

5-2016

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# WATERSHED SCIENCE BULLETIN

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Journal of the Center for Watershed Protection Association



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*Watershed Science Bulletin* is a publication of the Center for Watershed Protection Association

“*Evaluating the environmental effectiveness of grassroots environmental stewardship organizations in Maryland, USA*” was first published in the *Watershed Science Bulletin* May 2016.

Front cover photo courtesy of Anne Arundel Watershed Stewards Academy

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# Evaluating the environmental effectiveness of grassroots environmental stewardship organizations in Maryland, USA

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## Abstract

Small organizations that conduct environmental stewardship projects often lack access to the research capacity, funding, or tools needed to evaluate scientifically the environmental effectiveness of the measures they undertake. Still, evaluation of environmental effectiveness, defined here as the implementation of specific local goals, is prudent where projects are carried out with environmental stewardship goals in mind. We propose and test a process for evaluating environmental effectiveness of stewardship programs in a rigorous, yet feasible, approach through analysis of archived documents, program materials, and project inventories, as well as a survey of program participants. Using three franchises of the Watershed Stewards Academy in Maryland as a case study, we evaluate the environmental effectiveness of the stewardship work conducted by these organizations.

Keywords: stewardship, environmental effectiveness, evaluation, watershed stewardship, environmental education, stewardship organizations

## Introduction

Environmental stewardship and restoration is a growing movement in the United States (see particularly Weber 2000; Sirianni and Friedland 2001: Chapter 3; Andrews and Edwards 2005; Fisher et al. 2015). Although these efforts often focus on improving environmental conditions, very little is understood about how stewardship actions align with these organizational priorities (Wolf et al. 2013). However, a recent contribution from Romolini and colleagues (2013) finds that the presence of stewardship groups correlates positively with canopy cover in neighborhoods. Similarly, in their study of the relationship between stewardship organizations and changes in vegetative cover in New York City, Locke and colleagues find that neighborhoods that gained vegetative cover tended to have more stewardship groups (2014).

Community stewardship actions are often geographically dispersed and may contribute to environmental improvement through diffuse or delayed pathways. For instance, a single rain barrel or rain garden installed for the purpose of mitigating stormwater runoff may have little measurable effect at the watershed scale. Moreover, it may take a lot

of time for the rain barrel's or rain garden's more localized effects to be realized. In addition, environmental stewardship groups operate at local scales with limited budgets (Fisher et al. 2012). As such, their capacity to evaluate the effectiveness of the work they undertake is often limited. In these cases, measuring the environmental effectiveness of a single project may not be feasible. However, taking stock of how outcomes are connected to environmental goals can contribute to the focus and direction of stewardship programs. Evaluation can also help inform program directions, methods, and goals. With the growing presence of environmental stewardship groups, a better understanding of how the actions of these organizations relate to environmental conditions provides a more complete picture of both social and ecological interactions, as well as the factors influencing local ecological patterns and processes in places where stewardship groups are active.

In this paper, we outline a simple process for evaluating environmental effectiveness of stewardship programs in a rigorous, yet feasible, approach by analyzing archived documents, program materials, and project inventories, as well as surveying program participants. The intent here is not

to supplant rigorous scientific evaluation of environmental stewardship methods and outcomes, but to provide an alternative means of evaluation for organizations that lack that capacity or mission but wish to self-evaluate.

To develop and test this process we worked with the Watershed Stewards Academy (WSA) program in Maryland. The WSA program was founded in 2009 in Anne Arundel County, Maryland. It has since expanded to include additional franchises in the National Capital Region, which consists of the District of Columbia, Prince George's County, MD, and Montgomery County, MD (in 2011) and Howard County, MD (in 2012). The WSAs train volunteers to become Master Watershed Stewards (MWS). Stewards go through an intensive series of training courses, which educate them about watershed issues and restoration. In addition to learning the science behind watershed restoration, these courses include some hands-on experience doing on-the-ground environmental work, where stewards learn different watershed restoration methods that can be applied in their communities. The series of courses culminate with the new stewards planning and completing capstone projects wherein they implement an environmental best management practice (BMP) or environmental education initiative in their community. The aim of training stewards is to create a dispersed network of knowledgeable leaders to engage their respective communities in watershed restoration. By applying our evaluation process to the three WSA franchises (Anne Arundel, National Capital Region, and Howard County), this study can inform development of additional WSAs and assist with planning the next steps in existing programs, as well as provide insights to other local stewardship groups and researchers interested in understanding the socio-ecological impact of stewardship activities in the broader context of watershed health.

This project addresses the overarching question of the environmental effectiveness of the WSA programs. For the purposes of this project, we define environmental effectiveness as the implementation of specific goals as defined by each stewardship group. This definition allows us to evaluate effectiveness across the wide variety of types of stewardship actions undertaken by these various groups. In the pages that follow, we integrate data collected through archival research, a survey of program participants, and analysis of particular outcomes to look at the specific goals,

metrics, and outcomes for each WSA program and assess their environmental effectiveness.

## Methods

### Archival Research

To assess environmental effectiveness of the Watershed Stewards Academies, we used archival research to determine the extent to which environmental issues, goals, and outcomes are identified by WSAs as being important. The three WSAs were asked to share any available documents related to their programs. As each WSA is an independent franchise, the documents varied quite substantially. The types of documents provided for review included: capstone project inventories, annual reports, course syllabi, and reports to funders. We did not analyze course materials other than syllabi in order to maintain the focus on the program goals rather than curriculum content.

We analyzed each document by carefully reading and recording all environmental goals and metrics they contained, noting whether specific environmental outputs were mentioned, and whether qualitative (descriptive) and/or quantitative (specific numerical calculations) evaluation metrics were employed. The goals mentioned in the documents reviewed were grouped into eight general categories: *train and raise awareness*, *engage the community*, *improve environmental conditions*, *meet regulations*, *obtain resources*, *shift values*, *mitigate stormwater impacts*, and *improve water quality*. The *train and raise awareness* category included goals related to training and education of Master Watershed Stewards, as well as broader awareness of watershed issues. *Engage the community* included goals that address involving the community outside of the Master Stewards, such as volunteer projects and connecting with faith-based communities. The category of *improve environmental conditions* comprised goals that were environmental in nature but broad in scope, such as “engage, inform, and empower communities to preserve and protect the watershed” (Anne Arundel WSA 2013). Goals that addressed specific regulations were categorized under the *meet regulations* group. References to the need to connect stewards with other organizations or government entities to obtain resources to conduct restoration were categorized under the code *obtain resources*. Statements that indicated a goal of transforming community values were labeled as *shift values*.

The *mitigate stormwater impacts* category was used to classify any goal that referenced reducing the amount of stormwater runoff in waterways specifically, while the *improve water quality* category was used for more generic statements about reducing pollution and improving water quality.

To understand how these organizations are implementing projects and getting to outcomes associated with the environmental goals they adopt, we then conducted a more detailed examination of the WSAs’ internal evaluation of their projects by analyzing the metrics they report. In particular, we recorded each time a metric was reported in a WSA document, whether explicitly or implicitly, and identified which goal category (or categories) it addressed. Metrics were grouped into three categories: environmental metrics, training and engagement metrics, and outreach metrics. Finally, each quantifiable outcome that was reported was recorded and assigned to a goal category.

### Survey of Master Watershed Stewards

In order to obtain information directly from WSA Master Steward course participants, we conducted an online survey of all WSA members and volunteers in Summer 2014. Recruitment for the survey was done in cooperation with the WSA program leadership, who provided names and contact information of all current and former students. The survey was conducted with the approval of the University of Maryland College Park Institutional Review Boards (protocol #598272-1). In total, 154 members completed the survey,

representing a response rate of 56.2%. The survey contained questions collecting information on the level and type of current or past involvement in a given WSA, involvement with the Master Watershed Stewards course (e.g. in progress, completed, did not complete), type of watershed stewardship activities undertaken with the WSA and outside of WSA, and basic demographic information. One portion of the survey also asked respondents to describe their capstone projects, if applicable. The self-reported data from this section is vital to understanding the actual content of the capstone projects as they were completed. For the 120 respondents who reported completing a capstone project, we coded each respondent’s capstone description within the categories developed in the archival research phase of the project described above, allowing each capstone to fit as many categories as appropriate.

### Results

Here we begin by presenting findings from our archival research, followed by results from the survey of WSA participants. We conclude by integrating these findings across WSAs to identify emerging patterns.

### Archival Research

We received a total of 13 documents from the three WSAs that fit within the categories of relevance to the research questions (capstone project inventories, annual reports, course syllabi, and reports to funders). Howard County (HC)

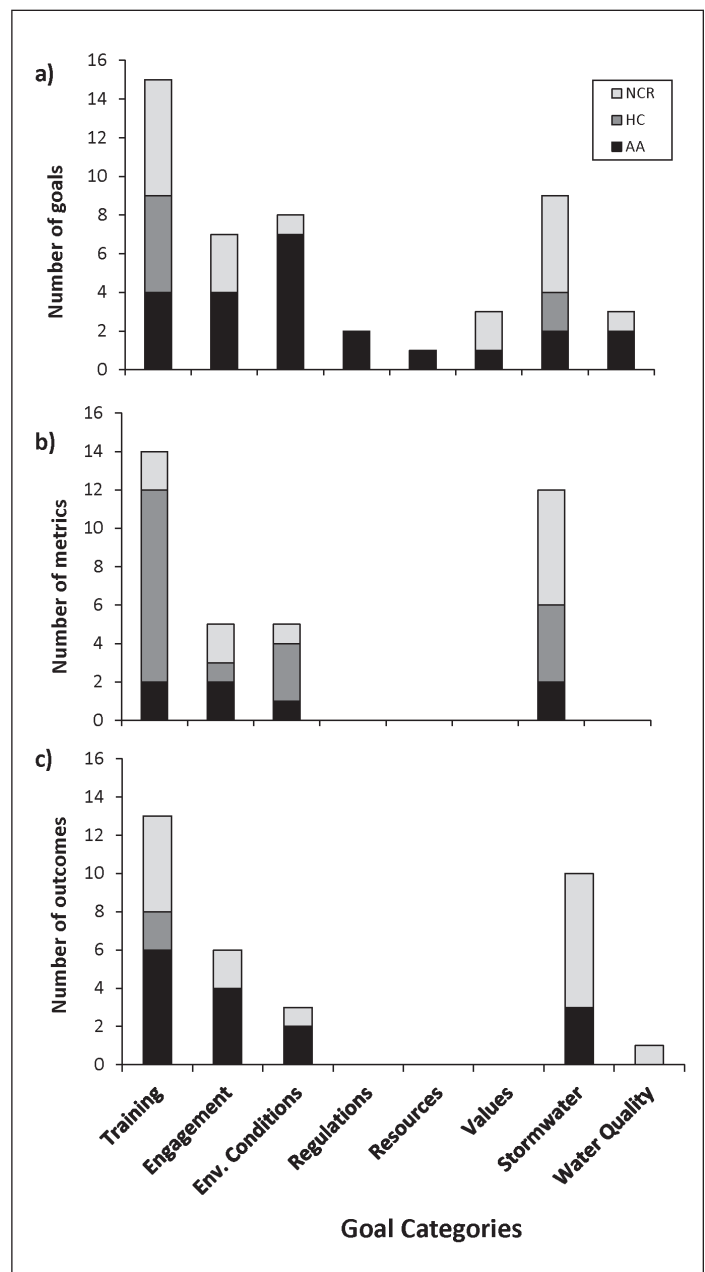
**Table 1. Cross-comparison of goal categories and metrics articulated in WSA documents. Goal categories articulated by a WSA are indicated with an “x” in the cell. A gray shaded cell indicates that that WSA listed a metric that could evaluate progress towards that goal type. Goal categories are defined in Methods.**

Goal Categories	WSA Group		
	Anne Arundel	Howard	National Capital
Train and Raise Awareness	x	x	x
Engage the Community	x		x
Improve Environmental Conditions	x		x
Meet Regulations	x		
Obtain Resources	x		
Shift Values	x		x
Mitigate Stormwater Impacts	x	x	x
Improve Water Quality	x		x

WSA submitted the fewest documents. The only document type common to all WSA groups was course syllabi. Because each WSA program is run differently and staffing resources vary among the programs, the diversity of document types is to be expected. Nonetheless, due to the limited number of documents across all WSA franchises, results should be interpreted cautiously.

Table 1 presents the goal categories articulated by each WSA franchise. Many of the stated goals were applicable to more than one of the categories, and of all the categories, all but one (*obtain resources*) had at least one goal falling into that category (Figure 1a). Only two categories—*mitigate stormwater impacts* and *train and raise awareness*—were common to all WSA groups (Table 1), but there were only two categories that were unique to one group (Anne Arundel [AA] WSA)—*meet regulations* and *obtain resources*. Notably, the goal of “certify a Master Steward in every watershed” was repeated verbatim in the AA WSA and National Capital Region (NCR) WSA documents, but not for the HC WSA.

All three WSA groups reported metrics for evaluation, whether explicitly by listing metrics or implicitly by stating outcomes in terms of a quantifiable metric. For instance, the statement “Stewards have engaged an estimated additional 350 volunteers through their projects and outreach activities” (Castelli 2012) would indicate that the number of volunteers participating in projects and outreach activities could be a metric to evaluate community engagement. Of the metrics that each WSA used or proposed to use to track progress towards goals, each measured success towards a goal category. However, not all goal categories identified by the WSAs were addressed by metrics they defined (Table 1). In comparing the metrics to the goals addressed by each WSA, two findings were evident. First, on an individual WSA basis, not all of the metrics that were reported addressed a goal of that WSA. For example, HC WSA reported metrics that would address the goal categories *engage the community* and *improve environmental conditions*, but did not state any goals in those categories. Second, there were some goals that did not have corresponding metrics presented by the WSAs. These included *shift values* (NCR WSA), *meet regulations* (AA WSA), *obtain resources* (AA WSA), and *mitigate stormwater impacts* (HC WSA) (Figure 1b).



**Figure 1.** The frequency of goals (a), metrics (b), and outcomes (c) of each goal category stated in WSA documents, see the section “Methods” for explanation of goal categories. Each WSA group is represented by a different shade (light gray = National Capital Region, dark gray = Howard County, and black = Anne Arundel). Absence of a shade in a bar indicates that no metrics or outcomes were stated that apply to that category for that WSA group. Goal categories are abbreviated as follows: Training = train and raise awareness, Engagement = engage the community, Env. Conditions = improve environmental conditions, Regulations = meet regulations, Resources = obtain resources, Values = shift values, Stormwater = mitigate stormwater impacts, and Water Quality = improve water quality.

**Table 2. Examples of metrics and outcomes associated with each goal category from review of WSA documents. This is not an exhaustive list of all metrics and outcomes reported.**

Goal Category	Example Metrics	Example Outcomes
Train and Raise Awareness	Number of Master Watershed Stewards, number of students enrolled in MWS course, number of attendees at presentations	2 semesters of training offered, 30 MWS trained, 167 presentations and events
Engage the Community	Number of volunteers, number of hours volunteered	350 volunteers engaged, over 2800 hours volunteered
Improve Environmental Conditions	Number of native plants and trees planted, area of invasive species removed	Over 8200 native trees and plants planted
Meet Regulations	<i>No metrics reported</i>	<i>No outcomes reported</i>
Obtain Resources	<i>No metrics reported</i>	<i>No outcomes reported</i>
Shift Values	<i>No metrics reported</i>	<i>No outcomes reported</i>
Mitigate Stormwater Impacts	Area of permeable pavement installed, volume of cistern storage capacity installed, area of rain gardens created, number of pet waste stations installed	8,000 ft <sup>2</sup> converted to bioretention, 206 rain barrels installed
Improve Water Quality	<i>No metrics reported</i>	<i>No outcomes reported</i>

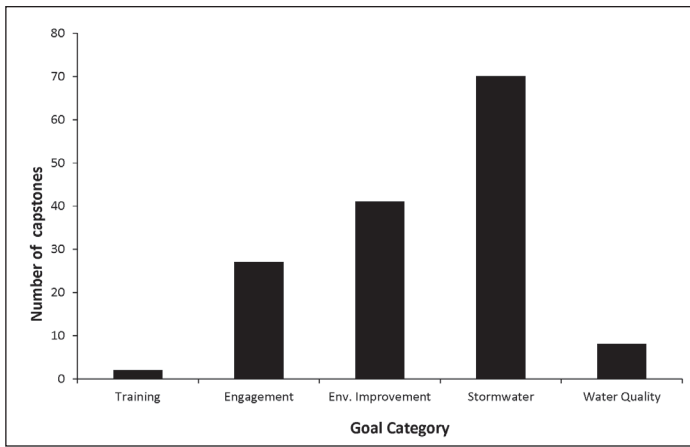
Of the outcomes reported by WSA groups, the majority addressed the goals of *mitigate stormwater impacts* and *train and raise awareness* (Figure 1c). Other goal categories addressed by reported outcomes were *engage the community*, *improve environmental conditions*, and one outcome addressed *improve water quality*. Across all 13 documents, there were 31 specific outcomes mentioned. Combined, in 2012 and 2013 the WSAs reported installing or creating over 370,000 square feet of bioretention (e.g. rain gardens and bioswales), planting over 14,000 native plants and trees, converting over 6,000 square feet of impervious surface to pervious, and distributing and/or installing 292 rain barrels and 1300 gallons of cistern storage capacity. Examples of metrics and outcomes identified for each goal type are given in Table 2.

Overall, the WSA program engages in numerous goals, with some degree of variation when we compare goals to metrics and outcomes. Most notably, the goals *meet regulations*, *obtain resources*, and *shift values* involved neither metrics nor outcomes in the documents provided by the WSA franchises.

### Survey of Master Watershed Stewards

Of the 154 people who completed the survey, 148 of them responded to the question that specifically asks about capstone projects. Most of those respondents (81%) reported having completed or being in the process of completing a capstone project as part of their MWS certification (not all survey participants were members of a MWS class and not all class members completed capstones). The capstone projects are a requirement of the MWS certification curriculum, wherein students design and implement an environmental best management practice or community engagement project as the culmination of the course. Based on the capstone descriptions provided by respondents, we find that most capstones fit into the *mitigate stormwater impacts* category (70), followed by *improve environmental conditions* (41), *engage the community* (27), *improve water quality* (8), and *train and raise awareness* (2) (Figure 2). Capstones were located in multiple watersheds, spanning the three geographic regions in which the WSAs work. Most stewards reported participating in watershed restoration/protection on personal property, public property, or privately owned residential property.





**Figure 2.** Number of capstone projects reported by survey respondents in each of the goal categories. 118 projects were described, and projects were allowed to fall into more than one category. Goal categories in which no capstone projects fell are not shown (*meet regulations, obtain resources, and shift values*). Goal categories are abbreviated as in Figure 1.

In addition to questions about capstone projects, we also asked questions about the environmental stewardship work that respondents engaged in, both in general and specific to their activities with the WSA groups (respondents were permitted to select more than one response, so the sum of percentages exceeds 100%). The most common types of environmental participation were “educated members of your community about watershed issues/protection” (126 respondents, 86%), “planted trees/vegetation” (120 respondents, 82%), and “removed non-native or invasive vegetation” (104 respondents, 71%). When asked to focus in on work done through the WSA, these categories were fairly similar. Eighty-seven respondents (76%) had “educated members of your community about watershed issues/protection” and 58 (50%) had “planted trees/vegetation,” with all other activities falling below 50% response rates.

Comparing the WSA documents to the survey responses by WSA participants, interesting patterns emerge regarding goals, metrics, and outcomes. Metrics reported by the WSAs, as well as survey results, show that the majority of capstone projects are related to improving environmental conditions and increasing awareness. Goals in the categories *meet regulations, obtain resources, and shift values* were consistently not tracked or reported on, nor did survey respondents report any capstone activities that fit into those categories.

## Discussion

Despite the increasing presence in cities and rural areas of community-based environmental stewardship programs, there is a dearth of research into the environmental effectiveness of such efforts (see Romolini et al. 2013 and Wolf et al. 2013). Without better understanding the connections between social and ecological outcomes of these efforts, we may fail to account fully for the role of stewardship in restoring and preserving landscapes. Although studies of the precise ecological effects of such work would provide valuable insight, lack of funding and controlled settings in which to conduct such research provide barriers to these efforts. The method we present here will benefit organizations without the means or mission to conduct or fund such research by providing an example of a process for self-evaluation across a range of project types (Box 1).

### Box 1. Steps for Evaluating Effectiveness of Stewardship Programs

Gather archival research, including archived documents, program materials, and project inventories related to the organization’s programs that include environmental issues, goals, and outcomes the organization identifies as important.

Review archival research and record all environmental goals, metrics, and outcomes they contain. Note whether specific outputs are qualitative or quantitative.

Based on the review, identify general categories of goals that are related.

Review metrics and outcomes reported in the documents and record each time they are reported, whether explicitly or implicitly, and which goal category they address.

Conduct a survey of program participants (members, employees, volunteers, etc.) to gather additional information about goals, metrics, and outcomes.

Cross-compare goal categories with the metrics and outcomes to determine which goals have the most metrics/outcomes reported and which are not consistently tracked or reported on.

We found shared goals among all WSA groups, such as the strictly environmental goal categories of *mitigate stormwater impacts* and *improve environmental conditions*. The stated goals to some extent reflected the unique priorities of each WSA. The NCR WSA and AA WSA both espoused a goal of *shifting values*, although it was more pronounced for the NCR franchise, which is consistent with their focus on working with faith-based communities. On the other hand, AA WSA documents included two unique goals of connecting stewards with other groups that may have resources for projects and meeting regulations, both of which reflect their maturity among the WSA groups.

In all three WSA programs, stated goals did not always align with metrics or outcomes reported by each group. Just over half of the goal categories have metrics and outcomes that are associated with those categories. This finding is evident across all of the WSAs, although we recognize that it is naturally more difficult to develop metrics to track progress towards some goals. Of particular note and perhaps not surprisingly, information from WSAs in external reports, either to donors or potential donors or funding entities, was more detailed and thorough than in internal documents. This finding points to the importance of self-reflection and synthesis and the role of funding entities in encouraging this type of reflection.

Our results indicate that the environmental work conducted by the three WSA franchises in Maryland is working towards addressing the most often stated environmental goals of these groups—namely to *train and raise awareness* and *mitigate stormwater impacts*. The environmental outcomes reported by the groups are diverse and likely have an impact on meeting their goals. Document analysis revealed a substantial number of on-the-ground actions that contribute to the environmental effectiveness of these groups, namely: installation of rain gardens, rain barrels, and pervious pavement, as well as planting native vegetation. In addition, survey results indicate that the majority of capstone projects reported by participants addressed environmental goals such as *mitigate stormwater impacts* and *improve water quality* via similar actions. Indeed, a majority of survey respondents participate in stewardship activities outside of their WSA group, suggesting that capstone projects are a conservative estimate of the work being conducted by WSA participants.

Without additional reporting, monitoring, and evaluation it is impossible to know the precise environmental effects of the WSA groups in Maryland. However, the evaluation effort reported here is the first step in assessing how these organizations align their goals, metrics, and outcomes with their self-reported activities. The approach of combining analysis of existing documents with a survey of participants is a strength of this research—one that can be readily and inexpensively applied to other local environmental efforts, in addition to the WSAs. This process is designed to accommodate a wide variety of organizational goals and activities, so efforts beyond implementation of on-the-ground stewardship could benefit from this approach with little tailoring necessary. This initial assessment of effectiveness could help organizations identify where their goals are not being addressed (i.e. there are no outcomes that map to certain goal categories) or measured (i.e. there are no metrics that map to certain goal categories), and through this prioritize activities to ensure that goals are met. Organizations might also benefit from employing these self-assessment strategies to first identify their desired outcomes in order to develop the metrics and goals needed to prioritize their efforts and demonstrate their successes. Finally, this method may enable organizations to take stock of what their major intended outcomes are in order to ensure those objectives align with their goals and that they have adequate metrics in place to measure them.

Future research should focus on understanding how different stewardship approaches and organizational models relate to their environmental effectiveness. In addition to developing a more complete understanding of ecological effects of stewardship activities, this effort will enable us to understand stewardship in the local socio-ecological context in which these groups are active. Stewardship represents an active and growing field of research and civic engagement. Working with these groups to understand their impact is a research need that transcends disciplines.

## Acknowledgements

We are grateful for the contributions and assistance of the staff and participants of the Watershed Stewards Associations franchises in Maryland: Anne Arundel WSA, Howard County WSA, and the National Capital Region

WSA. Funding for this study was provided by a grant from Maryland Sea Grant to Dana R. Fisher. Sarah L. Close's participation in the project was made possible through the Dean John A. Knauss Marine Policy Fellowship in NOAA's Climate Program Office, with funding provided by Oregon Sea Grant. The scientific results and conclusions, as well as any views or opinions expressed herein, are those of the authors and do not necessarily reflect the views of NOAA or the Department of Commerce.

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