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Laura A. Warner
University of Florida

Wayne H. Hobbs
University of Florida

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Abstract

The study reported here was conducted to inform potential social norms approaches to water conservation programs. Using a theoretically informed survey instrument, we examined Floridians' perceived descriptive norms of close-peer, neighborhood, state, and national groups pertaining to water conservation. Respondents perceived that people conserved less as groups became more distant and perceived that conservation among close peers was most strongly related to their own conservation practices. When we considered perceptions of the four groups together, we found that only perceptions of close peers' conservation efforts significantly predicted respondents' conservation behaviors. Our findings revealed opportunities to highlight descriptive norms as an Extension strategy, especially among clientele's close peers.

Keywords: descriptive norms, landscape practices, referent groups, social norms, water conservation

Laura A. Warner
Associate Professor and Extension Specialist
Department of Agricultural Education and Communication
University of Florida
Gainesville, Florida
lsanagorski@ufl.edu
@Laura_A_Warner

Wayne H. Hobbs
Extension Agent I
University of Florida
Institute of Food and Agricultural Sciences
Extension Clay County
Green Cove Springs, Florida
Whhobbs@ufl.edu

Introduction

Extension works to promote adoption of landscape management best practices among residents across the country, leading to water conservation and better nutrient management (Clemson University Cooperative Extension, 2014; University of California Division of Agriculture and Natural Resources, n.d., University of Florida Institute of Food and Agricultural Sciences, 2013). For those Extension professionals engaged in protecting water resources, the residential lawn and landscape remains an important focus (Ali & Warner, 2017).

Across the United States, Extension professionals are increasingly focused on behavior change above lower level outcomes such as knowledge gain and also are using more innovative strategies to encourage this change among their target audiences (Kumar Chaudhary & Warner, 2015; Rickenbach et al., 2017). One innovative behavior change approach supported by extensive research drawn from environmental psychology (Clayton, 2012) is driven by integrating an audience's perceptions of norms, or perceptions

among target audience members of what other people approve of and normally engage in (Cialdini, Reno, & Kallgren, 1990; Kumar Chaudhary & Warner, 2015). Extension can use norms to help people adopt desirable behaviors. For example, highlighting that a majority of people living in a given neighborhood have retrofitted their irrigation systems could influence those who have not yet done so. Norms also can promote undesired behaviors. For example, perceived social pressure to have a perfect lawn can serve as a barrier that prevents residents from conserving water (Felter, Irani, Monaghan, Carter, & Dukes, 2015).

The concept of norms can be decomposed into subjective norms (expectations of what should be done), injunctive norms (what behaviors are approved of), and descriptive norms (what is being done) (Cialdini et al., 1990; Park, Klein, Smith, & Martell, 2009; Richetin, Perugini, Mondani, & Hurling, 2014; Vinnell, Milfont, & McClure, 2018; Wallen & Romulo, 2017). Although different types of social norms seem similar, individuals' (i.e., Extension clients') perceptions of each contribute uniquely to behaviors (Park et al., 2009). For example, Vinnell et al. (2018) found that injunctive norms bolstered support for earthquake-strengthening legislation whereas descriptive norms did not. The focus of the study we report here was descriptive norms. Descriptive norms are of particular interest because Extension clientele may inaccurately perceive what others are doing, especially when it comes to environmental behaviors, which are often unseen (e.g., composting in the backyard, taking shorter showers).

In their classic study, Cialdini et al. (1990) found that parking garage users who encountered a littered parking area when returning to their car (causing them to perceive littering as the descriptive norm) were more likely to litter than those who returned to a clean parking area. This effect was even more pronounced when individuals observed someone in the act of littering (Cialdini et al., 1990). Richetin et al. (2014) used messages to inform individuals of a descriptive norm: "the majority of the people who used this soap helped the environment by turning off the tap while soaping hands" (p. 349). In this context of water conservation, the researchers found that individuals who received a descriptive norm treatment saved water by turning off the faucet while soaping hands significantly more often than those who did not.

When integrating norms into Extension programming, it is important to consider the type of norms and specify the referent group with which a norm is associated (Park et al., 2009; Wallen & Romulo, 2017). For example, a person's classmates, close friends, and coworkers are three distinct referent groups. Often, the specifics of norms are not considered or defined (McKenzie-Mohr & Schultz, 2014), which has created a gap in what is known about using social norms as a behavior change strategy that has decreased chances of successfully using this strategy to change behaviors.

Extension professionals should consider ways to help individuals feel similar to and connected with the individuals referenced in a message (Richetin et al., 2014). Typically, groups of people closer to an individual (i.e., friends, peers) are more influential on the individual's behavior than more distant groups (Cho, 2006). However, in a study of university drinking habits, Park et al. (2009) found that United States–level descriptive and injunctive norms influenced intent to limit alcohol consumption whereas university-level norms did not. Mixed findings such as this highlight the need to closely examine a target audience's perceptions prior to developing any type of Extension strategy for that audience.

Purpose and Objectives

Because there is significant promise in integrating norms in behavior change interventions, there is a need to examine how different types and levels of norms can be used in various water conservation contexts. The

purpose of our study was to examine the relationship between descriptive norms and Floridians' engagement in water conservation in their yards. Our hypothesis was that as compared to their perceptions of the practices of people at more distant (i.e., neighborhood, state, national) levels, Floridians' perceptions of their close peers' landscape water conservation practices would be more closely related to their own behaviors. The objectives were (a) to describe the norms Floridians perceived surrounding engagement in water conservation among specific referent groups (close-peer, neighborhood, state, and national) and (b) to evaluate how perceived descriptive norms from specific referent groups related to landscape water conservation at the household level.

Methods and Data Sources

We used an online survey we developed to collect data to address our study objectives in November and December 2018. The input variables pertaining to the objectives were close-peer descriptive norms, neighborhood descriptive norms, state descriptive norms, and national descriptive norms (see Table 1). We operationalized close peers as those individuals who were important to the respondent. Each of the descriptive norm variables was measured using a four-item, 5-point Likert-type scale. The responses to each set of these items were averaged to create an index.

The outcome variable was landscape water conservation, which was the average engagement across 18 different landscape irrigation conservation practices (see Table 1). We created dummy variables for each of the 18 practices, where a *yes* response was coded as a 1 and a *no* response was coded as a 0. We calculated the mean of non-*not-applicable* responses to the 18 items to create a landscape water conservation index. However, if a respondent indicated *not applicable* to more than half of the items, we excluded that person's responses from the analyses. We used Cronbach's alpha to estimate the reliability of the four input variables. Generally, values of .7 and above are considered appropriate for use in quantitative research (Santos, 1999), and our reliability values indicated that our scales were acceptable for use.

Table 1.

Variables, Individual Items, and Reliabilities

Variable	Individual items	Response options	α	Real limits
Close-peer descriptive norms[a, b]	The people who are important to me minimize their use of water when taking care of their lawn/landscape The people who are important to me conserve water in their yard The people who are important to me do not waste water when taking care of their lawn/landscape The people who are important to me take care of their landscape using the smallest amount of water possible	*Strongly disagree* to *strongly agree*	.945	1, 5
Neighborhood descriptive norms[a, b]	Most of the people in my neighborhood minimize their use of water when taking care of their lawn/landscape Most of the people in my neighborhood conserve water in their yard Most of the people in my neighborhood do not waste water when taking care of their lawn/landscape Most of the people in my neighborhood take care of their landscape using the smallest	*Strongly disagree* to *strongly agree*	.945	1, 5

	amount of water possible			
State descriptive norms[a, b]	Most of the people in Florida minimize their use of water when taking care of their lawn/landscape Most of the people in Florida conserve water in their yard Most of the people in Florida do not waste water when taking care of their lawn/landscape Most of the people in Florida take care of their landscape using the smallest amount of water possible	*Strongly disagree* to *strongly agree*	.943	1, 5
National descriptive norms[a, b]	Most of the people in the United States minimize their use of water when taking care of their lawn/landscape Most of the people in the United States conserve water in their yards Most of the people in the United States do not waste water when taking care of their lawn/landscape Most of the people in the United States take care of their landscape using the smallest amount of water possible	*Strongly disagree* to *strongly agree*	.950	1, 5
Landscape water conservation[c, d]	I use rain barrels to collect water for use in my garden/lawn I have low-water-consuming plants in my yard I use recycled wastewater to irrigate my lawn/landscape I use high-efficiency sprinklers I use drip (micro) irrigation I have retrofitted a portion of my landscape so that it is not irrigated I have turned off zone(s) or capped irrigation heads for established woody plants I have converted lawn (turfgrass) areas to landscaped beds I have replaced high-water plants with drought-tolerant plants I have replaced high-volume irrigated areas with low-volume irrigation I have installed smart irrigation controls (such as soil moisture sensors [SMS] or an evapotranspiration device [ET]) so irrigation won't turn on when it isn't needed I use a rain sensor to turn off irrigation when it is not needed I calibrate my sprinklers I use a rain gauge to monitor rainfall for reducing/skipping irrigation I use different irrigation zones/zone run times based on plants' irrigation needs I seasonally adjust irrigation time I follow watering restrictions imposed by local government and/or water management districts I group plants according to their water needs	*Yes*, *no*, *not applicable*		0, 1

[a]Respondents were instructed as follows: *Please indicate your level of agreement or disagreement with the following statements*. [b]Response options were *strongly disagree* (1)*, disagree* (2)*, neither disagree nor agree* (3)*, agree* (4)*, strongly agree* (5). [c]Respondents were instructed as follows: *Please mark the response that best describes your water saving practices*. [d]Response options were *Yes* (1), *No* (0), and *not applicable* (0).

We targeted residents 18 years of age and older living in Florida. Our sample indicated that they identified primarily as White and slightly more than half were male (see Table 2). We used a professional survey

sampling company to access a nonprobability sample.

Table 2.

Demographics of Survey Respondents

Characteristic	*f*	%
Race		
White	1,122	91.4
Black	46	3.7
Asian	15	1.2
American Indian	9	0.7
Multiracial	17	1.4
Other	18	1.5
Sex		
Male	656	53.5
Female	571	46.5

Note. n = 1,227.

Prior to analyzing the data, we weighted the data using poststratification weighting methods to reduce potential errors associated with nonprobability sampling (Baker et al., 2013; Maletta, 2007). We adjusted each respondent's data so that the person's contribution was consistent with the age, race, ethnicity, sex, and county's population density as reflected in the 2010 Census (U.S. Census Bureau, 2012).

We used SPSS to analyze the results. We calculated means and standard deviations for objective one. We used Spearman correlations to assess whether statistically significant correlations existed between the four descriptive norms and water conservation practices adopted. Finally, we used a multiple linear regression analysis to evaluate how the four descriptive norms predicted water conservation when considered together. Prior to conducting the analysis, we checked the data for multicollinearity, normality, and homoscedasticity, and all of the criteria were met.

Results

Perceived descriptive norms ranged from 2.68 to 3.50 (see Table 3). Respondents tended to perceive that those closest to them (close-peer and neighborhood referent groups) were more engaged in water conservation than those at more distant referent levels. A landscape conservation practices index of .36 indicates that respondents were engaged in six to seven conservation practices on average. For reference, a mean value of .50 would indicate that a person was engaged in nine of the practices.

Table 3.

Descriptive Statistics of Study Variables

Characteristic	*M* (*SD*)	*Mdn*
Descriptive norms		
Close-peer[a]	3.50 (.84)	3.50
Neighborhood[a]	3.29 (.92)	3.25
State[a]	2.84 (.92)	3.00
National[a]	2.68 (.90)	3.00
Landscape conservation practices[b]	.36 (.24)	0.33

[a]Descriptive norms variables could range from 1 to 5. [b]Landscape conservation practices could range from 0 to 1.

Results of the Spearman correlations indicated that there was a significant association between close-peer, $r_S(1,173) = .352$, $p < .001$, neighborhood, $r_S(1,173) = .236$, $p < .001$, state, $r_S(1,173) = .110$, $p < .001$, and national, $r_S(1,173) = .070$, $p = .031$ descriptive norms and landscape water conservation practices (see Table 4). As referent groups became more distant, the strengths of the relationships decreased.

Table 4.

Correlations Between Descriptive Norms Variables and Conservation Practices

	Conservation practices	
Variable	***r***	***p***
Descriptive norms		
Close-peer	.352**	<.001
Neighborhood	.236**	<.001
State	.110**	.001
National	.070*	.031

Note. **Correlation is significant at $p < .001$, two tailed. *Correlation is significant at $p = .05$, two tailed.

The multiple linear regression analysis showed that the model was significant, $R^2 = .140$, $F(4,1167) = 47.361$, $p < .001$, and predicted 14% of the variance in engagement in water conservation practices (see Table 5). However, of the four variables, a significant relationship existed only between close-peer norms ($t = 10.660$, $p < .001$) and landscape water conservation. The unstandardized beta coefficient associated with

close-peer descriptive norms indicated that compared to people with lower perceptions of close-peer descriptive norms (e.g., 3.5), people with 1-unit-greater perceptions of close peers' engagement in water conservation (e.g., 4.5) would be expected to have a .095-unit-greater conservation practices index, which is equivalent to about two more conservation practices.

Table 5.

Conservation Practices Predicted by Perceived Descriptive Norms of Four Referent Groups

Descriptive norms	*F*	R^2	Unstandardized coefficients beta	Standardized coefficients beta	*p*
Model	47.361	.140			<.001
Close-peer**			.095	.329	<.001
Neighborhood			.017	.064	.072
State			−.003	−.010	.829
National			.011	.043	.289

Note. **significant at $p < .001$.

Conclusions, Implications, and Recommendations

People have a tendency to misjudge norms as a referent group becomes more distant or dissimilar (Berkowitz, 2004). This phenomenon may have been reflected when we asked Floridians to think about others' engagement in landscape water conservation. Respondents perceived that those closest to them were most engaged in landscape water conservation and believed that more distant groups conserved less. For this reason (Cho, 2006), perceptions of conservation at a national level may be most inaccurate, and those for state and neighborhood levels also may be inaccurate to an extent.

We concluded that the more distant the descriptive norm level, the weaker the relationship with adoption, which is consistent with what is known about referent groups (Cho, 2006). Close-peer, neighborhood, and state norms each had a significant relationship with adoption of water conservation practices, and close-peer norms had the strongest relationship with conservation when these variables were considered separately. When we considered the four descriptive norms together, only close-peer norms was a significant predictor of conservation. The findings supported our hypothesis that as compared to their perceptions of the practices of people at more distant (i.e., neighborhood, state, and national) levels, Floridians' perceptions of their close peers' landscape water conservation practices would be more closely related to their own behaviors.

Descriptive norms provide an innovative way to understand a target audience. To integrate descriptive norms into a behavior change strategy, Extension professionals should consider increasing the visibility of engagement in positive behaviors (Cialdini et al., 1990; Kumar Chaudhary & Warner, 2015). The findings of our study imply that making Extension clients more aware of how their close peers are conserving water could be the most effective social norms strategy, though this likely would be difficult in practice. Our recommendation might take the form of Extension programs focused on teaching clients not only how to

conserve water but also training them to promote their personal conservation practices among their close-peer groups. This type of Extension program might be designed in conjunction with volunteer groups such as master gardeners or citizen science programs. Another possible approach might target Extension clientele with the goal of getting them to ask their close peers about conservation. We propose that social media campaigns might be exceptionally well suited for inspiring people to ask their close peers how they save water.

There may be some value in promoting descriptive norms at neighborhood and state levels, but the relationship between these norms and conservation is nullified when close-peer norms are introduced. Importantly, this finding sheds light on how Extension professionals should *not* use descriptive norms. According to our findings, a national-level landscape water conservation campaign likely would not be successful. There could be some value in neighborhood- and state-level campaigns, but promoting close-peer norms is ideal.

Beyond their immediate application, the findings hint at possible elements that could be missing from Extension programs. If Extension professionals could potentially increase their impact by targeting local norms and teaching Extension clients to share their knowledge with others (effectively increasing those others' perceived norms), then perhaps there are opportunities to better prepare Extension professionals to do these things by providing professional development to build facilitation and community development competencies. There also may be a need to consider designing programs in different ways, such as providing social opportunities for people to share their practices in contrast to using a knowledge-based educational approach. The significance of close-peer relationships on conservation practices also could be applied by Extension professionals using diffusion of innovations theory (Rogers, 2003) by targeting opinion leaders (respected individuals within a group that others will follow) to highlight and promote these local norms.

There may also be an opportunity to correct perceptions of conservation at the more distant levels given the increasingly lower perceptions of conservation. Extension professionals could consider collectively engaging in national water conservation campaigns to address such misconceptions. However, as perceptions of the more distant groups' norms do not relate strongly to conservation, this should be a secondary programmatic consideration.

Our findings are limited by our use of a nonprobability sample, although the potential error associated with this type of sampling is reduced due to poststratification weighting (Baker et al., 2013; Maletta, 2007). Further, our data were drawn from Florida residents only, and we believe that water conservation norms may be more visible in this state than other locations in the country, such as those without a year-round growing season. Replicating this study with a random national sample would be an ideal next step.

Extension professionals in all program areas can apply the concept of descriptive norms to their work. Illuminating desired behaviors in local areas might be an effective tool for increasing the occurrence of behaviors in topical areas ranging from health and wellness to agriculture to 4-H and community. Those working in all these areas should consider how they can promote practices using their clients' close-peer networks as well as encourage their clientele to share the knowledge they gain from Extension programs.

Now that relationships between different groups' descriptive norms and water conservation is better understood, Extension professionals can use these insights to develop innovative programming strategies.

Further research is also needed to better understand these findings. A field study comparing the effect of close-peer, neighborhood, state, and national normative messages would help validate the influence of descriptive norms. There would be value in next measuring how injunctive norms interact with these descriptive norms and conservation practices. Researchers might also replicate future analyses using demographic variables (i.e., race, gender, age) as controls and analyze how demographic variables may interplay with norms and influence conservation behaviors.

The R^2 value of the regression model indicated a small but significant explanation of the variance in water conservation behavior, highlighting the fact that there are many other factors driving these behaviors. Yet explaining 14% of the variance is an important finding given that we considered only specific descriptive norms. Some of the most used models of behavior explain, on average, 20%–30% of the behavior under study. Additional study could also be conducted to analyze how the addition of descriptive norms can increase the predictive power of known behavior change models such as the theory of planned behavior (Ajzen, 1991) and diffusion of innovation theory (Rogers, 2003).

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