

6-1-2013

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Heather Akin

University of Wisconsin- Madison

Bret Shaw

University of Wisconsin- Madison

Kristine F. Stepenuck

Wisconsin Department of Natural Resources

Elizabeth Goers

University of Wisconsin- Madison



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Recommended Citation

Akin, H., Shaw, B., Stepenuck, K. F., & Goers, E. (2013). Factors Associated with Ongoing Commitment to a Volunteer Stream-Monitoring Program. *The Journal of Extension*, 51(3), Article 25.
<https://tigerprints.clemson.edu/joe/vol51/iss3/25>

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Abstract

Volunteers are important contributors to Extension conservation efforts. Volunteer water monitoring is one solution for involving people so they become educated about local ecosystems and acquire data used to detect ecological threats. The study reported here measured relationships among Wisconsin's Stream-Monitoring Program's volunteers' motivations and perceptions of program efficacy, analyzing how these are associated with intention to stay involved as stream monitors. Findings indicate four categories of motivations and three categories of efficacy related to volunteers' perception of the program.

Heather Akin
PhD Candidate
Department of Life
Sciences
Communication
University of
Wisconsin-Madison
Madison, Wisconsin
hakin@wisc.edu

Bret Shaw
Assistant Professor
and Environmental
Communication
Specialist
Department of Life
Sciences
Communication, UW-
Extension
University of
Wisconsin-Madison
Madison, Wisconsin
brshaw@wisc.edu

**Kristine F.
Stepenuck**
PhD Candidate
Gaylord Nelson
Institute for
Environmental
Studies, UW-Madison
Wisconsin Department
of Natural Resources,
Environmental
Resources Center,
UW-Extension
Madison, Wisconsin
kfstepenuck@wisc.edu

Elizabeth Goers
Department of Life
Sciences
Communication
University of
Wisconsin-Madison
Madison, Wisconsin
elizabeth.goers@gmail.com

Introduction

Volunteerism is an important element in Extension programs (Cleveland & Thompson, 2007; Boyd, 2004), which are often diverse in nature and call for a variety of skills and involvement across vast geographic areas. Collaborations between volunteer groups and universities have also become more common, with volunteers providing useful services and faculty and advisors supporting these endeavors with expertise and resources (Savan, Morgan, & Gore, 2003). In the context of environmental programs, volunteers are often important partners in conservation efforts because of the limited time and resources allotted by government or other institutions to carry out necessary activities and volunteers' vested interest in the protection of local areas (Whitelaw, Vaughan, Craig, & Atkinson, 2004).

Water quality monitoring is one type of conservation program that can benefit from involving volunteers. Extension is a national leader in leading and supporting volunteer water-monitoring

programs, sponsoring 36 programs and affiliated with at least 21 others. Extension's role includes providing educational materials, technical assistance, training, staff, equipment, and funding for these programs (Extension Volunteer Monitoring Network, 2012). Additionally, Extension sponsors 22 Master Naturalist programs across the United States. A primary goal of many of these programs, such as the Alabama Master Naturalist Program, is "to help promote awareness, understanding, and respect of [the] natural world" (Alabama Master Naturalist Program, 2012). Thus, in a similar fashion to Extension's Master Gardener program, participants in Master Naturalist programs receive training about the natural environment. Then, in order to earn their "Master Naturalist" title, they are required to share their newfound knowledge by serving as volunteer naturalists or otherwise volunteering their time for a natural resources-related service project. Many Master Naturalist programs promote volunteer water monitoring as an option for these required volunteer service hours (Savanick & Blair, 2005).

Monitoring programs like those facilitated by Extension organizations are increasingly useful as U.S. waterways become more and more threatened (Shepard, 2002). In Wisconsin, a 2006 assessment acknowledged that the vast majority of waters in the state are affected by human activities that affect water quality (*Wisconsin Water*, 2006). Yet funding for monitoring of water resources is not increasing in response to these threats to water conservation. Thus, citizen-based water-monitoring initiatives are one sustainable solution to building capacity for environmental protection efforts and making stakeholders aware of local conservation concerns.

Promoting involvement of local people as volunteer monitors ensures more timely response when water quality thresholds are crossed and enables communities to respond to unwanted, unexpected developments in nearby ecosystems (Walker & Salt, 2006). Local organizations and state agencies rely on these volunteers for many reasons, including to build community awareness about waterways, collect data on water quality and observe trends over time, and help target restoration efforts, and serve as water advocates (Environmental Protection Agency, 2011; Stepenuck, Wolfson, Liukkonen, Iles, & Grant, 2011). Training people to monitor water quality cultivates an ecologically educated citizenry, and citizens' efforts are maximized when a stable and growing cadre of individuals continues to stay engaged in these programs (Overdeest, Orr, & Stepenuck, 2004; Shepard, 2002). Therefore, loss of volunteers over time is a top concern for volunteer water-monitoring program coordinators (Extension Volunteer Monitoring Network, 2012). Understanding what motivates and retains volunteers, particularly in specific programs, is an essential part of program development and program sustainability (Cleveland & Thompson, 2007).

In social-psychology research, action theories such as the Theory of Reasoned Action or the Theory of Planned Behavior hypothesize how attitudes predict behaviors (examples include Ajzen & Fishbein, 1970; Heckhausen & Gollwitzer, 1987; Shaw, Radler, Chenoweth, Heiberger, & Dearlove, 2011). These theories have also been used to explain why individuals volunteer. Recent research has honed in on this willingness to volunteer to consider how certain "categories" of intention predict behavior as well as how situational factors influence this commitment (Montada, Kals, & Becker, 2007). This helps assess what particular cognitions, emotions, perceptions of control, social norms, and other concepts are associated with each other and how they affect individuals' willingness to continue volunteering (Montada et al., 2007; Ajzen & Fishbein, 1972). Montada, Kals, and Becker (2007) have suggested that willingness to continue one's commitment to volunteering is associated with

categories of beliefs such as the awareness of specific problems, knowledge of a violation of justice, a willingness to accept responsibility to minimize the problem, and a sense of efficacy. While this research has addressed pro-environmental behavior, studies that explore what motivates those with valuable skill sets and how other contextual factors influence volunteers' involvement are limited (Corraliza & Berenguer, 2000; Wilson, 2000).

Given the needs that can be met by volunteer citizen water monitors for Extension and other programs, it is imperative to understand how to encourage volunteers to stay involved. Past research indicates volunteers desire recognition of their efforts and are more likely to drop out if they think their work is not making a difference (Field & Johnson, 1993). Interestingly, level of satisfaction with current volunteering seems to have little to do with commitment (Penner & Finkelstein, 1998; Wilson & Musick, 1999), but those who stop volunteering are more likely to say their efforts went unrecognized (Gora & Nemerowicz, 1985). Other motivational assessments, such as the Volunteer Functions Inventory (Clary & Snyder, 1999; Van Den Berg, Dann, & Dirkx, 2009) have evaluated individual motivations to volunteer (Broun, Nilon, & Pierce, 2009), but generally exclude efficacy perceptions and intention to continue volunteering. Therefore, our study aimed to examine the specific motivations and perceptions of efficacy of stream-monitoring volunteers, in order to determine how these factors affect volunteers' intention to continue their commitment to a water-monitoring program.

Research Questions

Based on this previous research and our interest in experienced volunteers' intentions to continue their commitment, the study reported here sought to explore how participants rank specific motivations for volunteering, which led to the first research question: RQ1: How do volunteers rate motivations to participate in a citizen stream-monitoring program?

Additionally, we explored how specific motivations for volunteering are associated with each other, representing specific categories of motivations. We pose the question: RQ2: What motivations to volunteer in a citizen stream-monitoring program are correlated with one another?

As suggested by the Theory of Planned Behavior (Ajzen, 1991), one's perception of control over their behavior is also predictive of intention and thus manifest behavior and perceptions of efficacy may be predictors of a volunteer's willingness to stay involved. Therefore we also explored what perceptions of efficacy are associated with one another to determine a categorization of efficacy types: RQ3: What volunteer perceptions of the efficacy of a stream-monitoring program are correlated with one another?

Finally, after establishing categories of motivations and perceptions of efficacy, we assessed how these categories predict volunteers' continued commitment to the program and pose the questions: RQ4a. What motivations are associated with ongoing commitment to a citizen stream-monitoring program? RQ4b. What perceptions of program efficacy are associated with ongoing commitment to a stream-monitoring program?

Based on these research questions, this article explores the unique categorization of volunteers' motivations to participate in a stream-monitoring program, perceptions of efficacy, and how these

factors relate to intention to stay involved. Our goal is that the results help monitoring programs determine how they can effectively retain their volunteers.

Methods

Sample

In Wisconsin, the Water Action Volunteers (WAV) Stream Monitoring Program is a partnership between the University of Wisconsin-Extension and the Wisconsin Department of Natural Resources (DNR). The program assists citizens across the state in becoming citizen water monitors and facilitates an educational program to promote the preservation and protection of Wisconsin's 84,000 miles of rivers and streams. By educating volunteers about the status of Wisconsin's water, the program builds a network of informed citizens who advocate for the management and protection of natural resources. In turn, the DNR and UW-Extension obtain important water resource data that are used in decision-making and environmental analysis. Thus far, the program has been successful in educating and retaining a body of informed citizens that provide data on regional streams.

At the time of data collection (2008), there were 96 citizen advanced citizen volunteers (hereafter referred to as "Level 2 volunteers") participating in the program who monitor over 120 stream sites throughout the state. Level 2 volunteers collect data on dissolved oxygen, pH, and transparency at least once per month from April to September. They also collect continuous temperature data. Volunteers undergo training every year to refresh their skills and learn new techniques. Volunteer leaders organize the management of equipment and monitoring schedules to ensure that monitoring is conducted regularly and efficiently. Level 2 volunteers are considered more advanced water-monitoring volunteers because they have previous stream-monitoring experience and their methods replicate those used by the DNR. Therefore, this sample represents an important cohort of highly valued, experienced volunteers who collect high-quality data equivalent to what is collected by trained professional biologists.

To survey these volunteers, a Web-based questionnaire was distributed via email to all 96 Level 2 citizen stream-monitoring volunteers in May 2008. A letter was also mailed to all volunteers to remind them to participate and to reach participants who may not use email frequently.

Measures

Length of Time Volunteering

To assess duration of time involved as Level 2 volunteers, a question was included, "How long have you been a Level 2 Citizen Stream Monitoring volunteer?" with possible responses of "Less than one year," "One to two years," "Three to four years," and "More than five years."

Motivations

Respondents were presented with a series of statements to assess what motivated them to participate in the program (Table 1). The statements asked respondents to rank the importance of

11 statements on a 5-point scale (1-"Not at all" through 5-"Very much").

Perceptions of Efficacy

Volunteers' perceptions of program efficacy are also an important factor that that have been shown to contribute to ongoing commitment (Montada et al., 2007). These perceptions of efficacy and the personal fulfillment volunteers acquire from participation were measured by using 13 items from the questionnaire on a scale from 1-"Not at all" to 5-"Very much." (Exact wording of the statements provided in the results.)

Ongoing Commitment

Stream-monitoring volunteers' ongoing commitment to volunteer, the dependent variable, was measured by the item, "I plan to stay involved in the citizen stream-monitoring program for at least the coming year," with responses from 1-"Not at all" to 5-"Extremely."

Results

Dependent Variable

Of the 96 Level 2 stream-monitoring volunteers, 51 completed the questionnaire (a 53% response rate) The sample was 64.7% male and an average age of 52.7 years old; 52.9% worked part-time, 20.3% worked full time, and 27.5% were retired. In terms of how long they had been involved with the program, 23.1% reported less than 1 year, 7.6% reported 1-2 years; 51.9% reported 3-4 years; and 17.3% reported 5 or more years. The mean value of intention to continuing volunteering, based on the 5-point scale, was 4.71 (*SD*=.58).

Motivations

Research Question 1 asked how volunteers rate their motivations for participation in the stream-monitoring program. The five most highly ranked motivations included "To support conservation of natural habitat" (*M*=4.51), "To do something worthwhile" (*M*=4.41), "To detect potential problems in stream health so they can be quickly responded to if needed" (*M*=4.29), "For my own personal satisfaction and sense of achievement" (*M*=4.08), and "To increase awareness of existing problems with stream health" (*M*=4.06). All ratings and their means and standard deviations can be found in Table 1.

Table 1.
Ratings of Volunteers' Motivations to Participate in a Stream-Monitoring Program
(*N*=51)

Motivation	M	S.D.
To support conservation of natural habitat.	4.51	0.73
To do something worthwhile.	4.41	0.73

To detect potential problems in stream health so they can be quickly responded to if needed.	4.29	0.94
For my own personal satisfaction and sense of achievement.	4.08	1.00
To increase awareness of existing problems with stream health.	4.06	1.05
To do something interesting.	3.98	0.86
To develop new skills, knowledge or experiences.	3.90	0.96
I am committed to the conservation of a particular stream system.	3.76	1.23
To get outside and explore new stream areas.	3.75	1.16
To use existing skills, knowledge, or experiences.	3.75	0.91
I live nearby and want to help.	3.75	1.07
To meet new people.	2.65	1.09

Research Question 2 was addressed with 11 items asking volunteers what motivates them to participate in the program, which were analyzed using a principle component analysis (PCA). This type of factor analysis characterizes variables in order to reduce the number of dimensions into more meaningful components (Field, 2009). The PCA was used to construct factors that are unique and represent different dimensions of each concept. Factors with Eigenvalues (a measure of variance) greater than one were selected for inclusion in the model. The PCA indicated four primary components from the set of 11 motivational factors for participation, explaining 70.8% of variance. These components represent dimensions of personal motivations, environmental conservation motivations, practical motivations, and local motivations (a motivation to volunteer in one's community). These components, factor loading values, and descriptive and reliability statistics are provided in Table 2.

Table 2.

Factor Solution After Rotation of Volunteers' Motivations to Participate in a Stream-Monitoring Program. (Measured on a 5-point scale [1-"Not at all" through 5-"Very much"])

	Eigenvalue	Rotated Factor Loading	Cronbach's α	Mean (N=51)	S.D.
<i>Personal motivations</i>	3.86		.807	4.16	0.74
For my own personal satisfaction and sense of achievement.		.841		4.08	1.00
To do something interesting.		.830		3.98	0.86
To do something worthwhile.		.794		4.41	0.73
<i>Environmental motivations</i>	2.07		.794	4.29	0.77

To detect potential problems in stream health so they can be quickly responded to if needed.		.857		4.29	0.94
To support conservation of natural habitat.		.853		4.51	0.73
To increase awareness of existing problems with stream health.		.742		4.06	1.05
Practical motivations	1.37		.732	3.38	0.86
To get outside and explore new stream areas.		.870		3.75	1.16
To meet new people.		.715		2.65	1.09
To use existing skills, knowledge, or experiences.		.634		3.75	0.91
Local motivations	1.21		r=.421*	3.75	0.94
I live nearby and want to help.		.758		3.75	1.07
I am committed to the conservation of a particular stream system.		.724		3.76	1.23
Notes: PCA was conducted using Varimax rotation with Kaiser Normalization. * The two items were significantly correlated ($p=.001$).					

Program Efficacy

To address Research Question 3, the PCA was also conducted on the 13 efficacy items. These items addressed volunteers' perceptions of the program's value and effectiveness. Three components were extracted from this factor rotation, explaining 65.5% of the total variance among the variables. These factors represent program efficacy, personal efficacy in their volunteer duties, and efficacy of the program's outreach (the program's effectiveness at promoting its mission and efforts). Results can be found in Table 3.

Table 3.

Factor Solution After Rotation of Volunteers' Perceptions of Efficacy in a Stream-Monitoring program. (Measured on a 5-point scale [1-"Not at all" through 5-"Very much"])

	Eigenvalue	Rotated Factor Loading	Cronbach's α	Mean (N=51)	SD
Program Efficacy	4.50		.865	3.75	0.68
The program helps preserve stream ecosystems in Wisconsin.		.802		3.90	0.81

The data I collect as a volunteer are being used as effectively as possible to promote conservation issues.		.774		3.29	0.90
My volunteering with the citizen stream monitoring program makes a difference in protecting the environment.		.727		3.76	0.97
The data I collect as a volunteer reach leaders responsible for making decisions about stream health.		.707		3.22	0.99
I believe the data I collect as a volunteer are valuable.		.690		4.27	0.67
<i>Personal Efficacy</i>	2.05		.697	4.42	0.50
My time as a citizen stream monitoring volunteer is a good use of my time compared with other ways I could volunteer.		.743		4.35	0.77
I would refer others I know to participate in the citizen stream monitoring program.		.684		4.31	0.71
I am confident in the quality of the data I collect as a volunteer.		.664		4.53	0.64
I understand the purpose of the citizen stream-monitoring program.		.659		4.47	0.64
<i>Efficacy of the Program's Outreach</i>	1.44		.704	2.65	0.82
The citizen stream monitoring program does a good job getting the word out about the data I collect as a citizen stream monitoring volunteer.		.785		3.02	0.88
Other conservation groups in my area are aware of the stream-monitoring program.		.742		2.98	1.09
Local media in my area are aware of the data I collect for the stream monitoring program.		.750		1.94	1.12

Ongoing Commitment

An Ordinary Least Squares (OLS) regression model was used for Research Questions 4a and 4b, which explore specific motivations and appraisals of personal and program efficacy associated with continued commitment. The independent measures were reduced into factors to determine how they contribute to ongoing commitment in the citizen stream-monitoring program. Each independent or

explanatory variable's effect on volunteers' ongoing commitment and the overall fit of the model, R^2 , are presented in Table 4.

Table 4.

Regression Table: Predictors of Volunteers' Willingness Stay Involved in a Stream-Monitoring Program

	β	<i>p</i> -value
(Constant)	4.74*	.000
Length of time as a volunteer		
<i>1-2 years</i>	.095	.775
<i>3-4 years</i>	-.009	.962
<i>More than 5 years</i>	-.285	.198
Motivations to participate		
<i>Personal motivations</i>	-.001	.994
<i>Environmental motivations</i>	.005	.957
<i>Practical motivations</i>	-.052	.510
<i>Local motivations</i>	.089	.229
Perceived efficacy of stream monitoring program		
<i>Program efficacy</i>	.002	.984
<i>Personal efficacy</i>	.325*	.000
<i>Program outreach</i>	.108	.187
F(10,38) =	3.43	.000
R^2 =	33.6%***	
Coefficients in table are unstandardized Betas. * $p < .05$		

Only one item entered into the model was a significant predictor of volunteers' ongoing commitment: volunteers' perception of personal efficacy. This item, referring to whether volunteers perceive themselves as effective volunteers, suggests that with an increase in volunteers' rating of perceived program efficacy, ongoing commitment is expected to increase. The model does not provide evidence that program efficacy and outreach, specific motivations, or the length of time involved in the program significantly contribute to continued commitment. Overall, the model significantly predicts ongoing volunteer commitment in the program $F(10,38) = 3.43$, $p < .001$. The model's fit, R^2 , indicates that the items included explain 33.6% of the variance in volunteers' indications that they

will continue volunteering in the stream-monitoring program.

Discussion

The purpose of the study reported here was to better understand the influence of volunteers' motivations and perceptions of efficacy in a statewide citizen-based stream-monitoring program and how these were associated with willingness to stay involved. These questions are particularly relevant for environmental volunteerism and Extension programs, such as water monitoring, which rely upon volunteers for their success. Conservation activities generally benefit from a continuous commitment from volunteers, as opposed to objectives that can be fulfilled by a one-time commitment (Montada, et al., 2007). Additionally, trained and experienced volunteers who provide trend data used directly for conservation provide a critical service, making it important to understand what may influence their continued involvement. Our findings of four types of motivations to volunteer and three main categories of efficacy perceptions for these volunteers and that one type of efficacy—personal efficacy—contributes to volunteers' intention to stay committed provide practical implications for Extension professionals who depend on committed volunteers to carry out effective programming.

Our assessment of how volunteers rate specific motivations shows volunteers prioritize contributions to conservation and the feeling of accomplishment they get from their monitoring efforts over more practicable outcomes. Our findings indicate these motivations can be grouped into four categories: the personal fulfillment one achieves from volunteering, the environmental problems that compel them to participate, the functional skills and experiences they achieve from volunteering, and motivation to respond to a local issue or to benefit a specific place in their community.

This systematic grouping of motivations that are germane to volunteers is useful for any administrator who aims to understand and support their volunteers. An administrator might use these categories to set comprehensive program goal, and use these categories to ensure that volunteers are in fact able to do what they are motivated by and/or that they receive recognition for their efforts in these areas. For instance, to fulfill volunteers' expectations related to the "personal motivations," they have to do something interesting and worthwhile, and volunteer administrators should strive to make the activity enjoyable and challenging, and ensure that volunteers are personally or publically recognized for their contributions. Likewise to address "environmental motivations," administrators could remind volunteers how their efforts contribute directly to conservation. If a volunteer organizer knows which motivations are particularly influential, she or he can set goals based on motivations that are most resonant to volunteers.

Similarly, the findings of the three categories of program efficacy (personal efficacy, program efficacy, and the efficacy of program outreach efforts) provide similar knowledge to program administrators. For instance, ongoing training efforts that improve volunteers' data-collection skills could assist in increasing volunteers' personal efficacy and thus commitment to keep volunteering. Targeting specific aspects of the program to improve the quality of the data gathered and emphasizing to volunteers the usefulness and importance of their efforts and the data they collect could also address program efficacy perceptions and in turn maintain volunteers' willingness to stay involved.

This acknowledgement of volunteers' efficacy perceptions relates to one of the most important findings of the study—the powerful influence of personal efficacy perceptions on volunteers' commitment to a volunteer program. This dimension of efficacy that emerged from our analysis significantly contributed to volunteers' intentions to stay involved in the stream-monitoring program. This suggests that when citizens believe they are effective and empowered volunteers, they are more likely to remain involved in this activity. Maintaining or improving this perception with ongoing training and skills development opportunities and regularly acknowledging volunteers' contributions should be priorities of program administrators if they want to retain and motivate their experienced volunteers.

Despite practical implications of the study for volunteer program leaders, it is important to acknowledge the study's limitations. One limitation is the correlational nature of the variables; that is, the statistically significant independent variables of program efficacy do not definitively have a causal relationship with the dependent variable of ongoing commitment.

It is also important to remind readers that the study examined how motivations and self perceived program efficacy are associated with behavioral intention to stay involved in a citizen stream-monitoring program rather than behavioral outcomes. While behavioral intention is often associated with actual behavior (e.g., Kaiser & Gutscher, 2003), future research should assess actual behaviors—and not just intention—as the manifest behavior of staying involved as a citizen stream monitor is what is necessary to maintain and expand the influence of the program.

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