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Communicating About Water in the Floridan Aquifer Region: Part 1—What Do People Know About Water Science?[1]

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Meaningful engagement by the public in the water decisions that affect their lives requires basic scientific knowledge, such as where their water comes from, what factors affect quality and availability, and which challenges influence the water supply.

A 2020 study suggests that Florida and Georgia residents lack fundamental knowledge about their water resources, including regional water processes, challenges, and policies. This is the base of information that would enable a person to competently participate in water discussions and make citizen-level voting decisions on topics related to the Floridan aquifer.

This publication is intended for water communicators including Extension agents and educators. Water communicators can build the public's water science comprehension in areas where the study identified knowledge deficits, thereby supporting increased public engagement. The findings also suggest the level of water science complexity that the public is equipped to understand.

How Was Regional Water Knowledge Assessed?

An "Ordinary Water Science Knowledge" (OWSK) assessment tool was developed for the Floridan Aquifer region and administered to 806 Florida and Georgia residents. Participants were selected to represent people geographically and demographically in the state.

Participants answered 27 multiple-choice and true-false water science questions relevant to the Floridan Aquifer region. Representatives from agriculture, forestry, and environmental organizations, as well as community leadership and scientists identified the examined assessment topics as those that the public "need to know."

The following is a sample question:

> *What is the primary source of drinking water in North and Central Florida?*
>
> These are the response choices: underground water; rainfall collected in cisterns; surface water; or ocean water with the salt removed.

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Areas of Relatively High Knowledge

Results of the study indicate that residents are most knowledgeable about water topics that they may have encountered in their daily lives or through local media. These include urban water challenges, water conservation, climate change, and algae.

- 71% of participants correctly identified algae as an indicator of high nutrient levels.
- 62% correctly identified potential steps that cities can take to reduce water use.

Fundamental Indicators

The foremost indicator of the public's ability to understand regional water challenges and participate in water discourse may be their ability to identify the region's primary source of drinking water. Approximately half of the participants correctly answered these questions, suggesting that educational interventions would be required for much of the public to understand complex regional water topics.

- 57% of participants correctly identified *underground water* as the region's primary drinking water source.
- 54% correctly selected the definition of an aquifer.

Areas of Relatively Low Knowledge

Participants possessed relatively low levels of water science knowledge on topics including natural water processes, aquifer recharge, nutrient pollution, and current water policy, all of which could be highly relevant to future water policy proposals in the region.

- 50% of participants correctly identified fertilizer as a source of nutrient pollution.
- 48% correctly identified a spring as an area where groundwater flows to the surface.
- 44% correctly identified rainwater seeping through the soil as the primary way Floridan Aquifer water levels increase.
- 44% correctly indicated that easily infiltrated soils carry the risk of increased groundwater pollution.
- 40% correctly indicated that one reason aquifer levels decline during droughts is that more water than usual is pumped from the aquifer.
- 20% correctly indicated that septic tanks are a source of nutrient pollution.

Note that when interpreting correct answer percentages, it is necessary to recognize the effect of guessing. For example, if participants selected from four answer options at random, consider that the participants could answer correctly at a 25% rate. In other words, just because 50% of participants answered correctly, does not mean that 50% know the correct answer.

How to Use This Information

Communicate for understanding. With awareness of what the public does and does not know, present water information at a level that maximizes understanding. Increased understanding also increases the public's ability to participate in the water decisions that affect their lives.

Educate for democratic participation. The general public does not need to know everything that a hydrologist, or even a top high school student, knows about water science, but there is a level of scientific knowledge that improves their ability to participate. Water education should consider what the public needs to know for effective engagement. The topics included in this assessment were identified as important by water scientists and stakeholders. (See Hundemer and Monroe (2020) for a comprehensive list of assessment questions.)

Be aware of the risks of low water science knowledge. At low levels of water science knowledge, the public may not be aware of the impact water quality and quantity have on their lives. They may, therefore, fail to take steps to protect critical water resources, even when it is in their best interest to do so (Dewey, 1916; Fischer, 2000). Additionally, low levels of water science knowledge allow false water information to more easily mislead the public (Sharon & Baram-Tsabari, 2020).

Considerations When Implementing New Water Policies

Not everyone wants to know more about water science. People have limited capacity and willingness to invest in learning about water. Stakeholders, such as farmers and environmentalists, who are substantially affected by public water management decisions, may be more motivated to invest in water education than the average resident.

People may not believe in water science. As detailed in EDIS publication #AEC781, "Do People Believe Water Science?", just because people are informed about water science does not mean they accept it as fact. Therefore, education alone may not be adequate to affect water beliefs or behaviors.

Avoid using water science to induce people to make the "right" water decisions. Water science, like any science, describes what *is*, not what *ought* to be. Water science is a tool for understanding the implications of various water management options, but it is up to society to choose water management strategies appropriate for their ecological, economic, and social context. Using water science to prescribe specific courses of action threatens the perceived legitimacy of the science, scientists, and communicators. Moreover, using water science to sway public opinion is likely to be ineffective. Scientific knowledge is only one factor that affects decision-making (Owens, 2000; Sturgis & Allum, 2004). When making water and other decisions, people consider their values (Douglas & Wildavsky, 1982; Haidt, 2012; Kahan & Braman, 2006), the advice of other people (Chong & Druckman, 2007; Kahan, 2017), and communication frames (Chong & Druckman, 2007; Entman, 1993; McCombs & Reynolds, 2008). Explore each of these factors in this EDIS series, Communicating About Water Science in the Floridan Region.

Do not assume that your audience's knowledge is reflected in this study. The findings presented above represent the water science knowledge of Florida and Georgia residents, but any subpopulation could be more or less water literate (overall or on subtopics). As an example, most of the survey participants reside in metropolitan counties. Understandably, they were most knowledgeable about water topics relevant to metropolitan life. Residents of rural areas, who have different water experiences, could have above-average scientific knowledge on topics related to rural living.

For more information on this study, see "The Water Science Communication Problem: Water Knowledge and the Acceptance or Rejection of Water Science" at https://doi.org/10.1016/j.jhydrol.2021.127230 (Hundemer et al., 2021).

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References

Chong, D., & Druckman, J. N. (2007). A theory of framing and opinion formation in competitive elite environments. *Journal of Communication, 57*(1), 99–118. https://doi.org/10.1111/j.1460-2466.2006.00331.x

Dewey, J. (1916). *Democracy and education: An introduction to the philosophy of education*. The Free Press.

Douglas, M., & Wildavsky, A. (1982). *Risk and culture: An essay on the selection of technical and environmental dangers*. University of California Press.

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

Fischer, F. (2000). *Citizens, experts, and the environment: The politics of local knowledge*. Duke University Press. https://doi.org/10.1215/9780822380283

Haidt, J. (2012). *The righteous mind: Why good people are divided by politics and religion*. Random House, Inc.

Hundemer, S., & Monroe, M. C. (2020). A co-orientation analysis of producers' and environmentalists' mental models of water issues: Opportunities for improved communication and collaboration. *Environmental Communication*, *15*(3), 320–338. https://doi.org/10.1080/17524032.2020.1828128

Hundemer, S., Monroe, M. C., & Kaplan, D. (2021). The water science communication problem: Water knowledge and the acceptance or rejection of water science. *Journal of Hydrology, 604*: 127230. https://doi.org/10.1016/j.jhydrol.2021.127230

Kahan, D. M. (2017). On the sources of ordinary science knowledge and extraordinary science ignorance. In K. H. Jamieson, D. M. Kahan, & D. A. Scheufele (Eds.), *Oxford Handbook of the Science of Science Communication* (pp. 34–49). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780190497620.013.4

Kahan, D. M., & Braman, D. (2006). Cultural cognition and public policy. *Yale Law & Policy Review, 24, Public Law Working Paper No. 87*, 147–170.

McCombs, M., & Reynolds, A. (2008). How the news shapes our civic agenda. In M. B. Oliver & J. Bryant (Eds.), *Media Effects: Advances in Theory and Research* (Third, pp. 1–16). Routledge.

Owens, S. (2000). 'Engaging the public': Information and deliberation in environmental policy. *Environment and Planning A: Economy and Space*, *32*(7), 1141–1148. https://doi.org/10.1068/a3330

Sharon, A. J., & Baram-Tsabari, A. (2020). Can science literacy help individuals identify misinformation in everyday life? *Science Education*, *104*(5), 873–894. https://doi.org/10.1002/sce.21581

Sturgis, P., & Allum, N. (2004). Science in society: Re-evaluating the deficit model of public attitudes. *Public Understanding of Science*, *13*(1), 55–74. https://doi.org/10.1177/0963662504042690