

A Comparative Analysis of Water Quality Monitoring Programs in the Southeast: Lessons for Tennessee

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Biographical Sketches of Authors

Ruth Anne Hanahan is a Senior Research Associate at the TN Water Resources Research Center (TN WRRC) located at the University of Tennessee. Over the past six years, her primary focus has been to build and manage the Knox County Adopt-A-Watershed Program. She conducts the program on behalf of the *Water Quality Forum*, a consortium dedicated to protecting and improving regional water quality. In addition to coordinating this hands-on environmental education program for the Forum, Ruth Anne has been integral in assisting with the development of other Forum educational/community outreach and technical projects including the recently established Adopt-A-Stream Program.

Caitlin Cottrill was employed as a Graduate Research Assistant at the TN WRRC while receiving her master's degree in urban planning from the University of Tennessee. She has participated in a number of planning activities involving environmental monitoring and planning for sustainable development. Caitlin is currently employed as a transportation planner at the Mid-America Regional Council in Kansas City, Missouri.

Abstract

The upsurge of state volunteer monitoring programs across the nation has been heralded as a way for citizens to turn knowledge into action including empowering them to make informed decisions and involving them in activities that directly protect state waterways. Tennessee does not currently have a statewide volunteer monitoring program, although there has been some preliminary discussion within the state's nonpoint source program to sponsor one. Building on this national movement and state interest, the TN Water Resources Research Center at the University of Tennessee has recently completed a study comparing three southeastern statewide volunteer monitoring programs, including Alabama Water Watch, Kentucky Water Watch and Georgia Adopt-A-Stream. The purpose of this comparative analysis was to examine how these programs have been implemented and learn from their experiences so that we could recommend to Tennessee policy decision makers and other stakeholders possible approaches to establishing such a program here in our state.

In order to provide a more substantive set of recommendations, we were also interested in acquiring information on the perceptions of the general benefits and limitations of volunteer monitoring. To that end, we surveyed volunteer monitors participating in the three state programs as well those in Tennessee who have an interest ("a stake") in expanding volunteer monitoring in the state. It is our hope that this study and its accompanying set of recommendations will advance a productive dialogue among Tennessee stakeholders on the viability of initiating a statewide volunteer monitoring program including actions necessary to make it happen.

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Background & Objectives

Volunteer monitoring has a long-standing history in the United States and over the past two decades there has been a growing trend of states utilizing citizen monitors as a means of acquiring needed water quality data and promoting watershed stewardship and education. More than half of U.S. states now have state-managed volunteer monitoring programs. This report provides the results of research that was conducted by the Tennessee Water Resources Research Center to provide state decision-makers and other stakeholders with information to begin an earnest dialogue on the viability of initiating such a program here in Tennessee. Our specific research objectives were to:

- compare and contrast three state-supported volunteer monitoring programs in the Southeast, including surveying their volunteers on their perceptions of volunteer monitoring;
- identify Tennessean's views on volunteer monitoring and
- devise a set of recommendations including if and how Tennessee should initiate and structure a statewide program.

Research Design

Our research was conducted in five phases. First, we reviewed literature on volunteer monitoring as a basis for the study. Second, we selected three Southeastern statewide volunteer monitoring programs to analyze, compare and contrast: Alabama Water Watch (AWW), Georgia Adopt-A-Stream (GA AAS), and Kentucky Water Watch (KY Water Watch). As a part of these case studies, we conducted face- to-face interviews with each of the Program Managers and reviewed program websites and documents.

The third research phase was to interview past and current volunteer monitors of the three selected programs to determine, among other things, their perceptions on the benefits and limitations of volunteer monitoring. The Social Science Research Institute at the University of Tennessee conducted the survey through a computer-assisted telephone interviewing system. Those who were 18 years and older and who had provided both an address and telephone number to the programs were included in the samples. Following are the sample sizes (excluding incorrect and disconnected telephone numbers), response rates, and confidence levels we obtained for each of the programs:

- AWW: 269, response rate - 82%; margin of error - +/- 5.2 at 95% confidence level
- GA AAS: 127, response rate - 73%; margin of error is +/- 5.7 at 95% confidence level
- KY Water Watch: 361 (drawn from KY Watershed Watch), response rate - 83%; margin of error is +/- 2.7 @ 95% confidence level

The data was analyzed by and across programs and included descriptive statistics and cross tabulations to determine data patterns. In addition, paired mean tests were run among the programs to identify significant differences in the perceived benefits and limitations of volunteer monitoring.

The fourth phase was to survey Tennesseans with a stake in volunteer monitoring. We opted to obtain a sample that would give us an indication of Tennesseans' perceptions on volunteer monitoring due to the costs of obtaining a statistically valid sample for this potentially large population. The survey questions were similar to those used for the three state program volunteers; however, it asked the volunteers to draw upon their knowledge and experience with volunteer monitoring rather than only their direct participation. We distributed written surveys at the Tennessee Water Resources Symposium and at select watershed meetings across the state and via the worldwide web. Notice of the on-line survey was sent to Tennessee Clean Water Network members. 87 hard and 72 electronic copies of the survey were returned.

The final phase of our research involved synthesizing and analyzing the above findings and then using them to develop a set of recommendations on if and how Tennessee should proceed on establishing a statewide monitoring program.

Case Study Synopsis

The case studies of the three programs, particularly the comparative analysis, provide valuable insights on the design and implementation of statewide volunteer monitoring programs. The bottom line is that there is no one way to structure a program; it depends on your intended outcomes. However, we found that there are certain benefits and limitations to certain structural and programmatic elements, and we drew upon these observations as we formulated our recommendations. Table I provides a thumbnail sketch of select aspects of each of the programs. KY Watershed Watch is included in this overview because KY Water Watch staff now devotes nearly half its time to providing technical assistance to this statewide program. It is also the program from which we derived our KY volunteer monitor sample. Benefits and limitations conferred by each of these elements as well as others are presented in the report found at <http://eerc.ra.utk.edu/WRRC.html>.

Survey Findings

Alabama, Georgia, and Kentucky Volunteer Survey

A typical volunteer monitor participating in one of the three programs falls into the age category of 35-64, has been involved in the program for more than two years and has a college degree or higher. No predominant occupational background was found.

Following are highlights of their collective perceptions of volunteer monitoring.

- The benefits of volunteer monitoring far outweigh its limitations.
- The greatest benefits were related to the state programs' ability to educate and involve their citizenry. Greatest limitations to volunteer monitoring are a lack of sufficient funding and community support.
- Collected data is being used for multiple purposes, particularly for education and for identifying ("red flagging") specific water quality problems.

In addition, volunteer monitors appear to be markedly satisfied with the support provided to them by their state programs.

Tennessee Stakeholder Survey

Tennessee respondents differed somewhat demographically from volunteers of the three programs - a situation likely primarily due to survey methodology. These respondents fell primarily in the 35-64 year age category, but as a whole were younger. There was a predominance of scientists and those in occupations related to the environment, which makes sense since our objective was to survey those with a "stake" in water quality. They also had a higher level of education.

Comparing Tennesseans' views to the collective views of the three programs' volunteers, we found:

- They tended to give higher ratings to both benefits and limitations of volunteer monitoring.
- They agreed that the benefits of volunteer monitoring outweigh its limitations.
- They agreed that the greatest benefits were increased awareness of water quality issues and increased community involvement.
- Although they agreed that a lack of sufficient funding could be a potential primary barrier to volunteer monitoring, they did not perceive that a lack of community support would be as much of a problem. Rather, more viewed volunteer monitoring being challenged by data credibility and related QA/QC issues.

Recommendations

Our overarching recommendation is that Tennessee should become part of the national trend of initiating a statewide volunteer monitoring program. This is based on the literature, case studies and surveys results. Nationally, particularly over the last two decades, states have continued to establish volunteer monitoring programs with US EPA’s support. Moreover, state environmental protection departments are increasingly examining how volunteers can stretch their limited monitoring budgets and how data can be used in water quality reporting in addition to the more readily accepted and acknowledged benefits of educating their citizenry and fostering watershed stewardship. Locally, volunteer monitoring is also being touted as a means of meeting CWA mandates including Phase II Stormwater requirements.

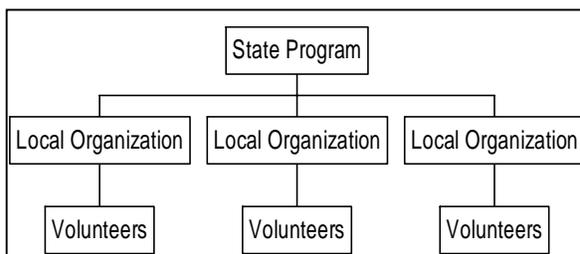
Alabama, Georgia, and Kentucky clearly demonstrate that statewide programs can be sustained with proper planning, dedicated management, and a willingness to adapt to changing statewide needs and demands. From the perspective of their volunteers and from those in Tennessee who have an interest in water quality, survey results show that they believe the effort of establishing and maintaining a volunteer monitoring program is worth it: that its benefits outweigh ongoing challenges it may face.

Our remaining recommendations address the structural and programmatic elements of initiating a volunteer monitoring program as well as elements that may help to increase the probability of long-term viability. Table II provides a summary of the primary topics covered in the remaining recommendations.

Table 2. Recommendations by Topic & Category

Structure	Programmatic Elements	Long-term Viability
Delivery System	Mission/Goals	Funding
Housing	Volunteer Support System	QA/QC
Membership/Recruitment	Information Management	Volunteer Retention
Advisory Body	Outreach Strategies	

Recommendation: The program should be administered by local organizations but should also be able to serve volunteers directly when no local oversight organization is in place.



Primary Basis: Tennesseans (81%) overwhelmingly stated that they prefer a program structure that will allow local organizations to administer a statewide monitoring program in contrast to a program that would solely provide direct support to its volunteers.

Recommendation: House the state volunteer monitoring program at a land grant college or university and partner with the Cooperative State Research, Education and Extension Service (CSREES).

Primary Basis: Case studies demonstrate the following benefits to housing a program at this location including:

- Greater impartiality if not associated with a regulatory agency
- Access to a greater range of fund-raising mechanisms
- Options for more creative staffing
- Greater access to state of the art resources including computer systems and laboratories
- Cooperative Extension support of volunteer monitoring

Recommendation: Involve a diversity of citizen monitors and organizations with varying affiliations and a mix of science-associated professionals and laypersons.

Primary Basis: Both the literature as well as the case studies demonstrate that a diversity of citizen backgrounds strengthens a program by drawing upon a range of knowledge, skills and experiences.

Recommendation: Create a statewide advisory board that can provide programmatic direction and guidance.

Primary Basis: GA AAS demonstrates multiple benefits of developing this type of supporting body that includes a diversity of stakeholders that geographically represent the state. These benefits include having a non-volunteer reservoir of knowledge, skills, and community connections that can provide program direction and guidance, serve as regional liaisons, and assist in overcoming programmatic barriers.

Recommendation: Clearly define programmatic mission and goals: keep them flexible enough to change over time as needed.

Primary Basis: The literature and the case studies support the need to transparently define program mission and goals at the outset of the program in order to effectively plan how to achieve intended programmatic outcomes and to avoid public misunderstanding of the program. However, it is equally important that they be kept fluid enough to adapt to changing program demands and needs.

Recommendation: Consider using multiple strategies for meeting volunteer training and technical needs as they expand across the state.

Primary Basis: The case studies demonstrate the merits of using multiple strategies for meeting volunteer needs in addition to the benefits of utilizing each of the following strategies:

- Trained citizen volunteer monitors – AWW; GA AAS; KY Water Watch
- Community/watershed program coordinators – GA AAS
- State college & university system professors – GA AAS & KY Water Watch
- Cooperative Extension agents --AWW

Recommendation: Use AWW’s multi-functional database as a model for information management.

Primary Basis: The AWW case study describes multiple features of this program’s database that support its adoption. These include:

- On-line data entry
- Real-time graphing that provides immediate volunteer feedback
- Quality control & quality assurance features
- Public access to spatial displays of data

Given the likely costs of database development, should Tennessee develop a volunteer monitoring program, a contract with AWW to manage its data may be worthy of consideration.

Recommendation: Develop a recruitment/outreach initiative to garner community support to increase volunteer involvement and local buy-in.

Primary Basis: Case studies indicate that outreach activities serve as vital means to promoting volunteer monitoring & increasing stakeholder buy-in. Two key ingredients to a successful initiative appear to be involving partners and including a range of activities such as:

- Development & distribution of watershed educational materials
 - Development & ongoing updates of a program website
 - Volunteer/community seminars/workshops
 - Organization of watershed/awareness community events
 - Involvement of volunteers in spearheading outreach activities
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Recommendation: Seek a mix of governmental, private sector, and NGO funds to support the program.

Primary Basis: Both the literature and case studies point to the need of a diverse funding portfolio. The AWW case study illustrates how this can be done by supplementing a program's primary funding (e.g., US EPA 319 funds) with funds from other entities with similar goals (e.g., Cooperative Extension). It also further underscores how the location of a program can impact its ability to acquire funds.

Recommendation: Seek and implement a US EPA Region 4-approved Quality Assurance Project Plan (QAPP) that supports long-term monitoring objectives.

Primary Basis: The literature reveals the dependence of data credibility on quality assurance/quality control. Without a sound quality assurance plan, the use of volunteer data will be limited to primarily education. The AWW case study illustrates the benefits of a comprehensive QAPP:

- Long-term acquisition of data
 - Increased data credibility with the state environmental agency
 - Broadened use of data including its incorporation into basin planning and corroborating agency-collected data used in state water quality reporting
 - Greater clout to the AWW Association as volunteer monitor advocates
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Recommendation: Devise volunteer recruitment strategies to maintain long-term commitment of volunteers. Consider strategies that will provide multiple forms of volunteer feedback and minimize volunteer time commitment and expenditures.

Primary Basis: Both the literature and case studies suggest that a primary contributing factor to volunteer attrition is a lack of volunteer feedback and that multiple types of feedback may be required to retain volunteers. These strategies may include but are not limited to:

- Data interpretation sessions, written materials
- Workshop updates
- Volunteer kudos

In addition, surveys indicate that financial considerations and time constraints influence volunteer retention, as well.

Conclusion

Volunteer monitoring has been heralded as a way for citizens and communities to translate knowledge into action. It educates citizens about their local environment; empowers them to make more informed decisions; reinforces the belief that government alone cannot solve all our environmental challenges; and provides information necessary to plan natural resource protection and improvement projects. Tennessee is fortunate to have neighboring states with quality statewide volunteer monitoring programs that can share the lessons they have learned as they have grown and evolved. Moreover, with shared basins, Tennessee also has an opportunity to collaborate and share resources with these programs. This partnering would allow all the programs to improve and expand upon the work that has already been done, including the credible contributions volunteer monitoring can make to protecting and enhancing our natural resources.

Table 1: Overview of Southeastern Statewide Volunteer Monitoring Programs

	AWW	GA AAS	KY Water Watch	KY Watershed Watch
Institutional Affiliation	Auburn University	GA Environmental Protection Division	KY Division of Water-Program Planning	KY Waterways Alliance (NGO)
Primary Program Delivery System*	Top-down	Community-based	Community/organization-based	Basin-based, coordinated by State Intercoordinating Council
Main Funding Source	CWA Nonpoint Source Program funds (319)	CWA Nonpoint Source Program funds (319)	CWA Water Planning & Pollution Control Grant Funds (205j & 106) & State Executive Budget	Varies by basin (Federal, state & local grants; corporate/private foundations)
Monitoring	<ul style="list-style-type: none"> • Chemistry (field kits) • Bacteria (field) • Benthics 	<ul style="list-style-type: none"> • Watershed/Streamwalk • Chemical (field kits) • Benthics 	<ul style="list-style-type: none"> • Streamwalk • Chemistry (field kits) • Benthics 	<ul style="list-style-type: none"> • Streamwalk • Chemistry (field kits&grab) • Bacteria (grab) • Benthics
Volunteer Support System	<ul style="list-style-type: none"> • AWW staff • Citizen volunteer trainers • Cooperative Extension 	<ul style="list-style-type: none"> • GA AAS staff • Citizen volunteer trainers • State College & University System • Community/Watershed Coordinators • Cooperative Extension 	<ul style="list-style-type: none"> • KY Water Watch staff • Citizen volunteer trainers • State College & University System • Cooperative Extension 	<ul style="list-style-type: none"> • KY Water Watch staff • Citizen volunteer trainers • State College & University System • Cooperative Extension
QA/QC	<ul style="list-style-type: none"> • Region 4-approved Quality Assurance Project Plan • Volunteer certification 	<ul style="list-style-type: none"> • Region 4-approved Quality Assurance Project Plan • Volunteer certification 	<ul style="list-style-type: none"> • No approved QAPP • No volunteer certification required 	<ul style="list-style-type: none"> • Overseen by basin level "Science Advisory Panels"
Data Management	<ul style="list-style-type: none"> • Microsoft Access™ database • Volunteer data entry on website • Real-time on-line graphic data feedback 	<ul style="list-style-type: none"> • Microsoft Access™ database • Plans for volunteer data entry on web 	<ul style="list-style-type: none"> • Microsoft SQL Server™ • Enters data on web • 	<ul style="list-style-type: none"> • Data provided to basin "data manager" • Sent to KY Water Watch office to be imported into ESRI Arcview
Data Uses	<ul style="list-style-type: none"> • Public education • Red flagging problems/remediation • Corroborate state water quality data • Basin planning 	<ul style="list-style-type: none"> • Public education • Red flagging problems/remediation 	<ul style="list-style-type: none"> • Public education • Red flagging problems/remediation 	<ul style="list-style-type: none"> • Public education • Red flagging problems/remediation • Corroborate state water quality data • Basin planning

* The difference in delivery systems is based on local communities/organizations having administrative structure for delivering programs. A "top down" delivery system should not be misconstrued to mean that a program using this system does not work with groups to address local issues. It simply does not have a preponderance of groups with administrative structures to deliver the program locally.