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Informal Water Education and Public Outreach

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Readers of the *Journal of Contemporary Water Research and Education* are familiar with many soil and water quality and quantity threats and are working to mitigate problems and/or educate the public on how they can be involved in solutions. This issue focuses on informal educational efforts that target students, community members, youth, and others in venues outside the formal classroom. These efforts are especially important if we are to make progress with the challenges ahead of us.

The Cooperative Extension Service has provided educational publications and programs for the public for over 100 years. The Smith Lever Act formalized Extension in 1914, establishing USDA's partnership with land-grant universities to apply research and provide education in agriculture (NIFA 2015). Researchers at land-grant universities, particularly those in agriculture fields, generally have a good understanding of the importance of outreach and citizen engagement. However, researchers outside of agriculture or at non-land-grant universities may not realize the value of outreach and engagement. The National Science Foundation (NSF) recognizes the significance of sharing university knowledge and research with the public and recently took steps to assure that all researchers who receive NSF funding strive to share their knowledge and results with the public. Proposals are now evaluated on both the intellectual merit and broader impacts of the work, as noted:

> *The two merit review criteria are listed below. Both criteria are to be given full consideration during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. …*
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> *When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:*
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> - ***Intellectual Merit:*** *The Intellectual Merit criterion encompasses the potential to advance knowledge; and*
> - ***Broader Impacts:*** *The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.* (NSF 2014)

The "broader impacts" requirement has been a challenge for many researchers, as acknowledged by the NSF in a supporting document:

> *Proposals submitted to the National Science Foundation are evaluated through use of two merit review criteria, which all proposals must address explicitly. Experience shows that while most proposers have little difficulty responding to the criterion relating to intellectual merit, many proposers have difficulty understanding how to frame the broader impacts of the activities they propose to undertake.* (NSF 2001)

These concerns were more forcefully stated by the editorial in the APS article by Ernie Tretkoff,

NSF's "Broader Impacts" Criterion Gets Mixed Reviews:

> *However, some scientists object to research funding being coupled to education or outreach efforts. Mildred Dresselhaus of MIT says she has heard from many scientists who are unhappy with the broader impacts requirements, and who feel they should be funded based on the quality of their research, not for outreach. Many physicists feel they don't have the expertise to do outreach activities, she adds. She thinks education and outreach should be encouraged, but shouldn't be a requirement for research funding.*
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> *Some scientists, especially those applying for their first grants, find the broader impacts requirement confusing and burdensome. Given the low success rate for scientists applying for their first grant, Dresselhaus says that these beginning professors are overstretched trying to survive. They feel they have to do everything possible to get a grant, and they think that they must devote significant time and energy to addressing the broader impacts criterion. Dresselhaus describes this situation as "punitive."* (Tretkoff 2015)

Tretkoff's article notes that "NSF grants that support large research centers often provide for extensive outreach projects" (and devote 10% of the funding to the center) which are of great benefit to research faculty. No mention is made, however, of the value of collaborating with faculty who have expertise in Extension, engagement, and outreach.

Researchers are advised to work with those experienced in Extension, outreach, engagement, and education to assure that they are sharing their new knowledge with the public. The project examples in this issue give an overview of how successful collaborations can work. These efforts should not be a last minute add-on to research efforts, however, but an integral part of the project and proposal development. The 10% of the proposal budget, mentioned by Tretkoff, should be a minimum for this collaboration, because doing good outreach and education takes time and money, just as any research does.

I hope that you enjoy reading the articles in this special issue and either find new ways to do outreach or see the value of collaborating with those who do this work.

The paper by Busse et al. describes a social indicator survey used to gather baseline data on urban and agricultural residents' attitudes towards, and usage of, water quality conservation practices. Local watershed organizations then used various outreach methods to encourage residents to implement specific practices. Post-project surveys were conducted to assess the effectiveness of outreach efforts. The authors found that while outreach efforts did not change attendee behavior, there were changes in participant attitudes. They also found that the primary barrier to practice adoption for all respondents was cost.

Co-authors Dann and Schroeder describe using camps as a context for nonformal learning. Their article describes a water resource education camp for youth that utilizes best practices in nonformal education methodologies. They used pre-camp and immediate post-camp surveys to evaluate their camp's effect on teens' Great Lakes literacy, place attachment, stewardship attitudes, and stewardship intentions. The authors include recommendations for designing nonformal water literacy education to enhance youth development and deep learning through nonformal camp-based programs.

Haynes and Cech describe multiple outreach efforts targeted at undergraduate students from multiple disciplinary areas and community members. The focus of the program is to teach the important role of water in Colorado's economy and environment and encourage residents' (students and community members) participation in finding solutions to local and statewide water issues.

The paper by Londo et al. describes the conditions that have led to the development of harmful algal blooms in Lake Erie, the legislative action that has been taken in attempts to curb the problem, and the educational programs developed by Extension, in partnership with state agencies, non-government organizations and other interested parties, to address water quality issues with Ohio agricultural producers and the general public.

The paper by Schneemann, Dorworth, and Gulley describes a collaborative outreach program, *Lawn to Lake*, targeted at people responsible for lawn and landscape care. The goal of this program is to reduce pesticide and fertilizer inputs to the Great Lakes

basin by promoting and implementing sustainable lawn and landscape practices (by promoting a switch from conventional lawn care practices to natural lawn care) at the community and household level. The authors also share "lessons learned" that will help others develop similar programs.

The article by Shelton et al. describes an effort, using Extension, classroom learning, and research, to develop educational programs addressing municipal stormwater runoff using green infrastructure and other best management practices. Extension programming targeted programs for design and green industry professionals, MS4 stormwater program managers, municipal officials, Master Gardeners, and homeowners. Classroom efforts included the development of new course lectures and design projects for undergraduates. Research studies evaluated rain garden hydrologic and plant growth attributes, homeowner perspectives on rain garden installation programs, and current regional bioretention design standards.

Authors Swistock et al. conducted research to document roadside spring use as a drinking water source and drinking water quality by surveying over 1,000 people and 37 springs for health-based drinking water quality. They also report on a more intensive follow-up study of ten of the 37 roadside springs. The authors found that frequent use of roadside springs with poor drinking water quality represent a significant health risk that needs to be addressed in public health education programs. The research also found that when only a single sample is collected, total coliform bacteria was found to be a better indicator than *Escherichia coli* bacteria of the overall microbiological drinking water safety of these springs.

Authors Wolfson et al. describe a collaborative education effort by four universities to deliver training programs that build capacity in local water resource professionals. Collaborators examined the core proficiencies that watershed group leaders need and evaluated how existing programs have approached professional training. They also analyzed effective methods for delivering the training. Results indicated that successful watershed leaders must be able to integrate basic natural science knowledge and a number of "soft" skills, including: leadership, communication, collaboration, technology, policy, and planning. The authors share the features of training programs that effectively build watershed leadership capacity.

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Dr. Carroll researches and supports youth education in natural resources and the environment for the Indiana 4-H Program and other informal youth and adult audiences. She works extensively with faculty and staff from various disciplines and has written or collaborated on 84 publications, served as committee chair for seven students and committee member for 26 students from 12 departments. Natalie served as an investigator, co-investigator, or collaborator on grants totaling more than $27 million, primarily as the outreach coordinator or curriculum developer. She has provided sessions at 452 Extension conferences, schools, workshops, short courses, and other organized educational activities for 11,833 youth and 8,920 adults since joining Purdue in 1995.

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