3	**57.9[c]**
Children Living in the Home (18 and Under)	Yes	34.4	**23.5[d]**
Seniors (60 and over)		38.8	**19.0[e]**
Years at Residence	Less than 1 Year	8.9	
	1-5 Years	27.6	
	6-10 Years	13.2	
	More than 10 Years	50.3	
Education Achieved	Eighth Grade or Less	0	**2.3[f]**
	Some High School	.7	**3.8[f]**
	High School Graduate	13.4	**23.9[f]**
	Vocational School	6.9	**Data Not Available[g]**
	Some College	24.5	**26.8[f]**
	College Graduate	34.4	**25.1[f]**
	Graduate School Graduate	20.3	**12.3[f]**
Total Family Income Levels		6.8 (Less than $20,000)	**6.1 (Less than $15,000)[h]**
		16.7 ($20,000 to $39,999)	**14.4 ($15,000 to $34,999)[h]**
		38.4 ($40,000 to $79,999)	**34.6 ($35,000 to $74,999)[h]**
		11.0 ($80,000 to $99,999)	**16.6 ($75,000 to $99,999)[h]**
		27.0 ($100,000 and over)	**28.3 (100,000 and over)[h]**
Partisanship	Republican	50.8	**47.6[i]**
	Democrat	19.3	**24.1[i]**
	Independent	29.9	**28.4[i]**

Sources: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates (http://factfinder.census.gov). State of Kansas Office of the Secretary of State (www.kssos.org). These figures represent the percentages of registered voters in Ellis County. Percent Independent is derived by adding Libertarian and Unaffiliated.

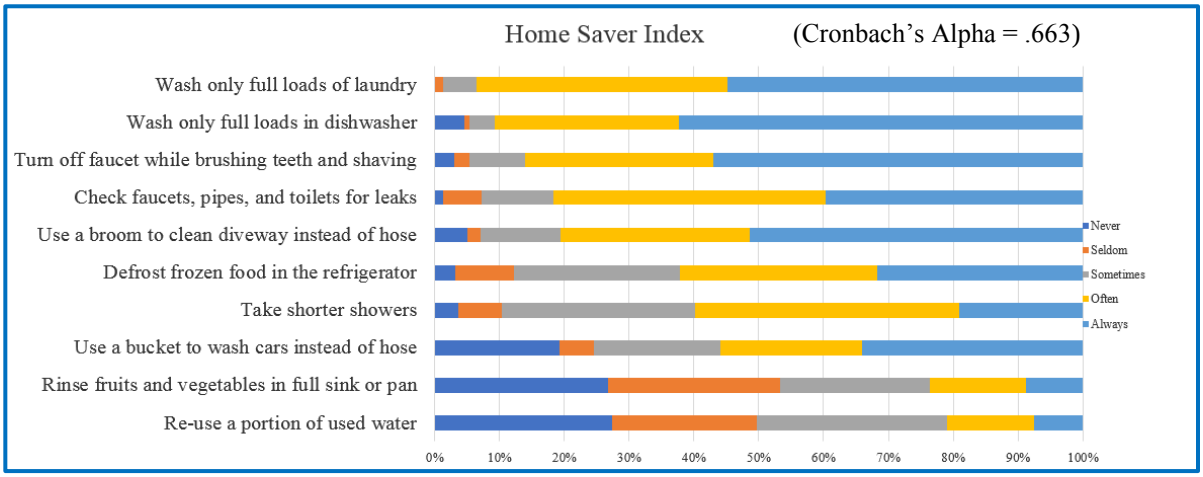
Water Conservation Attitudes and Behaviors

Our univariate analyses reveal that Hays residents understand the importance of water conservation and are implementing a variety of water-saving practices to reduce their household water consumption. 85% of respondents reported that they believe that municipal water conservation is very or extremely important. Many respondents also take water conservation personally, with 73% of respondents reporting that they believe it is important to reduce the amount of water used by their households.



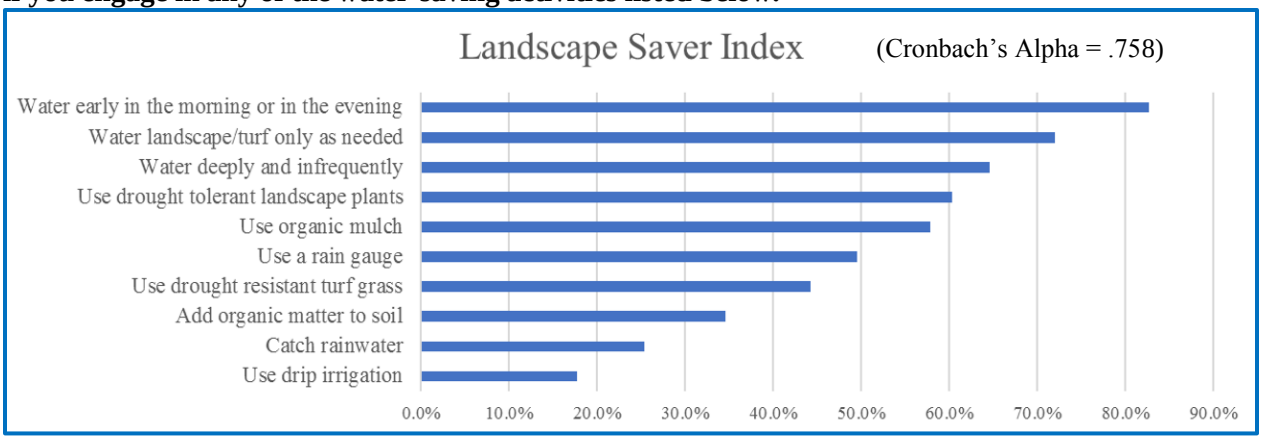
We asked respondents two series of questions about everyday activities they do to reduce water use in their homes and on outdoor landscaping, which we converted to index variables for bivariate and multivariate analyses. As you can see, survey respondents reported using a wide range of water saving behaviors in their homes. Our respondents are most conscious about washing full loads in the laundry machine and dishwasher, turning off the faucet while brushing their teeth and shaving, checking for leaks, and not using a hose to clean their driveways.

Thinking about things that you do to reduce the amount of water used in your home, please indicate how often you engage in any of the water-saving activities listed below.



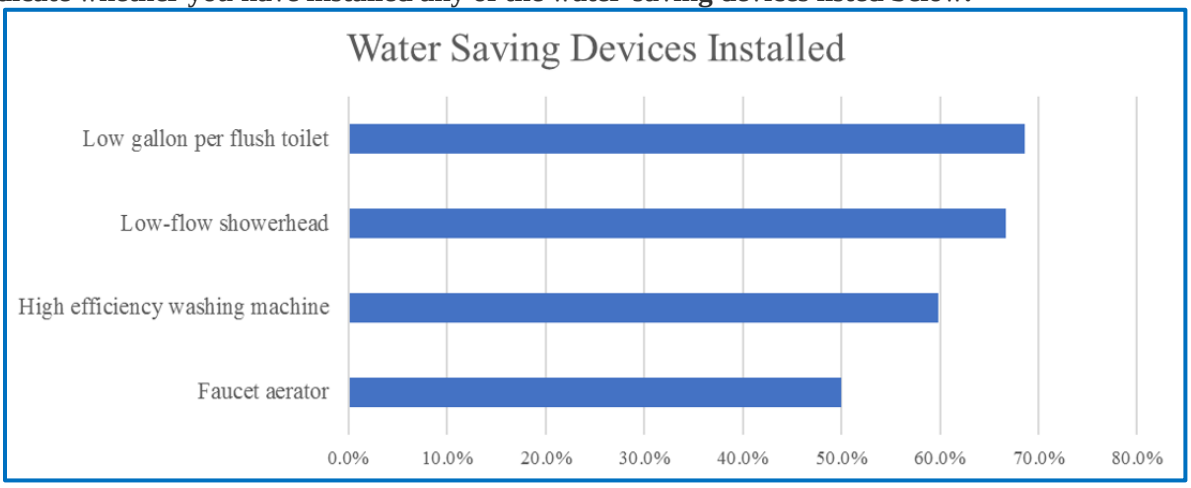
Likewise, respondents reported using a number of strategies to reduce the amount of water used on outdoor landscaping, with watering outside of peak evaporation times, watering only as needed, watering deeply and infrequently, and using drought resistant plants and organic mulch being leading water saving techniques.

Thinking about things that you do to reduce the amount of water used on your lawn, please indicate if you engage in any of the water-saving activities listed below.



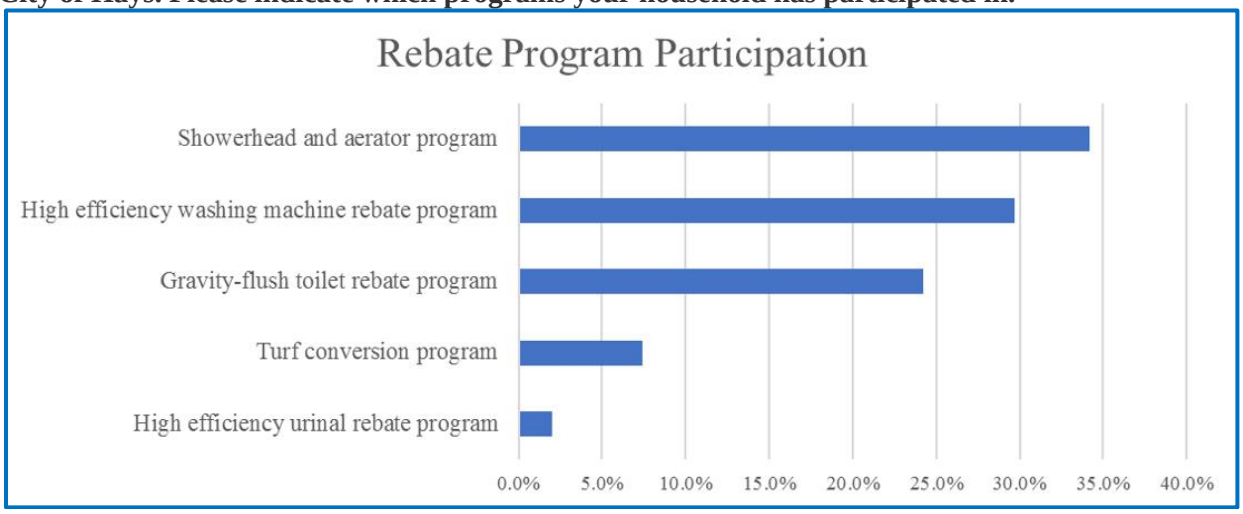
Many survey respondents also indicated that they have installed water saving devices in their homes. 68% of respondents reported having installed a low flow toilet in their home, 66% reported installing low flow showerhead fixtures, 60% reported having installed high efficiency washing machines, and 50% reported installing faucet aerators.

Thinking about things that you do to reduce the amount of water used in your home, please indicate whether you have installed any of the water-saving devices listed below.



However, not all respondents who have installed water saving devices are taking advantage of city-sponsored rebate programs. About a third of respondents have used the city's showerhead and aerator program and the high efficiency washing machine rebate, and a quarter report receiving a rebate from the city for installing a low flow toilet. Very few respondents reported participating in the turf conversion and urinal rebate programs, so we removed these two programs from subsequent analyses.

Now we want to know about your experience with water conservation programs sponsored by the City of Hays. Please indicate which programs your household has participated in.



We used Spearman's rho to assess the relationship between ordinal dependent variables and independent variables in our model, and we used Pearson's R to assess the relationship between our index variables and independent variables. Pictured below are associations between dependent and independent variables in our model.

Bivariate associations between dependent and independent variables

	Home INDEX (*r*)	Landscape INDEX (*r*)	Installed shower(*rho*)	Installed aerator (*rho*)	Installed washer (*rho*)	Installed toilet (*rho*)	Shower/ aerator rebate (*rho*)	Washer rebate (*rho*)	Toilet rebate (*rho*)
Conservation important	**0.362****	**0.163****	0.014	0.063	0.050	0.019	0.056	0.051	0.104
Reduce use important	**0.335****	**0.159****	0.007	0.083	0.058	0.062	0.109	0.057	0.093
Informed about water source	**0.160****	**0.271****	**0.177****	**0.207****	0.107	**0.156****	**0.191****	**0.158****	**0.161****
Years at residence	0.091	**0.282****	**0.239****	**0.273****	0.102	**0.197****	**0.288****	**0.140***	**0.167****
Kids in HH	**-0.143***	-0.083	-0.069	-0.049	0.077	-0.070	**-0.151****	0.048	**-0.141***
Seniors in HH	**0.159****	**0.194****	**0.150****	**0.171****	0.052	**0.116***	**0.204****	-0.042	**0.150****
Income	-0.033	**0.226****	0.081	0.101	**0.283****	**0.172****	-0.012	**0.194****	0.049
Gender	0.026	-0.075	-0.073	-0.089	0.059	-0.104	**-0.163****	-0.040	-0.063
White	0.060	**0.138***	-0.012	0.082	-0.008	0.068	0.049	0.030	0.043
Education	-0.029	**0.125***	0.070	0.047	**0.120***	0.013	0.031	0.079	0.079
Republican	**-0.145***	-0.074	**-0.153***	**-0.134***	-0.085	0.027	-0.051	-0.069	-0.106
Democrat	0.048	0.005	0.059	0.010	0.012	-0.037	0.066	0.007	0.036
Independent	0.117	0.077	0.117	**0.138***	0.083	0.002	-0.001	0.069	0.085

*p<.05
**p<.01

As you can see, the relationship between our attitudinal indicators – belief that water conservation is important and belief that reducing household water use is important – and the index variables is weak but statistically significant. Respondents who correctly identified the source of Hays' municipal water supply were significantly more likely to report engaging in water saving behaviors, installing water saving devices in their households, and were more likely to have used the city's rebate programs. Length of time at the current residence and the presence of individuals 60 years of age and older in the household were significantly and positively associated with a

number of water saving behaviors and participation in city-sponsored rebate programs. Family income is associated only with "big ticket" water saving items, like installing a gravity-flush toilet or a high efficiency washing machine, and reducing water used on outdoor landscaping. Gender, race, education level, and having children in the household were significantly associated with few dependent variables. We therefore excluded these variables from regression analyses. Concerning partisanship, only Republican affiliation was retained in our regression models as it showed a consistently significant but weak, negative relationship with our dependent variables.

We used regression analysis to assess how water conservation attitudes, knowledge about the source of Hays' water, and demographic factors predict participation in conservation behaviors. Regression analysis allows us to compare the relative importance of multiple variables in predicting a particular outcome. In this case, our outcomes of interest are engaging in water-saving behaviors in the home and on outdoor landscaping, and participation in city-sponsored conservation initiatives. We used multiple least squares regression for models in which the home saver index and the landscape saver index are the outcome variables, and we used multiple logistic regression for models in which the outcome variables are dichotomous.

Multiple Least Squares Regression: Regressing Home Saver and Landscape Saver Indexes on Water Conservation Attitudes, Water Source Knowledge, and Sociodemographic Characteristics

	Beta (Stadard Error)	
Variable	**Home Saver Index**	**Landscape Saver Index**
Municipal Water Conservation Importance	.198* (.054)	.016 (.025)
Household Reduce UseImportance	.191* (.046)	.143* (.021)
Informed About Sources of Municipal Water	.095 (.051)	.185** (.024)
Total Family Income	-.047 (.022)	.228** (.010)
Republican	-.084 (.069)	-.023 (.032)
Seniors in Household	.071 (.078)	.195** (.036)
Years Lived at Residence	.038 (.034)	.178** (.016)
Constant	(-.199)	(.092)
	Adj. R^2 = .159	Adj. R^2 = .206

*p<.05, **p<.01

In the multiple linear regression, only attitudes about the importance of municipal water conservation and the importance of reducing one's own household water remain significantly correlated with the index of home water saving behaviors. Both associations are slight in magnitude and positive, with higher ratings of importance predicting higher reported home water saving behaviors. Compared to the bivariate analysis findings on correlates of the landscape water saving behaviors index, the multivariate analysis finds that attitude about the importance of reducing one's own household water remains significant, as does knowing the City's sources of municipal water, total family income, the presence of seniors in the household, and years lived at one's current residence. All associations are in the same direction as in the bivariate correlations. The magnitude of the Beta associations is slight in most cases, with total family income showing a moderate association at 0.228.

Logistic Regression: Household Water Saving Devices Installed by Family on Water Conservation Attitudes, Water Source Knowledge, and Sociodemographic Characteristics

	Odds Ratio (Std Err)			
Variable	Low-flow Showerhead	Faucet Aerator	High Efficiency Washer	Low-Flow Toilet
Municipal Water Conservation Importance	.953 (.239)	.975 (.237)	.923 (.240)	.942 (.239)
Household Reduce Use Importance	.903 (.207)	1.128 (.198)	1.223 (.205)	1.146 (.205)
Informed About Sources of Municipal Water	1.081 (.227)	1.497 (.219)	.957 (.232)	1.383 (.247)
Total Family Income	1.191 (.097)	1.184 (.097)	1.542** (.102)	1.190 (.100)
Republican	.584 (.311)	.740 (.298)	.564 (.315)	1.278 (.321)
Seniors in Household	1.631 (.358)	1.986* (.338)	1.385 (.356)	1.679 (.376)
Years Lived at Residence	1.554** (.150)	1.472** (.149)	1.140 (.152)	1.388* (.153)
Constant	.444 (.868)	.080** (.914)	.195 (.895)	.230 (.891)
% correctly classified: specified model - null model = improvement with set of independent variables	68.6% - 65.6%= 3.1% improvement	63.2% - 51.4%= 11.8% improvement	70.4% - 63.4%= 7.0% improvement	72.6% - 70.3%= 2.3% improvement

*p<.05, **p<.01

Having installed the device is coded "1," and not installed is coded "0." An odds ratio greater than 1.0 indicated that as the independent variable increases, the odds of having installed the device increases (so, a positive relationship), and an odds ratio less than 1.0 indicates that as the independent variable increases, the odds of having not installed increases (a negative relationship).

In the logistic regression analysis, only years lived at residence is significantly associated with installation of a low flow showerhead, and its influence remains positive as it was in the bivariate analysis. Variables no longer significantly associated include: being informed about municipal water sources, presence of seniors in the household, and income. Turning to installation of a faucet aerator, compared to bivariate findings, both years lived at residence and seniors present in the household retained their significant association in the multivariate analysis and in the same direction, while being informed about the source of municipal water and being Republican in political orientation were no longer significant. For installation of a high efficiency washing machine, of the set of independent variables used in the multivariate model, total family income remains the only independent variable significantly associated. For installation of a low flow toilet, only years at residence retains its significant association compared to bivariate findings. Being informed about the municipal water sources, seniors present in the household, and income are no longer associated.

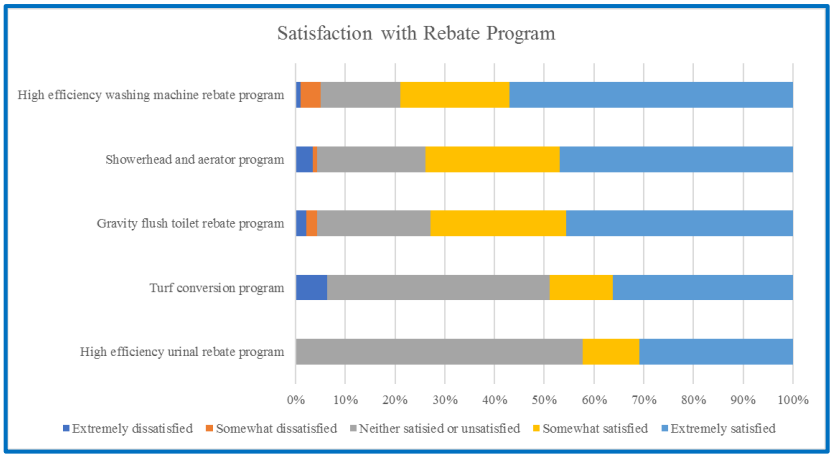
Logistic Regression: Use of City Incentive Programs on Water Conservation Attitudes, Water Source Knowledge, and Sociodemographic Characteristics

	Odds Ratio (Std Err)		
Variable	Showerhead and Aerator Exchange Program	High Efficienty Washer Rebate	Low-Flow Toilet Rebate
Municipal Water Conservaton Importance	.995 (.265)	1.060 (.260)	.943 (.283)
Household Reduce Use Importance	1.329 (.222)	1.125 (.212)	1.327 (.240)
Informed About Sources of Municipal Water	1.322 (.228)	1.114 (.227)	1.159 (.243)
Total Family Income	1.031 (.102)	1.299** (.104)	1.103 (.109)
Republican	.871 (.312)	.621 (.318)	.632 (.332)
Seniors in Household	2.032* (.344)	.690 (.359)	2.059* (.371)
Years Lived at Residence	1.630** (.166)	1.412* (.163)	1.205 (.173)
Constant	.030 (1.037)	.042** (1.033)	.056** (1.067)
% correctly classified: specified model - null model = improvement with set of independent variables	68.8% - 64.2% = 4.6% improvement	70.6% - 69.3% = 1.3% improvement	75.7% - 74.3% = 1.4% improvement

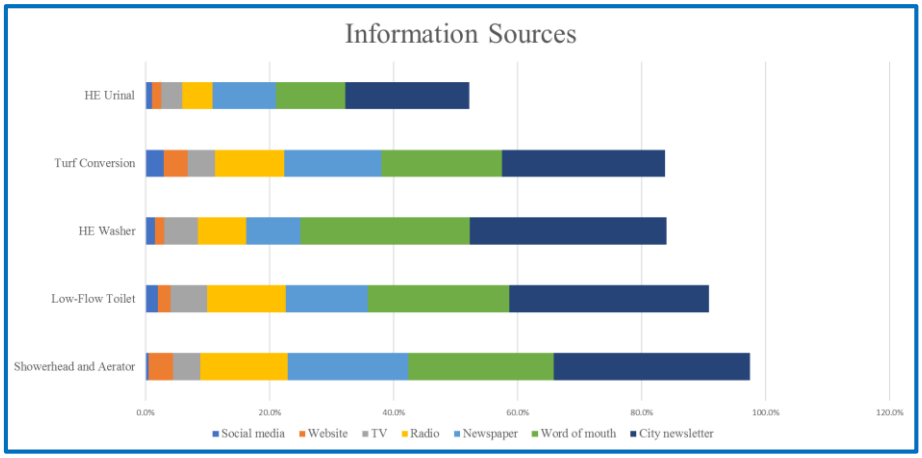
*p<.05, **p<.01

Having used the City program is coded "1," and not having used it is coded "0."

Turning to the multivariate analyses on use of three City incentive programs, for use of the showerhead and aerator exchange program, years lived at residence and presence of seniors in the household retain significant associations compared to the bivariate analysis, but being informed about municipal water sources does not. For use of the high efficiency washing machine rebate, years lived at residence and total family income retain their significant associations. Being informed about the municipal water sources is no longer associated in the multivariate model. For use of the low flow toilet rebate, the presence of seniors in the household is the only independent variable that retains its significance. Being informed about the source of municipal water and years at residence are no longer significant.



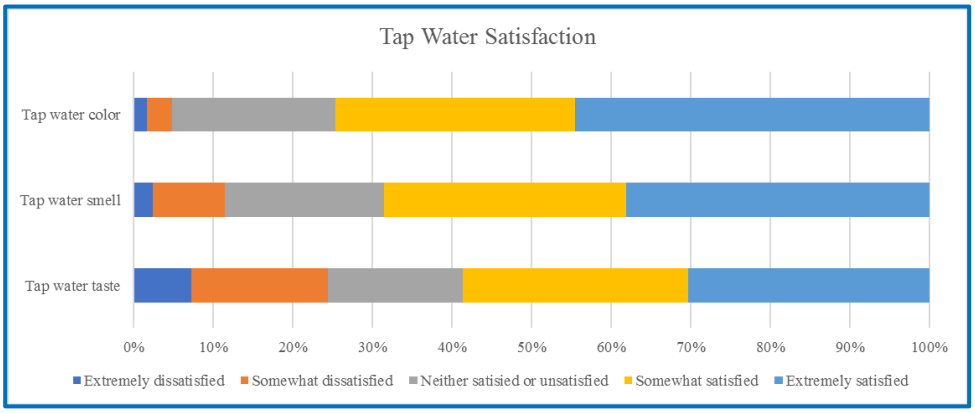
Among respondents who have utilized a city-sponsored rebate program, satisfaction with the rebate programs participated in is generally high. Approximately 75% of respondents who have participated in the most commonly used rebate programs – the high efficiency washing machine, showerhead and aerator, and gravity-flush toilet rebates – report being somewhat or extremely satisfied with these programs. Lower frequencies of satisfaction with the turf conversion and high efficiency urinal programs reflect the lower rate of participation in these programs among respondents in our sample.

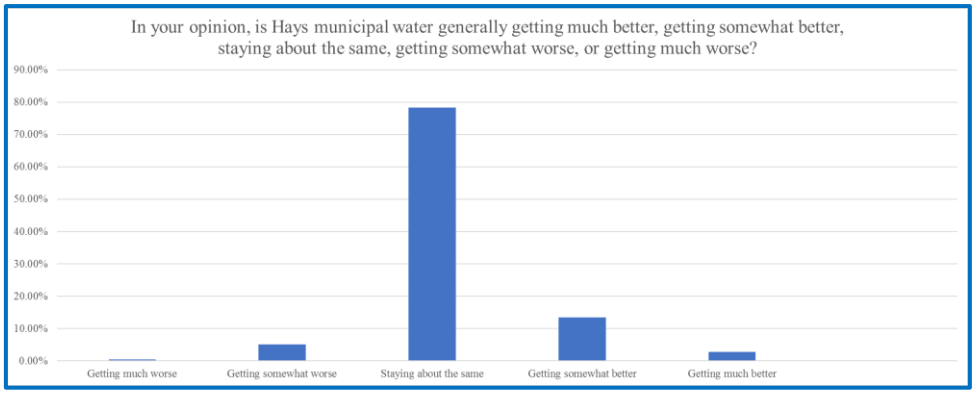


When asked how they first learned about the City rebate programs, respondents identified City newsletters, word of mouth, newspaper articles, and the radio as the most commonly encountered sources of information about the rebate programs.

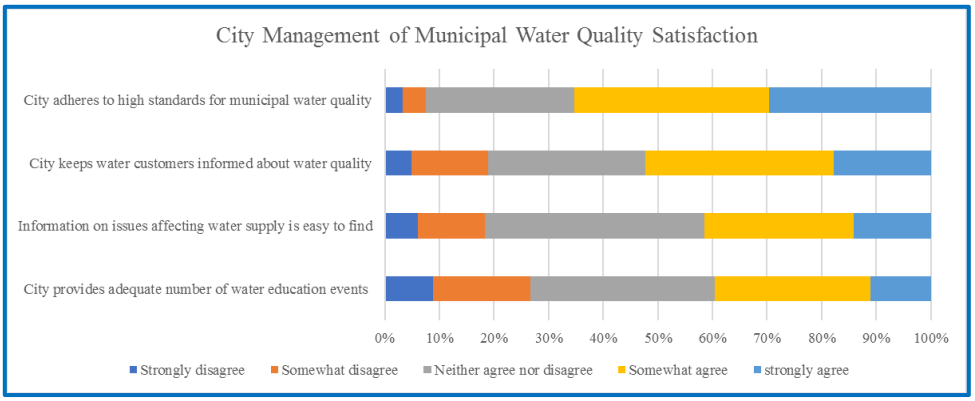
Satisfaction with Municipal Water Quality

Turning now to satisfaction with the city's management of municipal water resources, satisfaction with tap water color, smell, and taste are generally high. Rates of satisfaction with the taste of municipal tap water are slightly lower than are rates of satisfaction with the color and smell of the water.





When asked if they believe Hays' municipal water is getting better, staying the same, or getting worse, nearly 80% of respondents indicated that they believe the quality of municipal water in Hays has remained consistent over time.



Most respondents indicated high levels of confidence in the City's management of municipal water quality, with two-thirds of participants agreeing that the City adheres to high standards for municipal water quality, and just over half of participants agreeing that the City keeps municipal water customers informed about water quality. Respondents in our sample were less certain about locating information on issues that affect the municipal water supply and on the number of public events the City holds to educate the public about water issues.

To assess the relationship between satisfaction with the city's management of municipal water resources and perceptions of water quality, we collapsed these four questions about management of water resources into a single index for ease of interpretation.

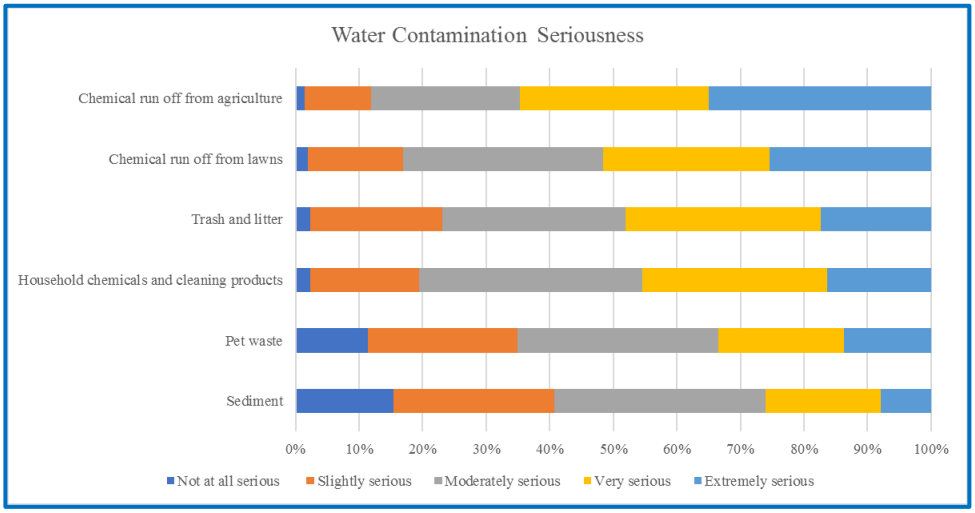
Below, we can see that satisfaction with the color, smell, and taste of tap water are highly correlated with one another, as we would expect. Perceptions regarding the relative quality of municipal water in Hays over time are significantly associated with satisfaction with the color, smell, and taste of tap water. The relationships between overall satisfaction with the City's management of water resources and satisfaction with tap water color, smell, and taste are significant and strongly correlated, as is the relative quality of municipal water over time. This suggests that trust in the City's management practices goes hand-in-hand with satisfaction with municipal water quality.

Please indicate your level of satisfaction with the color, smell, and taste of the tap water in your home (*r*)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 Satisfaction with Color of Tap Water	1																	
2 Satisfaction with Smell of Tap Water	**.818****	1																
3 Satisfaction with Taste of Tap Water	**.651****	**.742****	1															
4 Perception of Water Quality	**.277****	**.277****	**.295****	1														
5 Satisfaction with City Management	**.432****	**.464****	**.495****	**.327****	1													
6 Conservation important	0.042	0.021	-0.007	-0.063	0.054	1												
7 Reduce use important	0.027	-0.035	0.037	-0.047	0.003	**.592****	1											
8 Informed about water source	0.082	0.060	0.082	-0.078	**.133***	0.096	**.120***	1										
9 Years at residence	0.021	0.044	**.138***	0.029	**.127***	0.104	0.101	**.154****	1									
10 Kids in HH	**-.121***	0.044	**.138***	0.029	**.127***	-0.096	-0.052	-0.099	**-.228****	1								
11 Seniors in HH	0.021	0.027	**.140***	0.050	**.123***	**.188****	0.031	0.008	**.417****	**-.478****	1							
12 Income	-0.034	0.012	-0.033	**-.186****	-0.049	-0.079	-0.103	**.211****	0.018	**.258****	**-.215****	1						
13 Gender	-0.048	-0.011	-0.003	0.113	0.004	0.010	0.014	**-.257****	-0.079	0.108	-0.035	**-.121***	1					
14 White	0.063	0.063	0.080	**.129***	0.103	-0.084	-0.030	0.060	**.163****	-0.052	0.067	0.047	-0.084	1				
15 Education	0.018	0.074	-0.004	-0.103	-0.018	-0.008	-0.045	**.165****	-0.109	**.130***	**-0.123**	**.337****	0.023	-0.074	1			
16 Republican	**.129***	**.139***	**.175***	-0.44	0.009	**-.204****	**-.154***	-0.025	-0.076	0.117	-0.113	0.117	-0.086	0.107	-0.046	1		
17 Democrat	0.013	0.041	0.000	0.065	0.001	0.107	0.015	0.004	0.105	**-.150***	**.163****	-0.080	0.070	-0.014	0.063	**-.497****	1	
18 Independent	**-.152****	**-.186****	**-.191****	-0.008	-0.011	**.131***	**.156***	0.024	-0.007	0.001	-0.017	-0.060	0.033	-0.105	-0.005	**-.663****	**-.320****	1

***p<.05**
****p<.01**

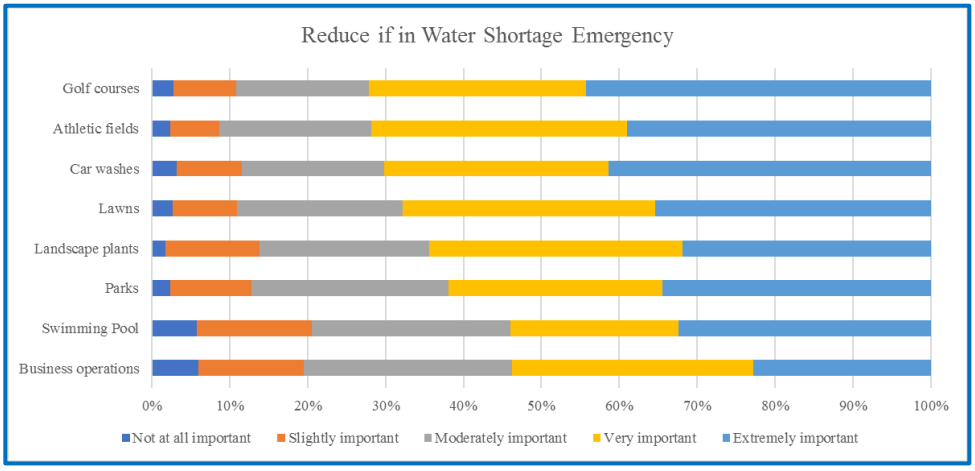
To evaluate respondents' awareness of sources of municipal water contamination, we asked them to rank their concern about various potential contamination sources, including chemical run off from agriculture and lawns, trash and litter, household chemicals and cleaning products, pet waste, and sediment. Interestingly, only a quarter of respondents cited contamination from sediment as a very or extremely serious concern, and only a third of respondents indicated that pet waste is a serious source of contamination. Contamination from trash and litter, and household chemicals and cleaning products were considered serious by 45% of respondents. Just over half of respondents are concerned about chemical run off from



lawns as a source of contamination, while two-thirds say that chemical run off from agriculture is a serious source of water contamination.

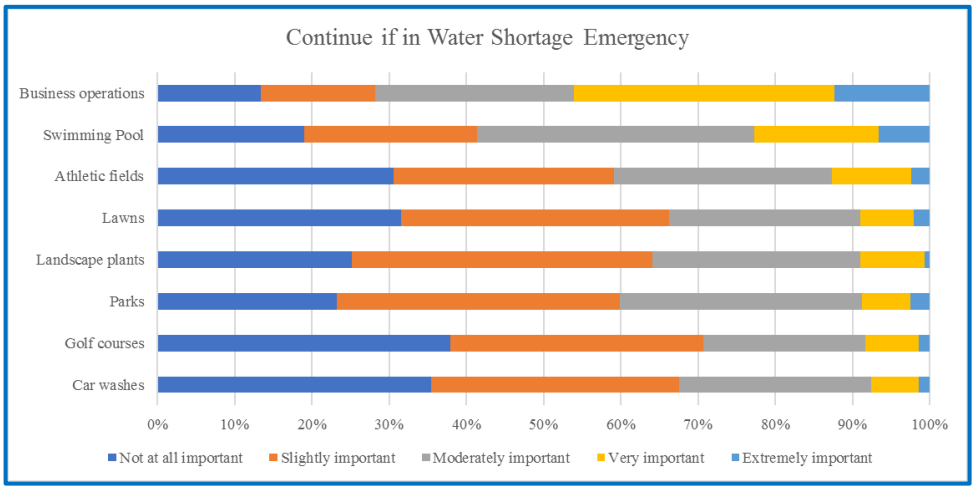
Water Use/Restriction Preferences

To evaluate which public uses of water resources Hays residents believe are most important, we asked our respondents to rate common municipal water uses that they would favor restricting or allowing in the event of a water emergency.



We found that respondents generally favored reducing water used for all activities we asked about in the event of a water emergency. For most activities, less than 15% of respondents reported that it would be slightly or not at all important to reduce the use of water in the event of a water emergency.

Regarding water uses respondents believe are important to maintain during water shortages, respondents preferred continuing water use for businesses and the city pool. Several people wrote notes on their surveys to clarify that they favor filling the public pool, but favor restrictions on filling personal pools during a water emergency.



Interested in exploring factors that shape preferences for water uses and restrictions, we examined the relationship between sociodemographic measures on our survey and stated preferences for allowed water uses during a water emergency. We used the responses for preferred "continued" uses because there is greater variation in responses for preferred continued uses than preferred reduced uses – respondents favor reducing all uses of water in the event of a water emergency.

Respondents who believe that water conservation is important and respondents who believe that it is important to reduce their personal water use are significantly *less likely* than other respondents in our sample to prefer continued municipal water use for watering lawns in the event of a water emergency. Respondents who correctly identified the source of Hays' municipal water supply are more likely to favor continuing water uses for business operations during a water emergency, but are less likely to prefer continued water use for watering lawns. Length of time at residence is significantly associated only with a preference to continue water use on landscape plants.

If we were in a water emergency, in your opinion how important would it be to continue each of these municipal water uses (*r*)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1 Continue Use for Athletic Fields	1																				
2 Continue Use for Businesses	.180**	1																			
3 Continue Use for Car Washes	.326**	.221**	1																		
4 Continue Use for Golf Courses	.627**	.212**	.466**	1																	
5 Continue Use for Landscape Plants	.272**	.167**	.448**	.393**	1																
6 Continue Use for Lawns	.357**	.121*	.407**	.409**	.604**	1															
7 Continue Use for Parks	.510**	.165*	.345**	.464**	.479**	.681**	1														
8 Continue Use for Swimming Pool	.428**	.201**	.422**	.402**	.304**	.278**	.454**	1													
9 Conservation important	-0.076	0.035	-0.027	-0.032	0.033	-.120*	0.016	0.049	1												
10 Reduce use important	-0.053	-0.064	-0.086	-0.028	-0.111	-.217**	-0.076	0.009	.592**	1											
11 Informed about water source	-0.046	.168**	-0.062	-0.045	-0.006	-0.117*	-0.041	-0.082	0.096	.120*	1										
12 Years at residence	0.002	0.037	0.006	0.050	.135*	0.017	-0.097	0.000	0.104	0.101	.154**	1									
13 Kids in HH	.231**	-0.076	0.045	.124*	0.007	0.059	0.115*	.118*	-0.096	-0.052	-0.099	-.228**	1								
14 Seniors in HH	-.153**	0.069	0.061	-0.080	0.094	0.030	-.115*	-0.090	.188**	0.031	0.008	.417**	-.478**	1							
15 Income	0.071	0.034	0.033	0.096	0.076	0.108	0.017	-0.003	-0.079	-0.103	.211**	0.018	.258**	-.215**	1						
16 Gender	-0.024	-.125*	0.056	-0.001	0.044	0.094	0.116	0.085	0.010	0.014	-.257**	-0.079	0.108	-0.035	-.121*	1					
17 White	-0.003	-0.021	0.030	0.057	0.043	0.080	0.039	-0.019	-0.084	-0.030	0.060	.163**	-0.052	0.067	0.047	-0.084	1				
18 Education	0.010	0.005	-0.060	-0.030	-0.032	-0.002	0.034	0.060	-0.008	-0.045	.165**	-0.109	.130*	-0.123	.337**	0.023	-0.074	1			
19 Republican	0.037	0.029	0.082	.136*	0.009	.133*	0.032	-0.027	-.204**	-.154*	-0.025	-0.076	0.117	-0.113	0.117	-0.086	0.107	-0.046	1		
20 Democrat	-0.071	-0.047	-0.092	-0.091	-0.008	-0.110	-0.017	-0.017	0.107	0.015	0.004	0.105	-.150*	.163**	-0.080	0.070	-0.014	0.063	-.497**	1	
21 Independent	0.020	0.007	-0.011	-0.072	-0.004	-0.052	-0.020	0.044	.131*	.156*	0.024	-0.007	0.001	-0.017	-0.060	0.033	-0.105	-0.005	-.663**	-.320**	1

*p<.05
**p<.01

Respondents from households with children are more likely to favor maintaining water use for athletic fields, golf courses, parks, and swimming pools, while respondents from households with seniors are significantly *less likely* to favor continuing water use for athletic fields and parks. Men in our sample are more likely to favor continuing water use for business operations than are women. Finally, Republican respondents are more likely to favor continuing water use for golf courses and lawn watering. Relationships between other partisan affiliations and preferred water uses during emergencies are statistically insignificant.

Discussion and Conclusions

While pro-conservation attitudes are important predictors of engaging in everyday activities that can reduce household water consumption, pro-conservation attitudes are poor predictors of our respondents' decisions to take more costly steps to conserve water, such as installing water efficient household devices. By distinguishing low-cost, everyday conservation behaviors from conservation behaviors that require a higher up-front capital investment, we are able to identify greater variability in the role that income plays in predicting conservation behaviors. Family income matters most when it comes to installing water-saving devices that require a higher up-front capital investment, but was otherwise a poor predictor of everyday conservation behaviors.

Additionally, our research finds that the length of time respondents have lived at their current residence is positively associated with installing a number of water-saving devices, lending limited support to existing research finding that place attachment motivates pro-conservation behaviors. Consistent with research by Kelly Fielding and colleagues (2016), our study reveals that age is a significant predictor of participation in a range of water conservation behaviors, with Hays households in which residents over age 60 reside reporting higher rates of participation in conservation behaviors, including city-sponsored rebate programs. Of course, there is a high correlation between years lived at current residence and people age 60 and older in the home.

Newsletters, word of mouth, newspaper articles, and radio ads are currently the most commonly cited sources of information on the City's rebate programs. This indicates room to maximize effective use of digital communication networks, such as the City's website and social media pages. These communication channels are especially important for targeting young adult audiences. Because FHSU students are under-represented in our survey sample, we cannot provide insight on their knowledge about the City's water conservation efforts and sources of information with which they routinely interact. Pending funding, we plan to conduct a follow-up study next year, using a sampling technique that will better allow us to secure responses from FHSU student.

Our survey respondents reported high levels of confidence in the City's management of municipal water resources, and these high levels of satisfaction corresponded with positive perceptions of municipal water quality. Satisfaction with tap water taste was slightly lower than satisfaction with the color and smell of tap water. However, respondents indicated that the quality of municipal water has generally been consistently satisfactory over time. There do appear to be a few holes in Hays residents' knowledge about potential sources of municipal water contamination. Few respondents reported thinking that sediment or pet waste posed serious contamination threats, pointing to potential outreach topics for the City's educational programming.

Our study finds that many Hays residents understand the importance of water conservation and personally engage in a wide range of behaviors to reduce their household water use. In the event of a water emergency, our respondents favor reducing water use for all purposes. When it comes to water uses that are important to continue during a water shortage crisis, our respondents favored continued use for business operations and preferred that the city pool remain open. Respondents with children in their households are particularly likely to favor uses of water that promote outdoor recreation, while these water uses are less important to respondents with seniors in the household. These generational differences in preferences may be important to keep in mind in the event that the City must implement water restrictions.

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