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Abstract

Residents and decision makers often perceive information regarding water use differently. This is an issue in Florida where water quantity is a concern, and the distribution of accurate knowledge will be necessary to assist in effective conservation efforts. This study used two online surveys to gain insight into Florida residents' and decision makers' (county commissioners, county clerks and county managers) perceptions of water use based on visual images. Using non-probability opt-in sampling methods a total of 525 Florida residents' responses were collected, and in a second survey 169 decision makers' responses were collected. Respondents were asked to associate a specific water user, based on a visual, with high, moderate, or low water usage. A series of chi-square tests were used to compare and test for differences between Florida residents' and decision makers' perceptions, revealing that significant differences in perception did exist. The identification of these differences was used to develop recommendations for enhancing education and communication regarding water use.

Keywords

Framing, Social semiotics, Visuals, Water-use

Water use in Florida: Examining perceptions of water use based on visual images

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Residents and decision makers often perceive information regarding water use differently. This is an issue in Florida where water quantity is a concern, and the distribution of accurate knowledge will be necessary to assist in effective conservation efforts. This study used two online surveys to gain insight into Florida residents' and decision makers' (county commissioners, county clerks and county managers) perceptions of water use based on visual images. Using non-probability opt-in sampling methods a total of 525 Florida residents' responses were collected, and in a second survey 169 decision makers' responses were collected. Respondents were asked to associate a specific water user, based on a visual, with high, moderate, or low water usage. A series of chi-square tests were used to compare and test for differences between Florida residents' and decision makers' perceptions, revealing that significant differences in perception did exist. The identification of these differences was used to develop recommendations for enhancing education and communication regarding water use.

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Introduction

Water is arguably the planet's most important natural resource in that it is necessary to sustain life, is responsible for many important biochemical and environmental processes, and supports many aspects of the economy. Florida, a state known to have an abundant supply of water, is beginning to deplete its supply of freshwater due to a long history of draining wetlands, population increase, and agricultural demand (Barnett, 2007; Leal, Rumble & Lamm, 2015). Lack of knowledge and communication regarding water quantity and quality issues often influence perceptions of water use. In return, these misguided perceptions can have direct implications on individual and large-scale water use actions, often characterized by overuse of the resource. Understanding these perceptions and where differences in perception arise are critical in implementing effective water conservation efforts. Agriculture is often associated with large-scale water use based on societal perceptions and media portrayal of industrial agriculture (Gaines, 2014; Lamm, Lamm & Carter, 2015; Whitaker & Dyer, 2000). In response, the agricultural industry perceives that the public views it collectively as a heavy water user that does not preserve the quality of water, although many farmers do follow best management practices (BMPs; Lamm et al., 2015).

Not only are members of the general public lacking in their understanding of water use in Florida, but decision makers (lawmakers and local leaders) often misunderstand the issue (Molden, 2007). Decision makers (defined in this study as county commissioners, county clerks and county managers) differ from residents in that they are responsible for passing legislation regarding water use. As such, it is imperative that they are provided with the proper resources and knowledge to do so (Molden, 2007). Florida's water resources are regulated and managed by

the state's five water management districts (Northwest Florida, Suwannee River, St. Johns River, South Florida, and Southwest Florida) under the Department of Environmental Protection (DEP), but ultimately state and local decision makers make water regulation decisions (Florida DEP, 2014). The communication among water management experts, decision makers, and managers of water consumptive practices is often inadequate (Leal et al., 2015). There is a need for shared understanding and cooperation in addressing future water conflicts (Barnett, 2017; Huang & Lamm, 2015b; Lamm et al., 2015; Turner, 2016).

Residents and decision makers' perceptions of water use are influenced by a myriad of sources. One type of source is visual portrayals of water users. These visuals are embedded in media messages, surrounding residents and decision makers. But how do residents and decision makers perceive these visuals of water use? The purpose of this study was to examine the influence of visual frames on Florida residents' and decision makers' perceived quantity of water associated with agricultural water users in order to provide recommendations on how to appropriately communicate about water use. The following objectives were used to guide the study:

1. Examine Florida residents' perceptions of water use based on visual images.
2. Examine Florida decision makers' perceptions of water use based on visual images.
3. Describe differences between Florida residents' and decision makers' perceptions of water use based on visual images.

Theoretical Framework

This study took a social semiotic approach (Eco, 1979) looking at images as framing devices (Entman, 1991). Cheregi and Adi (2015) took a similar approach in their study of the visual framing of Romanian migrants. Social semiotics examines the use of images to create meaning (Eco, 1979; Saeed, 1997). Social semiotics posits that visual images cause individuals to make connections to their cultural histories and cognitive information (Jewitt & Oyama, 2011).

Images as symbols and sign systems have been extremely useful in gaining insight on individual perspectives of concepts or ideas inherent in the images. Visual semiotics has been applied in analyzing individual perceptions on images in the context of political campaigns (Mcilwain, 2007), marketing and consumer research (Mick et al., 2004), public health promotion (Brookes & Harvey 2015), and education (Kim, 2008). Recently, images have become useful in gaining information on what individuals perceive about agriculture. It has been suggested that a "farm-to-plate" knowledge gap is prevalent in the United States because citizens often do not have satisfactory knowledge of agriculture (Rumble & Buck, 2013; Smart, 2009). Through viewing two images on traditional and conventional livestock housing methods and answering a series of questions, study participants in Ohio often had inaccurate perceptions of livestock housing (Rumble & Buck, 2013). This knowledge gap not only existed in terms of agricultural livestock, but also in terms of how water was used. Perceptions of water use were explored in this study.

Semiotics examines the meaning and interpretation of an image by way of examining the relationship between the symbol and what it signifies. Researchers have sought to understand how individual meaning is created from simply viewing an image and why meaning differs

among individuals. The theory of framing gives insight into this phenomenon. Generally, a frame is the way that an idea or concept is communicated or portrayed (Entman, 1991). According to Entman (1993) "to frame is to select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation" (p. 52). Framing is the presentation of a limited message meant to entice a particular perspective and interpretation (Entman, 1993). The way that a message is framed yields the activation of different mental frameworks that can have a strong influence on attitudes and decision making (Perloff, 2014).

The process of framing, however, does not solely refer to what is termed *media framing*, or audience responses to framed messages (Entman, 1991; Scheufele, 1999). Framing also can be viewed in the context of individual frames that are brought to message evaluation. From a semiotics standpoint, the specific meaning taken from an image is dependent on the pre-established frames that an individual brings in analyzing the image. This distinctive type of framing is referred to as *individual framing*, and Entman (1993) defined these frames as the collective group of mental ideas that guide an individual's information analysis. These mental ideas or *frames of reference* are drawn from past experiences, knowledge, and personal biases. Individual frames of reference can significantly influence how individuals perceive, organize, and interpret incoming information to make sense of news and draw inferences (Scheufele, 1999). Rather than emphasizing the speaker's framing schema, the focus is on what an audience member believes to be the most salient component of the message (Chong & Druckman, 2007). In recent years, agricultural communication researchers have examined framing in the context of food labels (Abrams, 2015; Jeong & Lundy, 2015) and food safety (Irlbeck, Akers, Baker, Burris

& Brashears, 2014). This study specifically examines visual images of water use and the impact of these visual images on perceptions of water use.

Methods

Two online surveys were used to gain insight into both Florida residents' and decision-maker perceptions of various water uses. For this study, only the section pertaining to perceptions of water use associated with specific images was utilized in the analysis. The targeted population was Florida residents age 18 or older and decision makers consisting of, but not limited to, local county commissioners, county clerks, and county managers. The focus of the study was water because water quantity and quality issues have been exacerbating with increases in wetland draining, saltwater intrusion, and reductions in groundwater wells (Odera, Lamm, Dukes, Irani, & Carter, 2013).

Sampling

The researchers employed two different sampling methods: one for Florida residents and another for decision makers. In sampling the Florida residents, a non-probability opt-in sample was obtained from a public opinion survey research company. Public opinion research often uses non-probability samples as an effective way to gain insight on population estimates (Baker et al., 2013). Non-probability samples require corrections for nonrandom selection and nonresponse, but multiple studies have shown that non-probability samples have the potential to generate results of equal or greater rigor than probability-based samples (Abate, 1998; Twyman, 2008; Vavreck & Rivers, 2008).

A link to the survey was sent via a public opinion survey research company to a sample of selected individuals in the Florida resident category found to be representative of the state

population based on the 2010 Census data. A response rate of 89% (n = 525) was obtained. Weighting procedures were implemented to account for potential exclusion, selection, and non-participation biases, which are inherent setbacks to using a non-probability sample (Baker et al., 2013). For this data, weighting was conducted using post-stratification methods (Kalton & Flores-Cervantes, 2003) based on age, gender, race, ethnicity, and geographic location to ensure that sample demographics were distributed according to the actual composition of the adult Florida population using the 2010 Florida census data. The weighting process provided a sample profile intended to approximate the population of interest in statistical analysis.

In sampling decision makers in Florida, a list of email addresses for all county commissioners, county clerks, and county managers (N = 1,212) was assembled through a web search and direct contact with decision makers' offices. There were three counties in the state that did not have available email addresses; therefore, representatives from these counties were not be included in the survey and is a limitation. For those obtained email addresses, a link to the survey instrument was sent requesting their participation in the study. After the initial email and three reminders, 194 responses were received, resulting in a response rate of 16%. After removing respondents with a substantial amount of missing data (25 respondents), 169 responses were used in the analysis. The respondents were compared to the general decision maker population using chi-square tests based on age, geographic location, and political affiliation. There were no statistically significant differences; therefore, the respondents were deemed to be representative of the population of interest. Demographic characteristics of both Florida resident and decision maker respondents can be seen in Table 1.

Table 1

Demographics of Florida Residents and Decision Makers

Characteristic	Florida Residents (N = 525) %	Decision Makers[a] (N = 169) %
Sex		
Female	51.6	29.8
Male	48.4	70.2
Race		
African American	15.8	5.4
Asian	6.5	0
Caucasian/White (Non–Hispanic)	75.6	89.2
Hispanic Ethnicity	17.0	5.4
Native American	0	3.2
Other	2.1	2.2
Age		
18 - 29	21.5	.60
30 - 39	17.0	6.0
40 - 49	15.5	19.3
50 - 59	20.5	28.9
60 - 69	18.2	29.5
70 - 79	5.9	13.9
80 and older	1.3	1.8
Years Living in FL		
0 - 9	21.9	6.5
10 - 19	25.0	13.0
20 - 29	25.3	13.0
30 and above	27.8	67.5

Note. Percentages have been rounded and may not total to 100. [a]Missing data from decision makers was not included in the demographic analysis.

Instrumentation

The survey instrument was developed from the 2012 RBC Canadian Water Attitudes Study (Patterson, 2012), and reflected a Florida-specific audience, with the addition of new questions specific to agricultural water use and Florida water issues. The instrument was reviewed by a panel of experts on water quality and quantity issues, agricultural water issues, and public opinion research. Members of the panel included the associate director of the Office of Agricultural Water Policy at the Florida Department of Agricultural and Consumer Services,

the director of Government and Community Affairs at the Florida Farm Bureau, the chief executive officer of the Florida Dairy Farmers, and an evaluation specialist with knowledge in survey design and construction. This research was part of a larger study; this paper focuses on the sections of the survey instrument related to perceptions of water use and demographics.

Figure 2. Images of water users presented to residents and decision makers in the surveys.

To measure respondents' perceptions of water use, respondents were shown a series of 12 images pertaining to common water uses in Florida (Figure 2), some agricultural (i.e., irrigating cattle pasture) and some general (i.e., home landscape). While the images were carefully selected to be representative of each water use based on common understanding, the images themselves may have had some effect, as could the labels, and, therefore, should be recognized as a

limitation. However, any study examining semiotics, or using diverse visual frames, accepts this as a recognized limitation (Lester, 2000). Respondents were asked to indicate how much water they believed was being used in each of the visuals by dragging each image to one of three boxes labeled "uses a lot of water," "uses a moderate level of water," and "uses a small amount of water." Respondents were also asked a series of demographic questions.

Data Analysis

Descriptive statistics were calculated in Rv 3.1.2 were used to determine frequencies of responses. A series of Chi square tests were used to compare and test for differences between Florida resident and decision makers' perceptions.

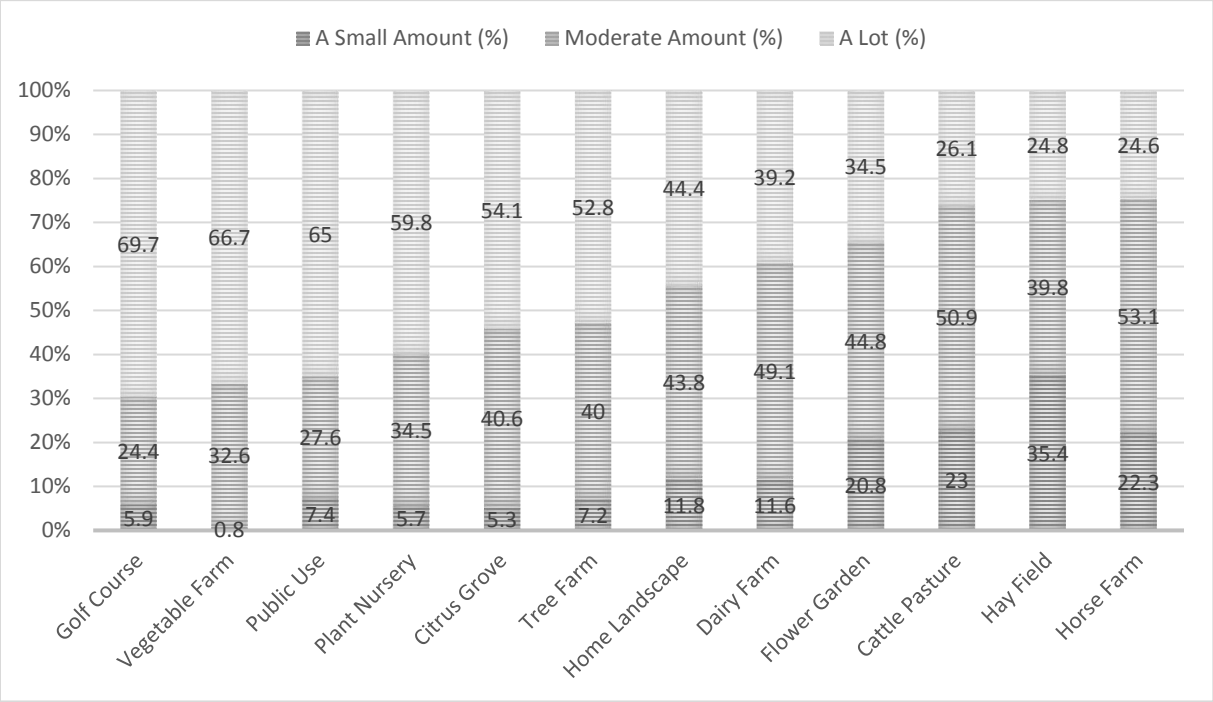
Results

The purpose of this study was to examine Florida residents' and decision makers' perceptions of water use associated with practices depicted in visual images. Some important differences in perception were found.

Florida Residents' Perceptions of Water Use

Florida residents were presented with 12 images (Figure 2) pertaining to water use practices and asked to categorize them based on the amount of water use they associated with each image. A summary of the percentages of Florida residents' water use perceptions can be seen in Figure 3. Florida residents perceived the visuals of golf courses (69.7%), vegetable farms (66.7%), public use (65.0%) to use a lot of water. These three visuals were the only ones where more than half of residents said they perceived them to use a lot of water. Hay fields were perceived by 35.4% of

Florida residents to use a small amount of water. Horse farms (53.1%), cattle pastures (50.9%), dairy farms (49.1%), and flower gardens (44.8%) utilized a moderate amount of water.



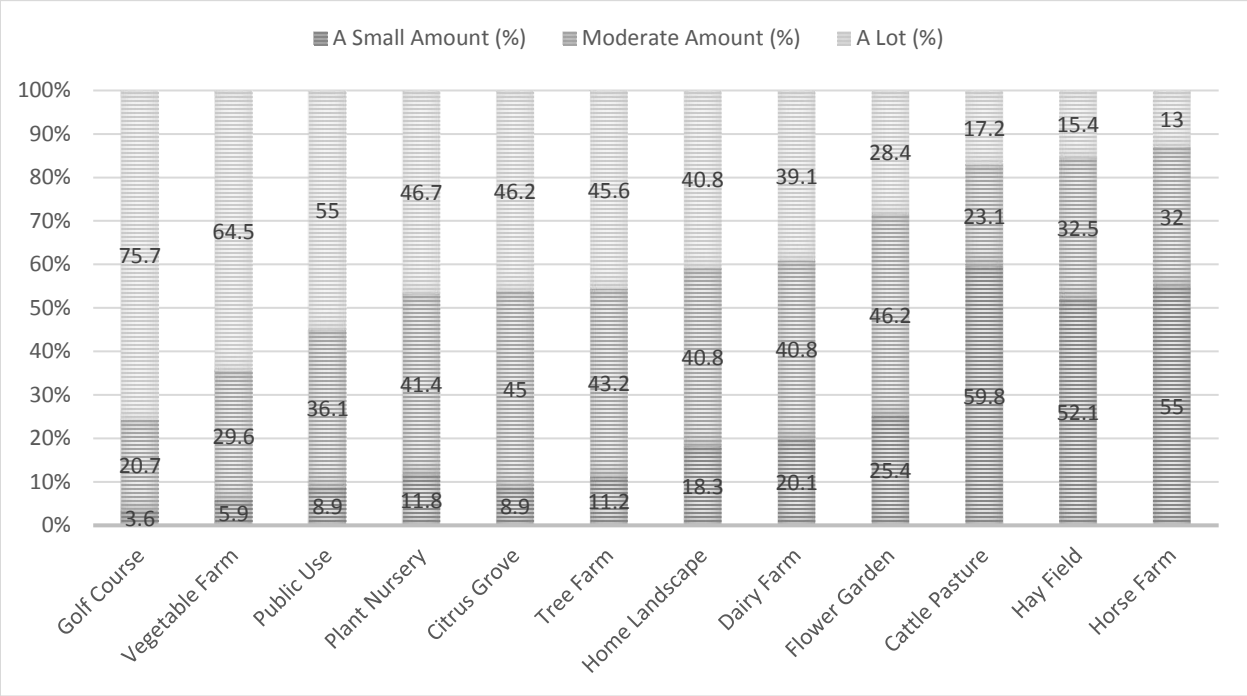
Note. Percentages have been rounded and may not total to 100%.

Figure 3. Perceptions of water use for Florida residents (n = 525).

Decision Makers' Perceptions of Water Use

Florida decision makers were presented with the same 12 images pertaining to water use and asked to delineate the amount of water use they associate with each image. A summary of the percentages of decision-maker water use perceptions can be seen in Figure 4. Similar to residents, decision makers associated the visuals of golf courses (75.7%), vegetable farms (64.5%), and public use (55%) with using a lot of water. In contrast, however, decision makers associated the visuals of cattle pastures (59.8%), horse farms (55.0%), and hay fields (52.1%)

with using a small amount of water. Other uses, including flower gardens (46.2%) and citrus groves (45%) were associated with using a moderate amount of water.



Note. Percentages have been rounded and may not total to 100.

Figure 4. Perceptions of water use for decision makers (*N* = 169).

Comparison of Florida Residents' and Decision Makers' Perceptions

A series of Chi square tests were used to compare and test for differences between Florida resident and decision makers' perceptions. The largest differences in perceptions were in cattle pastures' and horse farms' use of water, with decision makers believing both use a smaller amount of water than the general public. For example, 26.2% of residents perceived cattle pastures to use a lot of water; a perception shared by only 17.2% of decision makers. Decision makers also perceived both hay fields and tree farms used less water than the general public. When it came to personal and/or recreational uses in the home landscape, flower gardens and

golf courses, decision makers and the general public agreed in their perceptions of water use. Golf courses were believed to use the most water by both groups.

Table 2

Frequency of perceived water use by residents and decision makers.

	Residents			Decision Makers			X^2
	%			%			
	A lot	Moderate	Small	A lot	Moderate	Small	
Cattle Pasture	26.2	51.7	22.2	17.2	23.1	59.8	85.51**
Horse Farm	24.9	53.6	21.5	13.0	32.0	55.0	68.66**
Hay field	26.9	38.7	34.4	15.4	32.5	52.1	18.74**
Tree farm	53.7	38.4	7.9	40.8	40.8	18.3	18.07**
Public Use	63.1	28.9	8.1	45.6	43.2	11.2	16.41**
Vegetable Farm	67.8	31.2	0.9	64.5	29.6	5.9	14.86**
Citrus Grove	54.5	40.4	5.1	46.7	41.4	11.8	9.94**
Dairy Farm	38.7	49.9	11.4	39.1	40.8	20.1	9.34**
Plant Nursery	58.4	35.1	6.5	46.2	45.0	8.9	7.80*
Home Landscape	46.7	41.0	12.3	55.0	36.1	8.9	3.82
Flower Garden	34.8	45.2	20.0	28.4	46.2	25.4	3.32
Golf Course	70.7	23.4	5.9	75.7	20.7	3.6	2.24

Note. $p^* < 0.05$; $p^{**} < 0.01$.

Discussion

The results provide an interesting discussion regarding semiotics and framing based on differences in signification (Saeed, 1997). Prior to offering implications and recommendations, it is important to recognize the limitations of the study. The survey and subsequent statistical analyses indicated significant differences between what Florida residents and decision makers perceive about Florida water use. The low response rate of the decision maker group should be recognized; however, statistical tests were run to ensure the sample was representative of the population, in terms of age, geographic locations, and political preference. Another important consideration is the use of the terminology in assigning water quantity perceptions. The phrases, "uses a lot of water," "uses a moderate level of water," and "uses a small amount of water,"

might imply different connotations to different individuals. However, perceptions of the amount of water use are important in shaping public opinion and must be simplified as the public votes on their overall thoughts, rather than actual knowledge of application (e.g. gallons used by industry).

Recognizing the limitations, both Florida residents and decision makers saw the same images pertaining to water use in Florida, but different interpretations were made when assessing the amount of water consumption associated with the specific user depicted in the image. The standardization of the images shown in the study provided an unbiased depiction of how individuals perceive water use. If the images were different, or if images were not provided, it would be more difficult to draw direct conclusions from the data because individuals might have different thoughts about water use based on differences in their presentation in the survey. In addition, if different images were shown representing the water users, it is likely that the results would be different. Components in the new images may resonate differently with individuals providing different perceptions specific to that image. Even small changes, including, but not limited to color, size, and dimension, could alter perceptions. For this reason, the images shown were carefully designed to draw conclusions relevant to water use in Florida.

Implications and Recommendations

Based on the findings of this study, Florida residents and decision makers vary in their perceptions of water use. This is important because both parties play an important role in support of water conservation efforts and legislation of water use. If residents perceive certain water uses to be more demanding on Florida's water supply, they may support legislation or restrictions on

water use for that industry or group above others. If decision makers perceive certain water uses to be more demanding on Florida's water supply, they may propose legislation of or restrictions on water use that impact particular industries or water users above others.

All Floridians have an important role to play in conserving water and implementing best practices to encourage water conservation. All parties impacted by water issues in Florida must communicate information with one another, otherwise false information will earn validity, affect judgement, and create contradicting perceptions (Huang & Lamm, 2015a; Leal et al., 2015). These differing perceptions can complicate this communication. It is important for agricultural communicators to understand differences in perceptions and seek to share accurate information about water use to residents and decision makers. Communicators should work with journalists to share accurate and timely data on water use in local areas. Communicators should listen to the questions asked by decision makers in order to discern what information about water use is needed. Additionally, agricultural communicators should pay attention to conversations about water use via social media channels in order to understand resident perceptions of water use. They can then engage in these social media conversations to share accurate information about water use.

One group of agricultural communicators that plays an important role in communicating about water conservation is Extension professionals. Extension professionals can serve as liasons in this communication process to disseminate information and provide knowledge from a local and statewide perspective. Extension professionals are a great resource because they work in every county in Florida and are viewed as representing both federal and state agencies (Huang &

Lamm, 2015b; Lubell, Niles & Hoffman, 2014); therefore, they are accessible and have the capability to unite all stakeholders. For these reasons, they serve as an effective tool for breaking the communication barriers that normally exist between policymakers and laypersons (Leal et al., 2015). Extension professionals also remain informed on changing water policies, regulations, and issues; therefore, they have accurate and unbiased knowledge to counteract misconceptions surrounding water use and deliver relevant knowledge when necessary (Huang & Lamm, 2015b; Lubell et al., 2014). Additionally, they can serve as a direct contact for questions, advice, and information regarding water policies, help decision makers understand important water regulation topics, and provide them with the resources to make meaningful and pertinent decisions (Huang & Lamm, 2015b; Lamm et al., 2015; Leal et al., 2015).

Ultimately, facilitating consensus and cooperation among all competing stakeholders will be necessary in administering the most effective regulations to satisfy all parties and maximize water conservation (Lamm et al., 2015; Lubell, 2004). To address Florida's water issues, it's important to foster shared understanding among residents and decision makers. This study illuminates differences in perceptions of water use among residents and decision makers. Where water quantity is concerned, the distribution of accurate knowledge to both groups will be necessary to assist in effective conservation efforts.

References

Abate, T. (2008). Accuracy of online surveys may make phone polls obsolete. *The San Francisco Chronicle,* D1.

Abrams, K. M. (2015). Loss aversion and regulatory focus effects in the absence of numbers: Qualitatively framing equivalent messages on food labels. *Journal of Applied Communications, 99*(3), 21-36. Retrieved from http://journalofappliedcommunications.org/images/stories/issues/2015/jac_v99_n3_article2.pdf

Baker, R., Brick, J. M., Bates, N. A., Battaglia, M., Couper, M. P., & Dever, J. A. (2013). *Report of the AAPOR task force on non-probability sampling.* American Association for Public Opinion Research. Retreived from https://www.aapor.org/AAPORKentico/AAPOR_Main/media/MainSiteFiles/NPS_TF_Report_Final_7_revised_FNL_6_22_13.pdf

Barnett, C. (2007). *Mirage: Florida and the vanishing water of the Eastern U.S.* Ann Arbor, Michigan: The University of Michigan Press.

Blaney, J. R., & Wolfe, A. S. (2004). Critical theories of how media shape culture, values, and perspectives. In *Communication theories for everyday life*, eds. J. R. Baldwin, S. D. Perry and M. A. Moffitt. Boston, MA: Pearson Education, Inc.

Brookes, G., & Harvey, K. (2015). Peddling a semiotics of fear: A critical examination of scare tactics and commercial strategies in public health promotion. *Social Semiotics, 25*(1), 57-80. doi: 10.1080/10350330.2014.988920

Cheregi, B. & A. Adi. (2015). The visual framing of Romanian migrants in the national press: A social semiotic approach. *Romanian Journal of Journalism & Communication, 10*(2). Retrieved from http://eds.b.ebscohost.com/eds/detail/detail?sid=889fca26-71a8-4cc4-b4b3-

08d7c62e600c%40sessionmgr101&vid=0&hid=117&bdata=JnNpdGU9ZWRzLWxpdmU%3d#AN=110103689&db=ufh

Chong, D., & Druckman, J. N. (2007). Framing theory. *Annual Review of Political Science, 10*, 103-126. doi: 10.1146/annurev.polisci.10.072805.103054

Eco, U. (1979). *A theory of semiotics*. Indiana: Indiana University Press.

Entman, R. M. (1991). Symposium framing U.S. coverage of international news: Contrasts in narratives of the KAL and Iran Air incidents. *Journal of Communication, 41*, 6–27. Retrieved from http://jclass.umd.edu/classes/cpsp222/Entman%201991.pdf

Entman, R. M. (1993). Framing: Toward clarification of a fractured paradigm. *Journal of Communication, 43*(4), 51–58. doi: 10.1111/j.1460-2466.1993.tb01304.x

Florida Department of Environmental Protection. (2014). Water rules by program area. Retrieved from http://www.dep.state.fl.us/water/rulesprog.htm#gw

Gaines, E. (2014). Media representations of science, and implications for neuroscience and semiotics. *Semiotica, 200*, 103-117. doi: 10.1515/sem-2014-0011

Hoopes, J. (1991). *Peirce on signs. Writings on semiotics by Charles Sanders Peirce*. Chapel Hill, NC: The University of North Carolina Press.

Huang, P., & Lamm, A. J. (2015a). Impact of experience and participation in Extension programming on perceptions of water quality issues. *Journal of International Agricultural and Extension Education, 22*(3). doi:10.5191/jiaee.2015.22303

Huang, P., & Lamm, A. J. (2015b). Understanding public engagement in water conservation behaviors and knowledge of water policy: Promising hints for Extension. *Journal of Extension, 53*(6). Retrieved from http://www.joe.org/joe/2015december/rb1.php

Irlbeck, A., Akers, C., Baker, M., Burris, S., & Brashears, M. (2014). A case study and framing analysis of the 2008 Salmonella Outbreak. *Journal of Applied Communications, 98*(2), 65-77. Retrieved from http://journalofappliedcommunications.org/images/stories/issues/2014/jac_v98_n2_article5.pdf

Jeong, Y. & L. K. Lundy. (2015). Evaluating Food Labels and Food Messages: An Experimental Study of the Impact of Message Format and Product Type on Evaluations of Magazine Food Advertisements. *Journal of Applied Communications, 99*(1). Retrieved from http://journalofappliedcommunications.org/images/stories/issues/2015/jac_v99_n1_article4.pdf

Jewitt, C. & T. Van Leeuwen. (2001). *The Handbook of Visual Analysis*. Thousand Oaks, CA: Sage Publications.

Kalton, G., & Flores-Cervantes, I. (2003). Weighting methods. *Journal of Official Statistics, 19*(2): 81-97.

Keane, W. (2003). Semiotics and the social analysis of material things. *Language and Communication, 23*(3-4), 409-425. doi:10.1016/S0271-5309(03)00010-7

Kim, G. (2008). Comparative analysis of photographic images in Korea and Canada: Semiotic analysing photographic text for media education. *Secondary Education Research, 56*(2), 249-272.

Lamm, K.W., Lamm, A. J., & Carter, H. S. (2015). Bridging water issue knowledge gaps between the general public and opinion leaders. *Journal of Agricultural Education, 56*(3), 146-161. doi: 10.5032/jae.2015.03146

Leal, A., Rumble, J. N., & Lamm, A. J. (2015). Setting the agenda: Exploring Floridian's perceptions of water quality and quantity issues. *Journal of Applied Communications, 99*(3), 53-67. Retrieved from http://journalofappliedcommunications.org/images/stories/issues/2015/jac_v99_n3_article4.pdf

Lester, P. M. (2000). *Visual communication: Images with messages.* Belmont, CA: Wadsworth.

Lubell, M. (2004). Collaborative watershed management: A view from the grassroots. *The Policy Studies Journal, 32*(3), 341-361. doi: 10.1111/j.1541-0072.2004.00069.x

Lubell, M., Niles, M., & Hoffman, M. (2014). Extension 3.0: Managing agricultural knowledge systems in the Network Age. *Society and Natural Resources, 27*(10), 1089-1103. doi: 10.1080/08941920.2014.933496

Mcilwain, C. D. (2007). Race, pigskin, and politics: A semiotic analysis of racial images in political advertising. *Semiotica, 167*(1-4), 169-191. doi: 10.1515/SEM.2007.075

Mick, D. G., Burroughs, J. E., Hetzel, P., & Brannen M. Y. (2004). Pursuing the meaning of meaning in the commercial world: An international review of marketing and consumer research founded on semiotics. *Semiotica, 152*(1-4), 1-74. Retrieved from https://gates.comm.virginia.edu/dgm9t/Papers/Mick%20Burroughs%20Hetzel%20and%20Brannen%202004%20Pursuing%20the%20Meaning%20of%20Meaning%20in%20the%20Commercial%20World.pdf

Molden, D. (Ed.). (2007). *Water for food, water for life: A comprehensive assessment of water management in agriculture.* Sterling, VA: Earthscan.

Patterson, L. (2012). *2012 RBC Canadian water attitudes study.* RBC Blue Water Project. Retrieved from http://www.rbc.com/community-sustainability/environment/rbc-blue-water/index.html

Perloff, R. M. (2014). *The dynamics of persuasion: Communication and attitudes in the 21st century* (5th ed.). New York, NY: Routledge.

Odera, E., Lamm, A. J., Dukes, M., Irani, T., & Carter, H. S. (2013). *Water issues in Florida: How Extension can facilitate stakeholder engagement and involvement*. UF/IFAS Extension EDIS Publication. Retrieved from http://edis.ifas.ufl.edu/wc151

Rumble, J. N., & Buck, E. B. (2013). Narrowing the farm-to-plate knowledge gap through semiotics and the study of consumer responses regarding livestock images. *Journal of Applied Communications, 97*(3), 57-70. Retrieved from http://journalofappliedcommunications.org/images/stories/issues/2013/jac_v97_n3_article6.pdf

Saeed, J. I. (1997). *Semantics*. Malden, MA: Blackwell Publishers Inc.

Scheufele, D. A. (1999). Framing as a theory of media effects. *Journal of Communication, 49*(1), 103-122. doi: 10.1111/j.1460-2466.1999.tb02784.x

Smart, R. (2009). Closing the farm to plate knowledge gap. The Huffington Post. Retrieved from http://civileats.com/2009/06/19/closing-the-farm-to-plate-knowledge-gap/

Turner, S. P. (2016). Internal and external influences on water resource decision making. *Society and Natural Resources, 29*(2), 203-217. doi: 10.1080/08941920.2015.1058996

Twyman, J. (2008). Getting it right: YouGov and online survey research in Britain. *Journal of Elections, Public Opinions and Parties, 18*, 343-354. doi: 10.1080/17457280802305169

Vavreck, L., & Rivers, D. (2008). The 2006 cooperative congressional election study. *Journal of Elections, Public Opinion and Parties, 18*(4), 355-366. doi: 10.1080/17457280802305177

Whitaker, B. K., & Dyer, J. E. (2000). Identifying sources of bias in agricultural news reporting. *Journal of Agricultural Education, 41*(4), 125-133. doi: 10.5032/jae.2000.04125