

# Exploring Applications of Behavioral Economics Research to Environmental Policy-making in the Chesapeake Bay Watershed



STAC Workshop Report  
August 27-28, 2014  
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## **About the Scientific and Technical Advisory Committee**

The Scientific and Technical Advisory Committee (STAC) provides scientific and technical guidance to the Chesapeake Bay Program (CBP) on measures to restore and protect the Chesapeake Bay. Since its creation in December 1984, STAC has worked to enhance scientific communication and outreach throughout the Chesapeake Bay Watershed and beyond. STAC provides scientific and technical advice in various ways, including (1) technical reports and papers, (2) discussion groups, (3) assistance in organizing merit reviews of CBP programs and projects, (4) technical workshops, and (5) interaction between STAC members and the CBP. Through professional and academic contacts and organizational networks of its members, STAC ensures close cooperation among and between the various research institutions and management agencies represented in the Watershed. For additional information about STAC, please visit the STAC website at <http://www.chesapeake.org/stac/>.

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## **Introduction**

Many pressing environmental management issues, including restoring the Chesapeake Bay, are complex and appear intractable. Solutions are elusive because environmental problems cannot be addressed purely through gaining a better understanding of physical systems or through developing more detailed models. Addressing complex environmental issues requires consideration of the broader economic, social, and political context in which the physical environmental problem exists, and potential technological “solutions” to such a problem. In addition, individual households, agricultural firms, and other organizations will in some cases incur large costs to make changes, such as the implementation of Best Management Practices (BMPs), to lead to improvements in the Chesapeake Bay's water quality.

The messy nature of intricate environmental management issues is a result of both the biophysical complexity of the system and stakeholders' differing perceptions and values, and the trade-offs that may be required for problem-solving. This complexity implies that new information is needed to develop effective policy approaches that address the multiple sources of environmental problems. The social sciences, including the emerging fields of behavioral economics and behavioral decision-making, have much to offer in helping to identify and address environmental problems.

For more than thirty years, biophysical research conducted on the Chesapeake Bay has raised awareness of serious water quality issues and has been used to support better management of pollutants. Science-based policy has been instrumental in organizing command-and-control efforts directed towards the regulated sector of polluters, generally larger point source polluters that are easier to identify. However, a challenging aspect that Chesapeake Bay managers have not yet addressed are the countless individual actions by consumers and households, farmers and smaller landowners, and others located throughout the watershed that cumulatively affect the Bay's water quality.

Greater understanding of the drivers of individual choices holds promise for developing more effective policy decision-making to restore the Chesapeake Bay. The goal of this exploratory workshop was to increase the depth of STAC's and other social scientists' knowledge about behavioral economics and explore potential applications in the Chesapeake Bay watershed.

## What is Behavioral Economics?

*"Behavioral economics is, in a way, at the intersection of economics and psychology. On one hand, traditional economic theory assumes that people are perfectly rational, patient, and computationally proficient little economic robots that know objectively what makes them happy and make choices that maximize this happiness (even if traditional economists acknowledge that people aren't perfect utility-maximizers, they usually argue that the deviations are random rather than showing evidence of consistent biases). Behavioral economists, on the other hand, know better—they aim to develop models which account for the facts that people procrastinate, are impatient, aren't always good decision-makers when decisions are hard (and sometimes even avoid making decisions altogether), go out of their way to avoid what feels like a loss, care about things like fairness in addition to economic gain, and are subject to psychological biases which make them interpret information in biased ways, and so on."*

- Jodi Beggs <http://economics.about.com/>

The focus of much of behavioral economic research is to discover how choices or decisions are, or can be, influenced by relatively subtle changes in framing or phrasing such choices (Just 2014; Dayan and Bar-Hillel 2011). Some examples presented at the workshop were helpful in understanding how choices can be altered through “nudges” rather than direct intervention (such as a regulation). In addition to changes in framing or phrasing, behavioral economists can alter the structure of the environment within which individuals make decisions (sometimes called the “choice architecture”). Behavioral economic researchers have found that changes in the structure of the choice architecture can have major impacts upon the decisions that individuals make. The cumulative impact of changes in individuals’ behavior can be substantial. This has led to growing interest by policy-makers and in the field of economics in the potential of behavioral economics research to help resolve important societal problems.

Healthy Lunches: Agricultural Economist David Just (Cornell University) presented the results from an experiment to influence high school students to make healthier choices at lunch. A more traditional approach would have been to remove unhealthy choices from the cafeteria altogether. Instead, changes were made to placement and presentation of food choices. Healthy choices were placed within easy reach while unhealthy choices were moved outside of an easy reach. A healthy entrée, a bean burrito, was renamed to make it sound more appealing. Some healthy choices were more attractively displayed. The changes resulted in more students selecting healthier foods for lunch. Careful selection of the ways in which choices were presented (i.e., decisions about the choice architecture) improved the students’ food decisions without limiting availability.

U.S. Department of Agriculture’s (USDA’s) Conservation Reserve Program (CRP): The CRP is one of the USDA’s largest conservation programs. A decline in enrollment in recent years has raised concerns about maintaining the environmental benefits the program provided. Without an ability to raise payment rates to compete with higher commodity prices, USDA’s Economic Research Service (ERS) and Farm Service Agency (FSA) conducted a study to determine if providing additional information on program benefits and participation by neighboring farms could increase re-enrollment rates. The study found that a small, but statistically significant increase in enrollment rates could be attained by providing additional information, even though

the landowners were already familiar with the program. The cost of the extra mailings was minimal (Wallander and Higgins 2014).

Phytase in Feed: Agricultural Economist Laura McCann (University of Missouri) presented an example of the use of phytase in animal feed. Phytase is an enzyme that frees the phosphorus bound in feed grains and thus reduces the amount of dicalcium phosphate supplementation required for non-ruminants (swine, poultry), reducing phosphorus excretion and thus reducing water pollution. Decision-making by feed companies to reduce input costs resulted in automatic adoption of phytase by essentially all producers. Most producers who purchased the feed containing phytase did so without knowledge that the enzyme was in it. In this case, technical change, the industrial structure and practices (i.e. contracting) within of this particular animal agricultural supply sector, as well as the nature of the product, combined to generate this result. Attempting to work from the bottom up and convincing each producer to use it would probably have taken much longer to reach the current level of use.

## **Workshop Overview**

The STAC workshop entitled “Exploring Applications of Behavioral Economics Research to Environmental Policy-making in the Chesapeake Bay Watershed” was held on August 27-28, 2014 in Annapolis, Maryland. The steering committee included:

- Charles Abdalla (Pennsylvania State University)
- Matthew Ellis (Chesapeake Research Consortium)
- Susan Julius (US Environmental Protection Agency)
- Poornima Madhavan (formerly Old Dominion University, currently with the National Academy of Sciences)
- Jim Pease (Virginia Tech University)
- Marc Ribaldo (US Department of Agriculture – Economic Research Service)
- Kurt Stephenson (Virginia Tech University)

The number of participants was limited to approximately 15 people, including invited speakers and STAC members. Discussion among the steering committee led to a decision to invite practitioners in water quality education and outreach. Abdalla and Julius co-facilitated the workshop. The workshop’s supporting materials are in appendices A-E (i.e., summaries of major workshop presentations, a summary of the workshop evaluations, summaries of breakout group discussions, and a list of participant contact information and biographies, respectively).

The overall goal of the workshop was to increase the depth of STAC’s and other social scientists’ knowledge regarding behavioral economics and behavioral decision-making and to explore potential applications in the Chesapeake Bay watershed. More specific goals were to:

- Broaden participants’ knowledge of behavioral economics and behavioral decision-making, and potential applications of these fields in the Chesapeake Bay watershed;
- Explore in an in-depth manner the potential applications in the problem areas of non-point source agricultural pollution, and household/homeowner contributions to pollution;

- Increase the exchange of knowledge and expand collaboration among social science researchers in the region who are familiar with challenges in the use of behavioral economics; and
- Identify and prioritize follow-up strategies for extending the insights gained at the workshop, and communicate this knowledge to the states, policy-makers, and other key audiences.

## General Recommendations

As previously stated, the goal of the workshop was primarily to educate the participants on behavioral economics and to help the attendees theorize how these principles could be applied in the setting of the Chesapeake Bay Total Maximum Daily Load (TMDL). The presentations and discussions led to suggestions for research that would contribute to knowledge about behavior that would increase the likelihood of Chesapeake Bay restoration goals being met in a more effective way. The recommendations included:

- Research human behavior before developing outreach and other engagement programs. In general, the complexity of human decision-making was perceived by workshop participants as a necessary consideration to better understanding the audience before conducting an educational/outreach campaign (i.e., “thinking before doing”), or there may be unintended consequences.
- Research on the efficacy of informing homeowners about their links to the Bay. A current strategy is the placement of signs on storm sewers to make homeowners who are thinking about dumping motor oil feel “guilty”.
- Research ways to recognize the implementation of BMPs by homeowners (such as a sign or list in the newspaper). This area is largely unexplored, and there may be opportunities.
- Develop methods that can be used to cultivate peer pressure related to stewardship in order to encourage change. One example that is gaining traction in USDA is “community conservation”, where groups of landowners are encouraged to work together to solve a water quality problem through an incentive based on a joint outcome.
- Research on how CBP can embed stewardship and water quality improvements into farmers’ social identity, including considerations of geographical location, sense of place, and ownership. Questions to pursue include: (1) At what point do people take ownership of their location and establish a sense of place? (2) How does that connection to the land impact their decisions? (3) How does social identity differ in different regions? And (4) How do dairy farmers differ from corn farmers, and at what level do they care about the water quality issues enough to change their behavior?.
- Research effective visual communication techniques that encourage behavioral change among various communities. For example, a video of what happens with water movement, sediment removal, erosion, changes in terrain, and damage during a storm event might be a way to increase the visibility of problems among the general population.
- Research how information provided to farmers can increase participation in conservation programs (see CRP example below).

## **Were the Workshop Goals Attained?**

Participants reported gaining valuable insight from the presentations and discussions regarding an enhanced focus on human behavior as it related to conservation decisions, but also on the complexity of these decisions and the need for increased understanding due to possible unintended consequences of intervening. Most participants provided informal and formal evaluative feedback (Appendix B) that the workshop was:

- Effective in broadening their knowledge of behavioral economics and how this field might be applied in the Chesapeake Bay watershed.
- Successful at facilitating an in-depth exploration of the potential application of behavioral economics to non-point source agricultural pollution or household/homeowner land and water management.
- Successful at identifying and prioritizing follow-up strategies that will serve to extend insights beyond the attendees to the larger community of researchers and regulators/policy-makers.

## **Broader Research Program Recommendations**

One specific recommendation would be the development of collaborative learning communities (e.g., building the literature inventory, coordination, collaboration, and communities of practice). Collaborative learning communities between researchers and practitioners could be developed to facilitate identification of opportunities and refine implementation approaches related to behavioral change. Other potential partnerships between practitioners and the academics could be developed. For instance, university students could participate in internships and experiential course projects to deliver literature synthesis, survey design, or data analysis related to behavioral change programs. Watershed groups and organizations could leverage young talent and academic expertise in program research and evaluation, and the academic community would be informed about the on-the-ground implementation challenges and issues. There may be a number of efforts to apply behavioral economics or marketing to environmental problems in the Bay watershed or across the country. These efforts represent learning opportunities for organizations and individuals that could apply those same techniques in other places. A database of such efforts, including key characteristics of the environmental problems and solutions, would facilitate learning and expansion of the application of behavioral sciences to environmental issues. Information and studies in the appendices and suggested references following this report can be the start of such an effort. The Chesapeake Bay Trust (CBT) and USDA-Economic Research Service's Center for Behavioral Agri-Environmental Research (CBEAR) would be appropriate partners in such an effort.



### **Homeowner Example (prepared by Suzanne Etgen, Watershed Stewards Academy)**

Example of bacterial impairment from pet waste in Anne Arundel County:

All rivers in Anne Arundel County are impaired by elevated levels of bacteria. Testing showed levels in one stream, Marley Creek in the northern part of Anne Arundel County, up to 10,000 Colony Forming Units (CFUs), far above the acceptable limit of 100 CFUs. The Anne Arundel Watershed Stewards Academy in partnership with community leaders, Master Watershed Stewards (who educate and engage their communities, in restoration projects), set out to assist the community surrounding Marley Creek to reduce bacteria.

In late 2013, the team began their campaign by first identifying the source of the high bacterial loads into the creek and the behavioral changes that would have the greatest effect on reducing bacteria. In that area, the source was not likely to be human because the sewers were intact and the area had no septic systems. Dry weather bacteria testing also confirmed that the source was not a sewer line break. Wildlife was not the likely source because the area is highly urbanized. The team concluded that pet waste was the probable cause. They investigated where pet waste was being deposited and found the most likely source to be domesticated pets belonging to a number of owners with fenced back yards abutting the creek. The owners were leaving their pets' waste in the yard, and with every rainfall event, the waste was running into the creek.

The Anne Arundel Watershed Stewards Academy wanted to change owners' behavior toward removal and proper disposal of waste in the trash. They worked with community Master Watershed Stewards to survey home owners in the area to assess their attitudes toward pet waste disposal and found that most did not think pet waste in backyards was an issue. They also found that home owners were both patriotic and had a great deal of pride in their community. Armed with this information, they designed a community-based social marketing campaign that included a message that tested highest with a subset of home owners -- keeping "your" community clean and "your" health safe -- and delivered it using a patriotic backdrop for the message. They included directions on how to properly dispose of pet waste, used one-on-one conversations and direct mail to convey their message, and provided technical assistance where needed. The pilot phase of this case study is nearing completion and bacteria testing will be performed in November 2015. Results will be used to judge whether this campaign has been successful in achieving behavioral changes that positively affect water quality. The Watershed Stewardship Academy has had success with similar campaigns that use messages tailored to the problem based on audience formative research, and that deliver those messages face-to-face through known and trusted persons.

**Farmer “Informational ‘Nudges’” and USDA’s Conservation Reserve Program (prepared by Marc Ribaldo, USDA-Economic Research Service)**

The Conservation Reserve Program (CRP) is one of the USDA’s longest running and most expensive conservation programs. Owners of eligible cropland can offer to enroll their land in 10-15 year contracts, during which time they agree to establish and maintain conservation covers that provide environmental benefits such as reduced soil erosion, improved wildlife habitat, and improved off-site water quality. In exchange, the land owners receive annual rental payments from USDA. As of September 2013, the CRP had about 26.8 million acres enrolled. This is down from a peak of over 36 million acres in 2007. Budget-driven caps on enrollment are one reason for the decline. Other reasons include the difficulty in enticing farmers already in the program to renew contracts that are about to expire and the disincentive for farmers to enroll new land in a year when the demand for crops is high.

Given USDA’s interest in maintaining the environmental services provided by the CRP, one option would be to increase the financial incentive. However, with shrinking budgets for conservation on agricultural lands, this strategy is not likely feasible. Behavioral economics research suggests that other approaches may also be effective. For example, preliminary research suggests that USDA’s outreach efforts may encourage greater participation in situations where farmers are not well-informed about the program or where they have limited time and energy to process the available information about all possible uses for their land. Outreach may also invoke peer pressure, which can have a large motivational factor if many neighboring farms are enrolled, and may change program participation. Lastly, the framing of information about the program, such as how financial incentives are presented, may influence whether farmers respond to the incentive.

To test whether the information provided to landowners with expiring CRP contracts could increase re-enrollment rates without increasing financial incentives, researchers at the USDA-ERS collaborated with the Farm Services Agency (FSA) to conduct a field experiment with the March 2012 CRP sign-up where 6.5 million acres of expiring contracts were automatically eligible to re-enroll (Wallander and Higgins 2014). A sample of 39,000 landowners with expiring contracts received an additional outreach letter reminding them about their eligibility. Further, some of these landowners received additional information about interest in the program by farmers in other parts of the state, and the environmental benefits of the program (termed “informational nudges”). The results showed that an outreach letter sent to those farmers who were already familiar with the program increased the re-enrollment rate by 1.7 percent. While not a sizable increase, the cost of sending out additional letters is low. The experiment suggests that the results of behavioral economics research can contribute to the success of agricultural conservation programs.

**Workshop Summary**

Even with the best monitored data, land use determinations, modeled results, and measured rate processes for hydrology, biogeochemistry, etc., human behavior governs whether these rigorously quantified parameters will actually lead to most effective on-the-ground restoration of the distressed Chesapeake Bay watershed. Restoration progress and load reduction would be substantially accelerated if decision-makers better understood human behavior, beliefs, and

decision-making. Research on behavioral economic and behavioral decision-making needs to be increased and better integrated into research and education/outreach on the biophysical and technical management components of the Bay watershed

In sum, the workshop discussions highlighted the critical importance of incorporating behavioral economics into the core of CBP partnership activities, and built upon the 2011 CRC workshop on the roles of the social sciences (Paolisso, et al., 2011). An important next step would be for regional social scientists (perhaps some of those attending this workshop) should be regularly engaged in developing future partnership commitments and strategies. This workshop report narrative, including the resources, bibliographic references, and examples and discussion summaries in the appendices could service as an intellectual “stepping stone” for application of behavioral economics insights to help improve the quality of the Chesapeake Bay and its watershed.

## References

- Dayan, E. and M. Bar-Hillel. 2011. Nudge to nobesity II: Menu positions influence food orders. *Judgment and Decision Making*. 6(4): 333–342.
- Just, D. 2014. Behavioral Choice: Applications to food choices. Paper prepared for August 27-28 STAC workshop. 24 pp. Annapolis, MD.
- Paolisso, M., E. Van Dolah, T.W. Hartley, L.A. Wainger, J. Pease, D. Lipton, and S. Julius. 2011. Integrating social science research into Chesapeake Bay restoration. Chesapeake Research Consortium. Edgewater, MD. Publication # STAC 11-05. November 2011.
- Wallander, S. and N. Higgins. 2014. Nudges and federal program participation. Presentation to National Center for Environmental Economics, Environmental Protection Agency, Washington, DC. January 27.

## Suggested Resources

- Arocha, J. and L. McCann. 2013. Behavioral economics and the design of a dual-flush toilet. *Journal of the American Water Research Association*: 105(2).
- Batie, S. 2010. Taking conservation seriously as a wicked problem: Pages 143-145 in: P. Nowak and M. Schnepf (eds.), *Managing agricultural landscapes for environmental quality II: Achieving more effective conservation*. Ankey Iowa, Soil and Water Conservation Society.
- Carrico, A.R., J. Fraser, and J.T. Bazuin. 2013. Green with envy: Psychological and social predictors of lawn fertilizer application. *Environment and Behavior* 45: 427.
- Conservation Reserve Program (CRP). 2014. Nudges and federal program participation: A field experiment with the Conservation Reserve Program. Abstract (in prep.). <http://www.webmeets.com/files/papers/wcere/2014/1674/CRP%20Nudge%20Article%20for%20WCERE.pdf>.
- Cotterill, A. 2013. Behavioral economics in defra: Applying theory to policy. Department for Environment, Food, and Rural Affairs. Publ. No: 13986. 17 pp. <https://www.gov.uk/government/publications/behavioural-economics-in-defra-applying-theory-to-policy>.
- Jonson, E.J. and D. Goldstein. 2003. “Do defaults save lives?” *Science* 302: 1338-1339.
- Lee, N.R. and P. Kotler. 2011. Quick reference guide - social marketing: Influencing behaviors for good. Fourth Edition. [http://www.socialmarketingservice.com/site/assets/files/1010/socmkt\\_primer.pdf](http://www.socialmarketingservice.com/site/assets/files/1010/socmkt_primer.pdf).

- McCann, L., H. Gedikoglu, B. Broz, J. Lory, and R. Massey. 2014. Effects of observability and complexity on farmers' adoption of environmental practices. *Journal of Environmental Planning and Management*. June (published online: 25 Jun 2014).
- McKenzie-Mohr, D. 2010. *Fostering sustainable behavior: An introduction to community-based social marketing*. Gabriola Island, BC: New Society Publishers.  
<http://www.cbsm.com/pages/guide/preface/>.
- Scarlett, L., J. Boyd, A. Brittain, L. Shabman, and T. Brennan. 2013. Catalysts for conservation: Exploring behavioral science insights for natural resource investments. RFF Report.  
<http://www.rff.org/RFF/Documents/RFF-Rpt-BehavioralScienceEconomicInsights.pdf>.
- Sellner, K.G., M. Palmer, L. Wainger, A.P. Davis, B. Benham, E.J. Ling, and G. Yagow. 2011. Metrics and protocols for progress assessment in Chesapeake Bay Stewardship Fund Grants. A report to the National Fish and Wildlife Foundation. CRC Publ. No. 11-173, Edgewater, MD. 470 pp. Excerpt - Encouraging sustainable behavior: A guide for National Fish and Wildlife (NFWF) grantees to implement social marketing campaigns.
- Shove, E. 2010. Beyond the ABC: Climate change policy and theories of social change. *Environment and Planning A* 42(6): 1273-1285.  
<http://www.envplan.com/abstract.cgi?id=a42282>.
- Stahlman, M. and L. McCann. 2012. Technology characteristics, choice architecture, and farmer knowledge: The case of phytase. *Agric. Hum. Values* 29: 371-379.
- Sunstein, C.R. 2014. Why nudge? Behavioral economics, consumption and the environment. *In*: L. Reisch and J. Thøgersen (eds.), *Handbook on research in sustainable consumption*, Edward Elgar Publishing.
- Sunstein, C.R. and L.A. Reisch. 2014. Automatically green: Behavioral economics and environmental protection. *Harvard Environmental Law Review*. Vol. 38. pp. 128-153.
- Thaler, R. H. and C. R. Sunstein. 2009. *Nudge: Improving decisions about health, wealth, and happiness*. New York, NY. Penguin Books. 312 pp.
- Weber, E.U. 2013. Doing the right thing willingly: Using the insights of behavioral decision research for better environmental decisions. Chapter 22. *In*: E. Shafir (ed.), *The Behavioral Foundations of Public Policy*. University Press, Princeton, New Jersey.

## **Appendix A: Summaries of Workshop Presentations**

### **Challenges related to individual behavior in the Chesapeake Bay watershed: Household/homeowner land and water management - Suzanne Etgen, Watershed Stewards Academy**

Etgen provided an overview of the Anne Arundel County, Maryland watershed and the work done by the Watershed Stewards Academy (WSA) to identify, educate, and support Master Watershed Stewards who assess their local neighborhoods for various education and restoration initiatives, educate and engage their communities through outreach events, and coordinate plans to take action. These actions can include changes in lawn care practices, proper maintenance of septic systems, picking up pet waste, and more. To compel communities to change their behavior, the WSA must examine the reasons why people change their behavior in the first place. Behavioral change occurs when an individual learns something new which changes their attitude/beliefs, when it fulfills an economic self-interest, when they feel they have a real and positive effect for a “greater good”, and when they ultimately perceive the benefits of their actions outweigh the potential barriers. Providing people with more information will not always encourage results when it comes to behavioral change. Etgen noted the importance of making community-based social marketing (CBSM) a very important component of the WSA’s process. The WSA identifies specific behaviors they want to change, locates a target audience, and then discovers information about that audience to reduce specific barriers to incentives that could be attained through prescribed behavioral changes. Etgen provided the example of bacteria in waterways. In Anne Arundel County, the issue of bacteria in waterways was likely not the result of malfunctioning sewer systems but rather the large amount of unaccounted pet waste seeping into groundwater and through surface water runoff into nearby streams. The WSA established a Public Service Announcement (PSA) type campaign to encourage homeowners to properly dispose pet waste as a means of taking pride in their communities using patriotic imagery and messages, while spreading awareness about the health issues associated with bacteria. The WSA also showed that people change their behavior most often when speaking with individuals they trust and see as an authority figure, hence the role of the local Master Watershed Steward. Developing one-on-one contact with key community leaders creates a domino effect. Still, the process takes time and multiple contacts with the target audience members, and even then, communities will have holdouts who require measures beyond social marketing strategies (i.e., regulations and legal interventions) to encourage change.

### **Challenges related to individual behavior in the Chesapeake Bay Watershed: Non-point source agricultural pollution - Lamonte Garber, Stroud Water Research Center**

Garber presented case studies and anecdotal evidence of behavioral change from interaction with farmers in Pennsylvania. In most cases, farmers asked Garber if the agricultural community was truly at fault for water quality issues to the extent that the media makes it appear. Garber reinforced the current scientific findings regarding agricultural runoff and its associated impacts, but noted that there are other contributors to pollution in the Chesapeake Bay watershed. Farmers expressed that they feel all other pollution sources have not been blamed as much as the agricultural industry and so they feel targeted, and thus, less open to change their practices as drastically as recommended. In another instance, Garber spoke to Lancaster farmers about

combined sewage overflows (CSO) and the effects of Lancaster city infrastructure on surrounding water quality. The city of Lancaster was threatened with EPA fines for CSO and established green infrastructure to combat the issue. The agricultural community argued that farmers are being asked to mitigate impacts at great individual cost and therefore, there is resentment that other large-scale urban polluters are not asked to commit as many resources as at the individual scale. In a third case, one Pennsylvania farmer invited Garber to his farm to demonstrate the efficiency of the wide forest buffer on his property. This farmer in particular understood the benefits of the management practice, but many others do not share the same understanding. Garber explained that reduction of “emotional baggage” within the agricultural community is necessary to improve rapport and encourage behavioral change. Messaging is especially important because many farmers are seemingly distrustful of the world view presented by urbanites, academics, and general non-farmers. Common ground can be reached through common language and scientific understanding, but at the micro-level issues such as lawsuits and media “spin” counteract some of these efforts.

**Recent developments and opportunities: Non-point source agricultural pollution - Marc Ribaldo, USDA-Economic Research Service**

Ribaldo discussed the competitive grant process and launch of a new USDA Center for Behavioral Agri-Environmental Policy Research (CBEAR) that will “...use behavioral and experimental economics to conduct research on how policies and programs can influence the provision of ecosystem services from agricultural lands.” This research will help develop strategies to “nudge” farmers to meet Chesapeake Bay TMDL goals with and without monetary assistance. Ribaldo also talked about the Conservation Reserve Program (CRP) and efforts to increase farmer participation through letter campaigns. Studies showed that minor changes in the wording of CRP letters increased the rate of re-enrollment in farmers who had already participated in the program.

**Recent developments and opportunities: Non-point source agricultural pollution - Ann Sorensen, American Farmland Trust**

Sorensen described American Farmland Trust’s (AFT’s) research in behavioral economics which was carried out with the USDA-ERS as part of assistance agreements in 2010-2013. The study examined if the timing of cost share payments might influence late adopters and/or early adopters of conservation practices to participate in conservation cost-share programs. In the initial experiment, Sorensen’s group assumed that farmers participating in AFT’s Best Management Practices Challenge (BMPC) were late adopters. The BMPC offers a yield guarantee to farmers who want to test conservation practices on small plots of their properties and pays for any yield loss on the small plot. Farmers who attended AFT’s ecosystem service market workshops or Farm Bill listening sessions were identified as early adopters. Both groups were then offered payments in acknowledgement of the environmental services they were providing by installing conservation practices. The experiment found that farmers identified as early adopters of conservation practices were willing to wait for payment whereas late adopters preferred payment upfront. As a result, Sorensen’s team devised a way to be more precise in how the two adoption groups were split and asked the farmers a series of questions that required self-identification as early or late adopters (or somewhere in between). From that self-

identification study, Sorensen's group determined that more farmers would sign up to implement conservation practices on their lands if payments were timelier across the spectrum of participants. Additionally, technical assistance in a one-on-one encounter was determined to be another influential factor in farmer sign up rates.

**Recent developments and opportunities: Homeowner/consumer issues - Jamie Baxter, Chesapeake Bay Trust (CBT)**

Baxter explained how the CBT has begun looking at public engagement efforts with a more 'scientific eye', with specific consideration of social science. Based on grantee research recommendations, the CBT determined it should address misconceptions of behavior change, offer opportunities to learn more about behavior change, provide technical assistance, and encourage collaboration. Baxter provided an example of how the Chesapeake Bay TMDL has driven regulatory change, forcing change in the way governments manage their Municipal Separate Storm Sewer Systems (MS4s). Due to these changes, Baxter said public outreach is required because the majority of the land contributing to stormwater runoff is privately owned and the only method of addressing the issue is to encourage private property owners to alter their behavior. The CBT utilized CBSM in much the same way as the WSA, selecting one specific management practice to focus on and strategically targeting key audience groups using formative research and identification of associated barriers/benefits. Baxter stated that work must be undertaken at all stream levels (upstream/headwaters, midstream, and downstream locations), but each location requires a different approach and framework for that specific audience. Baxter provided an example of how implementation at larger scales is not always as effective at smaller scales. In efforts to reduce personal fertilizer use in Maryland, laws were passed making certain fertilizer applications illegal during certain times of the year, but many Maryland residents are still unaware of the restrictions. Individual consumers usually do not think about implementation at larger scales and there must be an effort to connect and coordinate efforts simultaneously through all levels of the market. Baxter recommended facilitating strong partnerships and collaboration, increasing public investment in CBSM-modeled programs, streamlining audience research, focusing on preparing the market (especially the midstream audience, and increasing CBSM technical assistance). Currently, the CBT is helping the EPA to develop a crowd-sourced database to promote shared research, results, and materials. Additionally, the CBP approved funding to develop an indicator to measure progress towards the Citizen Stewardship Outcome provided in the Chesapeake Bay Watershed Agreement (CBWA).

**Behavioral economics and applications in the food choice area - Dr. David Just, Charles Dyson School of Applied Economics and Management at Cornell University**

Just presented the concept of Samuelson's philosophy and the relationship between economic incentives and risk before describing the growth of the behavioral economics field in the 1990's and how the understanding of individual financial decision-making has changed as a result. Just believes people do not necessarily have the "utility of wealth" function present in Samuelson's philosophy, but instead individuals measure wealth against a particular reference point. This understanding changes the value of an object based on the appreciation factor assessed by the individual – this is known as the "endowment effect". Just also explained individual's rational behavior with respect to time – something good should be enjoyed as soon as possible,



something bad should be pushed off until later, and the amount of time spent waiting for or deferring a certain action is considered as a cost-benefit analysis. When selling products or ideas to consumers, there needs to be recognition of consumers' motivations and the consumer must feel as if they are getting a good deal in order to take part in the transaction. Just presented an example of behavioral bias by showing a video in which students received the same portion of food, but one group was told that they received a double portion and the other received a half portion. The double portion group, for the most part, did not finish their food whereas the half portion group ate all of the food. Initial messaging is key to altering or influencing an individual's upcoming decision. Factors that can affect choice include price, appearance, convenience, state of mind, *status quo*, habit, and expectations. Economics and psychology go hand-in-hand. Just explained that individuals make thousands of decisions a day and deliberate decision-making requires too much energy and focus. Therefore, Just said it is easier to engage the "thoughtless" citizen over the "thoughtful" citizen because the "thoughtless" citizen will more readily accept the promoted decision. The promoted decision is considered a "nudge," initiated because the environment or social situation the individual faces was designed to lead them to a particular conclusion, rather than asking or forcing them to undertake a certain course of action. Providing choice, or even the illusion of choice, is especially important because humans naturally respond to suggestions without realizing it. Product, price, place, and promotion are important components of the provided choice(s). Just stated that BMPs function in the same way and can be repackaged as a product for sale in a way that allows consumers to meet at a mutually beneficial middle ground. Product nomenclature can be as important as the product itself. Just described an example in which a certain food item was not selling particularly well. The name of the item was changed to appeal to the target audience and sales went up significantly despite the fact that there were no other changes made to the item's availability or appearance. Just stressed the concept of absolute versus relative choice, and said that there are very few situations when someone is willing to cede their decision-making authority to someone else. Therefore, nudges and choices are the best option for encouraging certain behavior without seemingly overstepping authoritative boundaries.

### **Developments and opportunities in the environmental/water field - Dr. Laura McCann Department of Agricultural Economics, University of Missouri**

McCann proposed that establishing individual contact with target audience members can create high transaction costs to achieving desired decision-making changes. People are influenced by cognitive biases such as framing effects, *status quo* inertia, and for the most part, individuals are poor at predicting consequences. People are also heavily influenced by the default option, which in some cases may be a social norm. McCann explained that the default option should be utilized more often to influence behavioral changes. For instance, in an example from Germany, a renewable energy choice was provided to individuals as a default option in a region dominated by the conservative political party. More than 90% of the of the consumers chose the default option despite the party's general disinclinations regarding renewable energy and the fact that the default option was in fact more expensive than other non-renewable energy options. The default option was chosen out of "thoughtlessness." Choice is important, but maximization of choices can be problematic when an issue is complicated and/or individuals do not receive timely feedback regarding their decision(s). In another example, McCann examined the use of financial incentives and how these incentives can crowd out altruistic behavior. In Switzerland,

organizations began providing an incentive for blood donations. Donations to the organizations actually went down so they reversed the policy. There is an element of altruism intrinsic in the act of donating blood and receiving a financial return for such an act negated the altruistic motivation. McCann also provided examples of a dual-flush toilet study in which she and a graduate student examined the effect of the default option on toilet handles. In another study she examined the inclusion of phytase in premixed livestock feed. In the Midwest, phytase was included in premixed feed by feed companies as a default and many farmers were not aware they were using it, despite the benefits. Nutrients, like energy use, are invisible and this poses a problem for activists and organizations trying to improve water quality because people are not aware of the issues associated with them – “out of sight, out of mind.” McCann summarized a number of recommendations from Sunstein (2014) and Weber (2013) before presenting her own recommendations including building good decisions into products and making environmental choices the easier or “default” option.

## Appendix B: Summary of Behavioral Economics Post-workshop Evaluations

All workshop participants were provided written evaluation forms and asked to answer questions and rank the effectiveness of the workshop in achieving certain goals. Effectiveness was measured on a scale of 1-7 with 1 indicating the workshop was “not effective” and 7 indicating the workshop was “very effective.” A summary of information from the seven completed written evaluation forms received is below.

- The average score for the first question (“Was this workshop effective in broadening your knowledge of behavioral economics and how this field might be applied in the Chesapeake Bay watershed?”) was **5.86**.
- The average score for the second question (“Was this workshop successful at facilitating an in-depth exploration of the potential application of behavioral economics to non-point source agricultural pollution or household/homeowner land and water management?”) was **6.0**.
- The average score for the third question (“Was this workshop successful at identifying and prioritizing follow-up strategies that will serve to extend insights beyond the attendees to the larger community of researchers and regulators/policy-makers?”) was **6.29**.

How do participants plan to use the information received/discussed at the workshop?

- Integrate it into future research and activities.
- Use it to inform/refine strategies to promote supplication of social science to watershed restoration.
- To re-think how to apply the behavioral economics structure to existing work.
- To consider climate change issues relating to adaptation and lack of implementation: behavioral economics could be a very useful approach to that problem.
- Relay ideas to USDA-ERS colleagues and NRCS-FSA program staff.
- To help design new research into environmental decision-making at the farm level.

100% of workshop respondents thought there should be additional follow-up steps to the workshop, but had varying ideas of what those steps should entail. The following are a sample of individual responses:

- Collaboration with similar activities to synergize and expand impact.
- STAC-proposed research agenda on application of social science; identification of local research faculty and money to implement research agenda; report to CBP Management Board (there is a need for research/academic participation in development of a Citizen Stewardship indicator).
- Develop a report outlining findings and making recommendations.
- It may have been important to have a 10 minute presentation to define behavioral economics so everyone starts off with the same context; this workshop was a beginning of what could be accomplished through behavioral economics – there is a need to identify more opportunities to ‘dig deeper’; in terms of next steps, the participants suggested identifying proposals to fund research.
- Follow-up meeting to report results of next steps could help identify further opportunities.

## Appendix C: Breakout Group Discussions

### Homeowner Group

#### Greatest Needs

Needs were broken down to upstream (regulatory and policy makers), midstream (implementers, contractors, practitioners, non-profits), and downstream (homeowners).

1. Select behaviors and audiences that have the greatest effect on pollution reduction.
  - Identify sources of pollution to target resources and target those sources that are the greatest contributors.
  - Identify means to address/solve the problem (e.g., the BMPs that will reduce the largest amount of the targeted pollutant) and methods to get people on-board to implement them.
  - An audience survey can both identify attitudes toward implementing different BMPs and the messaging that would be most effective in getting adoption of various practices. For example, the survey could present three BMPs that would help with a particular problem. It would then ask landowners how likely they would be to “change certain behaviors” to implement any one of the three BMPs. The survey can also help identify reasons why landowners would or would not change their behavior with respect to the BMPs. The selection of a behavior to change and an approach to encourage such a change would be based on (1) the probability of effecting significant pollution reduction; (2) the target audience’s willingness to participate in the behavior; and (3) the percentage of the target audience that is not already engaged in the behavior.
2. Provide incentives to local governments to identify the degree to which residential lands contribute to pollution problems.
  - Need ways to encourage local governments to diversify their methods for reducing pollution, including moving from seeking reductions only from those polluters easiest to identify (low hanging fruit) to non-point sources that are more difficult to identify and target.
  - Need to encourage/motivate local governments to identify pollution problem ‘hot spots’. Currently, few jurisdictions have the capacity or incentive to identify problem areas or locations. In Anne Arundel County, Maryland, each stream and surrounding watershed has been evaluated to determine health, identify hot spots and restoration opportunities. This information, combined with land use data allows the County to identify priority watersheds for both restoration and preservations. Further, it has allowed the County to identify potential stream and outfall restoration sites. More information on Anne Arundel County’s watershed assessments may be found at: <http://www.aacounty.org/DPW/Watershed/watershedassessment.cfm>. One way to motivate local governments would be to craft permits that encourage local governments to consider residential contributions to the local stormwater problems.
3. MS4 regulations and outreach to the regulated community need to be more stringently targeted.

- Raise expectations in terms of outreach and evaluation, and tie efforts into actual load reductions.
  - Target outreach initiatives to areas where the largest reductions could occur, and elevate education initiatives that are geared toward achieving pollution reductions.
  - First address those local impairments that when aggregated, provide credits for larger water quality improvements.
4. Residential landowners in urban/suburban areas are often overlooked but can be a potential source of significant pollution reductions.
    - Problems that are acute and easily identifiable (and solvable) are being addressed by local governments through planned retrofits. However, one serious cause of disparate sources of pollution is homeowners in the urban/suburban areas where local governments have no control. Few options exist except to encourage homeowners to implement practices to trap stormwater before it enters the municipal system. More municipalities need to be engaged in advocating that homeowners implement BMPs. What are successful ways in which urban/suburban residential landowners can be ‘pushed’ to change their behavior?
    - Targeting municipalities to get individual landowner change can be effective. We need to understand how public and political support can be gained for funding larger municipal projects.
    - Homeowner Associations (HOAs) should also be brought into the effort to reduce residential pollution. They have the ability to restrict or encourage positive or negative actions at the individual homeowner level. What are the best ways to encourage HOA participation in supporting positive homeowner actions?
  5. Need to standardize behavioral change campaigns to make use of resources across the watershed.
    - Evaluate whether behavioral change campaigns, and what components of such campaigns, are effective across a variety of situations and therefore, standardize for adoption across the watershed. This would economize on cost and increase effectiveness of individual research and campaign efforts.
    - There needs to be a synthesis and interpretation of information on marketing research and campaigns across the country and within the Bay watershed. Development of an indicator to track the progress of citizens within the Bay who are implementing BMPs which may also inform assessment of effectiveness of various campaigns. An extensive public survey project was conducted in the Pacific Northwest (Public Opinion Research section of the under Puget Sound Partnership’s website: <http://www.psp.wa.gov/>) to gather data on BMPs and behavior change.
  6. Cross-program analysis at a regional level for effectiveness of incentive and rebate programs, targeting individual and neighborhood behaviors. It is important to be able to justify the efficacy of programs, but local governments do not have the capacity to do this analysis. Local governments are partnering with NGO’s to conduct “boots on the ground” analysis and to encourage constituents to participate in rebate and other incentive programs. In several jurisdictions, groups of trained volunteers such as Master Gardeners and Master Watershed Stewards, who are already engaging homeowners to care for their individual properties, are armed with resources to help homeowners take advantage of incentives and technical

assistance available for BMP implementation. As an example, the Anne Arundel Watershed Stewards Academy supports over 130 trained Master Watershed Stewards who provide direct outreach to almost 10,000 residents each year. While there is currently no rebate program, the Anne Arundel Stewards do carry information on the Anne Arundel property tax credit for BMP installation and are likely to do the same if a rebate program is implemented. RiverKeepers and watershed organizations provide similar assistance.

7. How to incentivize participation in stormwater programs and fees?
  - Make participation simple and easy for homeowners. Remove barriers to participating and provide information in a “one stop shop” sort of format (e.g., here is what we can do, here is what you save, and here is what it costs). The information provided about what homeowners can do, what it will cost, etc., should be based on research that tests alternative messaging (scenarios) and uses the most effective approach for participation.
  - Related to the point above, studies are needed that compare marketing approaches (e.g., do people want to install BMPs for economically beneficial reasons, or to avoid paying more fees?). Certain audiences may react differently and require different approaches.
8. Identify socioeconomic considerations that would motivate (or overcome barriers to) implementation of BMPs.
  - For example, installing trees in low income areas was resisted by residents because of their concern about the potential associated increase in crime (hiding places for criminals). In order to overcome this barrier, research identified that residents in these low income areas had a lot of pride in the front of their residences. As a result, options for different types of trees were offered, using beautiful drawings of the trees in front of their residences as an aesthetic accent and appealing to their pride in home. The residents had the drawing of the selected tree framed for the homeowner to hang on their wall and use as a story to all who came to visit. This benefit overcame the fear of increased crime.
9. Research is needed to develop visualization and assessment tools for use by the mid-stream audience and homeowners.
  - Visualization is important, and people care about appearance. What occasionally looks appropriate from an ecological perspective does not always do so from an aesthetic perspective. How does one ‘sell’ the ecological perspective, and how is it made it attractive? Often, what “looks good” is subjective.
10. Build public-private partnerships.
  - Work with universities and other interested parties to help answer research questions above. STAC could act as the organization that connects NGOs and academics to undertake the needed research (e.g., class projects or individual students conducting research on specific behavioral research needed by NGOs to target marketing campaigns to reduce specific pollution problems).

## **Research Priorities**

1. Conduct cross-program analysis of incentive prioritization at a regional scale for targeting individual neighborhood behaviors.

- Collect and standardize resources (i.e., change campaigns); provide a database of those resources, including a synthesis and interpretation of studies and campaigns that allow generalization of results based on shared characteristics.
  - Assess those features of practices/policies that best incentivize stormwater fees (e.g., design structure of choices/options), especially practices/policies that receive the highest response rates with the lowest administrative cost.
2. Evaluate how to craft an MS4 permit that builds incentives to identify ‘hot spots’ and that elevates education to achieve pollutant reductions through behavioral changes.
  3. Connect academic resources and research with practitioners to tackle key needs.
  4. Conduct research at the sub-watershed scale to determine the largest sources of impairment at these smaller scales.
  5. Research methods to give credit for BMP implementation by homeowners (such as credits for behavioral change).
  6. Research effective visual communication techniques that encourage behavioral change among various communities.
    - For instance, visibility was a key issue of campaigns in Africa to help people wash their hands. A campaign was initiated where someone went around with purple on their hands and people could see the purple (“germs”) being spread to everything they touched.
    - Example: Sonoma Co., WA or Austin, TX – effective pet waste programs (strong visuals). As part of monitoring efforts, all the bags of feces were collected and made into one big pile to illustrate the magnitude of the issue).
  7. Catalogue where default programs are being used, why they were used, how effective they are, and the basis on which those programs were developed (e.g., characteristics of the community, etc.); develop a toolkit that could be stylized to each individual community.
    - Stormwater utility fee programs often operate under the default assumption that no one can or is actively working to mitigate stormwater runoff. The way it could be framed is to offer a default fee with the expectation that actions will be taken to control stormwater, but that if those actions are not taken within a certain time period, then fees will be raised.

#### Farmer’s non-point source (NPS) Group

The opportunities for future research and outreach included (not in priority order):

1. Focus on the positives - How are the positive farming effects hi-lited, showing that in many cases farmers are implementing changes, and then demonstrate observable results to influence continued action and convince other farmers that these practices are working and could also work for them?

2. Organizational relationships and building trust - Who are the groups interacting and how do those interactions influence farmers' decision-making? Is the group of farmers those who mistrust the government or traditional agencies? Farmers tend to hold a view that protecting the environment and "feeding the world" are contrary goals. Is it possible to reframe messages that scientists and managers are trying to help them feed the world while maintaining their profitability/yields? Could a farmer trade group be more beneficial to work with in conjunction with the farmers because trust is stronger between those groups?
3. Geography, sense of place, and ownership - At what point do individuals take ownership of their location and establish a sense of place? How does that connectivity to the land impact their decisions?
4. Environmentalism needs to be built into the farmer decision-making thought process. How can stewardship and water quality improvements be embedded into their perceived self-identity? How can farmers get engaged to care about environmental stewardship as much as yields? A strategy for a new program could be to use peer pressure related to stewardship to encourage behaviors related to environmental stewardship.
5. Language and consistent messaging – Some current terminology clearly does not work with farmers. CBP needs to be selective of the language used and how it communicates with farmers and the organizations they work with (consistent messaging). Just as the stormwater professionals have established effective language for their programs, CBP needs terminology for farmers/agricultural industry/stewardship. Are words used that communicate well (e.g., the term "legacy") across audiences?
6. There are limitations on the effectiveness of surveys in assessing behavioral change: what surveyed individuals say vs. what they do could be very different, and actual observations are necessary. Field experiments and pilot projects are important because on-the-ground effects can be seen in real time.
7. Visualization tools - Perhaps farmers would care about losing fertile soil and nutrients that they paid for by allowing runoff to wash off the farm? How do we visualize this for farmers, and the issue of wasting resources (e.g., loss of efficiency)?
8. There needs to be more "bottom up" efforts in engaging farmers in designing interventions and experimenting with these producers. Such research could be directed at better understanding how farmers think about the problem (yield, profitability, etc.), and/or finding and engaging organizations that aid farmers (banks, feed industry, etc.). This will entail reducing institutional barriers and permit greater flexibility that is needed for experimentation with alternative conservation program designs.
9. Additional efforts are needed to discuss technological options as these clearly affect the choice framework that farmers face. In many cases, the crux of the challenge is to make "invisible" issues more visible. In some cases, technology can further that understanding.



Limitations: The group recognized that given the important realities and complexities of the issues that were discussed, more time is needed to adequately address behavioral economics research needs related to farming and Chesapeake Bay water quality. Some of the complexities that were acknowledged included: the drivers of farmer decisions may be largely economic (market driven signals) and political; that farmers are businesses, households, and families (multi-generational), not just consumers; that farmers' livelihood and farms' continuation are interconnected to other societal issues including open space, landscape, and rural amenity issues, and others (e.g., climate change); and that there are many challenges related to complexity and uncertainty of water quality management (lack of quality data and uncertainty about cause-and-effect, modeling, etc.).

**Appendix D: Workshop Participant Contact Information**

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Additional Steering Committee Members (Not in Attendance)

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## **Appendix E: Biographies of Workshop Participants (listed alphabetically)**

**Jamie Baxter** works with the Chesapeake Bay Trust (CBT) as Program Director for Capacity Building, Community Engagement, and Environmental Education. In his role with the CBT, Baxter leads initiatives in cooperation with funding partners, non-profit organizations, and community leaders. Baxter earned degrees in Economics and Environmental Science from Dickinson College and previously worked with the Chesapeake Bay Foundation (CBF) and Maryland Department of Natural Resources.

**Dana Dolan** is a Ph.D. candidate at George Mason's School of Public Policy with research focusing on long-term decision making in complex governance contexts. Before beginning her Ph.D., Dolan worked in management information systems research and development with Lockheed Martin, Computer Associates Services, and Software Productivity Consortium where she was Director of Research. She previously earned a Master's degree in Management Information Systems and a Bachelor's degree in Business and Mathematics.

**Suzanne Etgen** is the Coordinator of the Watershed Stewards Academy at Arlington Echo Outdoor Education Center. The Academy organizes a consortium of support professionals including 80 governmental, non-profit, and business experts to provide assistance to Master Watershed Stewards by consulting on design and development of watershed restoration projects.

**Lamonte Garber** joined the Stroud Water Research Center in January 2014 as a Watershed Restoration Coordinator after working with the CBF. Garber will help oversee the implementation of more than 40 forested buffers to assist more than 50 farmers in addressing conservation needs while implementing approximately 400 BMPs. Garber earned a Bachelor's degree in Agricultural Economics and Rural Sociology from PSU.

**David Just** is a Professor at Cornell University's School of Applied Economics and Management and the Director of the Cornell Center for Behavioral Economics in Child Nutrition Programs, with expertise in risk and uncertainty, information, and behavioral economics. His past work on low cost solutions for healthier school lunch choices and risky investments has been published in research articles and reported in national media outlets. Just earned his Ph.D. at the University of California, Berkeley.

**Sarah Lynch** works as Director of Agriculture and Markets and Policy Lead for Food Goal at the World Wildlife Fund. She earned her Master's degree in Agricultural Economics from Michigan State University and a Ph.D. in Agricultural Economics from Cornell University.

**Laura McCann** is an Associate Professor in the Department of Agriculture Economics at the University of Missouri. Her research areas include transaction costs of agro-environmental policies related to animal waste, phosphorous, and pesticides; measurement issues related to transaction costs; determinants of transaction costs including property rights institutions; and comparisons of environmental policy issues in developed versus developing countries. She studied in Morocco and later earned her Ph.D. at the University of Minnesota before working in Western Australia, Vietnam, and now Missouri.

**Kent Messer** is a Professor at the University of Delaware College of Agricultural and Natural Resources. His research topics include environmental conservation, provision of public goods, and behavioral response to risk. He is the Unidel Howard Cosgrove Chair for the Environment and the Director of the Center for Experimental and Applied Economics. Messer has also served as editor for the *Agricultural and Resource Economics Review*, a board member of the Northeastern Agricultural and Resource Economics Association, and a member of various other environmental economic associations.

**Amanda Pruzinsky** is the former CRC career development staff member for the Chesapeake Bay Program's Scientific, Technical, Analysis and Reporting (STAR) committee. As of December 2014, she works as a physical scientist providing geobrowser, GIS, and mapping support for the EPA Region 3 Water Protection Division. Pruzinsky earned her Bachelor's degree in Mathematics at Washington College and attended the workshop to learn more about the field of behavioral economics.

**Ann Sorensen** is the Director of Research at the American Farmland Trust (AFT) and has worked there since 1992, previously serving as the Director of the American Farmland Trust's Center for Agriculture in the Environment. Her work includes managing assistance agreements between AFT and the EPA to promote Integrated Pest Management (IPM) practices and contributing to Farming on the Edge projects to document developmental sprawl. Sorensen is also working to design and implement an interstate water quality trading program for the Ohio River Basin. She earned her Ph.D. from the University of California, Berkeley.

**Lauren Taneyhill** is the Chesapeake Bay Program's Management Board Career Development staff member and also serves a similar capacity at the Enhancing Partnering, Leadership, and Management Goal Implementation Team. Taneyhill also works with the Agriculture Workgroup and the Best Management Practices Verification Workgroup. She earned her Bachelor's degree from PSU and attended the workshop to learn more about the field of behavioral economics.

#### Workshop Steering Committee

**Charlie Abdalla** is a Professor of Agricultural and Environmental Economics at PSU and belongs to the Agricultural and Applied Economics Association and Northeast Agricultural and Resource Economics Association. He earned his Bachelor's degree in Environmental Resource Management, a Master's of Science in Agricultural Economics, a Master's of Arts in Economics, and a Ph. D. in Agricultural Economics.

**Matt Ellis** is the former Scientific and Technical Advisory Committee (STAC) Staff member at the Chesapeake Research Consortium. He graduated from the University of Maryland with a Bachelor's degree in Journalism and a minor in Geographic Information Systems.

**Natalie Gardner** is the Coordinator for the Scientific and Technical Advisory Committee (STAC) at the Chesapeake Research Consortium. She earned a Bachelor's degree in Business Administration and Management and will received a Master's degree in Environmental Planning and Geography from Towson University in Summer 2015.

**Susan Julius** is an Environmental Assessment Specialist at the EPA, leading national teams for the National Center for Environmental Assessment and Global Change Research Program. She earned her Master's degree from Carnegie Mellon University in Public Management and Policy, concentrating on policy analysis.

**Poornima Madhavan** is the new Director of the Board on Human-Systems Integration at the National Research Council of the National Academy of Sciences. Previously, she was an Associate Professor of Psychology at Old Dominion University (ODU), as well as the Director of Undergraduate Research within the Honors College. She received her Ph.D. in Engineering Psychology from the University of Illinois at Urbana-Champaign, followed by a post-doctoral fellowship at the Department of Social and Decision Sciences at Carnegie Mellon University. Dr. Madhavan was the founder/director of the Applied Decision Making Laboratory at ODU where she supervised projects that examined human decision-making under risk, stress, time pressure, and uncertainty, and the intersection of social science and public policy.

**Marc Ribaud** is currently a Senior Economist in the Resource, Environment and Science Policy Branch of ERS's Resource and Rural Economics Division. He has worked at ERS since 1983. His primary areas of expertise are water quality and policy design for addressing agriculture-related environmental issues. He earned a Bachelor's degree in Natural Resource Management, a Master's degree in Agricultural and Resource Economics, and a Ph.D. in Agricultural Economics.

**Kurt Stephenson** is a Professor and Undergraduate Director of the Virginia Tech Department of Agricultural and Applied Economics. Stephenson's research interests include market-based environmental policies, water resource economics and policy, and the role of economic analysis in public policy. His current work focuses on nutrient credit trading, stormwater management, enhancing the function of natural systems to serve as nutrient sinks, and incentives to reduce agricultural non-point source nutrient runoff. He earned a Bachelor's degree in Economics, Master's degree in Agricultural Economics, and a Ph.D. in Economics.

Additional Steering Committee Members (Not in Attendance):

**Jim Pease** is a professor with Virginia Tech's Department of Agricultural and Applied Economics. His program research focus is in economic and environmental policies affecting agricultural production. Pease earned his Master's degree in Agricultural Economics and a Ph.D. in Agricultural Economics. Pease also participates in extension/outreach programs focusing on government policies affecting agricultural production and Farm Bill programs.