

**VIRGINIA WATER RESOURCES RESEARCH CENTER**

**MOTIVATION, RETENTION, AND  
PROGRAM RECOMMENDATIONS OF  
SAVE OUR STREAMS VOLUNTEERS**



**SPECIAL REPORT**



**VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY  
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## ABSTRACT

A survey of the Save Our Streams (SOS) volunteers in Virginia documented their socio-economic characteristics, their reasons for volunteering, their level of participation in SOS monitoring and other volunteering, their assessment of the validity and reliability of the SOS water quality monitoring procedures, and suggestions for program improvement. Common reasons for SOS involvement were to protect the environment, learning, teaching, be of service, and nature enjoyment. The most common length of participation in the SOS program was one to three years. Most volunteers felt that the SOS's recommended procedures provided accurate measures of stream health, and most felt they did the monitoring procedures quite or very well. However, about one-third of all SOS volunteers monitored a stream less than once a year; about 20% did so the recommended four times a year. Volunteers generally rated program services provided by SOS as quite high. Program changes most favored included standardized training procedures across all of Virginia, and lobbying government agencies to use volunteer data to protect streams. A second tier of preferred services included special guest speakers about water and environmental quality, an annual meeting for all volunteer water monitoring groups in Virginia, paid full-time SOS regional coordinators, and random field spot-checks of the SOS volunteers' work to assure quality data. Opposed changes were an easier certification test and removing the choice from volunteers on what streams they monitor. Reasons for dropping out of the program included too many other obligations and not enough time. Differences in reasons for participation and suggestions for program improvement are reported for Rookies, Fading Veterans, Active Veterans, and All-Stars among the SOS volunteers.

Keywords: water quality monitoring, Save Our Streams (SOS), volunteer characteristics, volunteer participation, volunteer program evaluation, volunteer typology.

## INTRODUCTION

Protecting water quality is a vital concern of the American people. For example, state and federal agencies and the private sector spend about 65 billion dollars each year to protect and improve water quality (United States Environmental Protection Agency 2000). However, the total dollars spent do not tell the complete story, either about the enormity of the task or about the commitment of citizens. All across the country volunteers, often with concerns about the quality of water in their own backyards, are stepping forth to assist the water regulatory and protection agencies.

One area where volunteers are making a major contribution is in monitoring water quality. At the most basic level, volunteers and non-governmental voluntary organizations are extending the reach of the environmental protection agencies. A network of well-trained volunteers can sharply increase the number of streams and drinking water sources monitored, identify water quality problems, assist governmental agencies in locating pollution sources, and help monitor the effectiveness of remedial actions (Virginia Department of Environmental Quality 1999a). In addition, volunteer water quality monitoring can build a body of citizens informed about the nation's water. These volunteers, acting alone or as part of conservation organizations, can teach others in their communities about conservation practices, be watchdogs on the activities of both potential polluters and those charged with public responsibility to protect the environment, and be public activists for the protection of water.

Federal, state, and local regulatory agencies are becoming increasingly dependent on the services of volunteers. These agencies simply do not have the necessary budgets and staffing levels to monitor all the waterways in the United States. At the same time, water quality problems have become more complex, quality control targets have become rigorous, and mandates to monitor more water quality indicators have become more numerous.

The role of volunteer water quality monitors in Virginia has recently taken on greater importance with the promulgation of two cooperative ventures between volunteer groups and state regulatory agencies. The Declaration for Virginia Rivers and Tidal Waters was signed by 52 state, regional, and local conservation groups committing themselves to monitoring and/or restoring the Commonwealth's waters. This declaration was submitted to Virginia's Secretary of Natural Resources with a request for state agencies to identify effective water quality monitoring protocol, quality assurance/quality control mechanisms, and reporting systems so that citizen data can be used and easily accessed by state and federal agencies (Virginia Save Our Streams Staff 2000).

The second cooperative venture, signed by the Virginia Department of Environmental Quality (DEQ), the Virginia Department of Conservation and Recreation (DCR), and the Izaak Walton League's Save Our Streams (SOS) program, commits state agencies to supporting citizen monitoring efforts throughout the Commonwealth for the purpose of collecting useful water quality information and encouraging environmental stewardship (Virginia Department of Environmental Quality 1999b). The DEQ promised to help volunteer organizations assure quality control of the water data, and indicated that citizen monitoring data collected under an

approved quality assurance/quality control project plan would in the future be used to develop DEQ water quality assessment reports.

Thus, the role of the citizen volunteer in water quality monitoring has grown rapidly and is becoming institutionalized. The potential of volunteers to contribute to the protection of the Commonwealth's water resource seems great. But two problems may limit the potential. The first is one of quality control/quality assurance of the data collected by the volunteers. As already indicated, this problem is beginning to be addressed. The second problem is recruiting, training, organizing, and retaining volunteers. This report summarizes a study designed to address the second problem.

## **CASE STUDY: THE IZAAK WALTON LEAGUE OF AMERICA'S SAVE OUR STREAMS PROGRAM**

### **Choosing the SOS Program**

We chose to study Save Our Streams' volunteers for several reasons. First, the program is part of the nationally recognized conservation organization, the Izaak Walton League of America (IWLA). As such, the resources of a national organization might be applied to the efforts of volunteerism, and we wondered about this effect. On the other hand, the IWLA is truly a grassroots organization. It has over 350 local chapters throughout the country. The Virginia Division of IWLA has over 7,000 members belonging to 27 local chapters. These conservationists enjoy outdoor recreation and work in various ways to promote the responsible use of our natural resources and public lands. One of the Virginia IWLA's conservation programs is the Save Our Streams program. Thus, SOS is a grassroots program, but it has ties to similar SOS programs in other states and is sanctioned by the parent organization, the IWLA.

Second, as discussed above, the SOS program is strongly linked to and supported by both the Virginia DEQ and DCR. As such, the program has credibility, with a commitment that program data will be used in decision-making. We believed this might be important in volunteer recruitment and retention.

Finally, the SOS procedure is the dominant and preferred biological water monitoring technique in Virginia. There is a large population of SOS program volunteers available for study. Virginia Tech and the Virginia Museum of Natural History in Blacksburg have an active group of Save Our Streams volunteers. These volunteers were a convenient group for us to begin our study.

### **Description of the SOS Program**

The Virginia Save Our Streams Program has six primary goals:

1. To foster citizen stewardship of the water resources of the Commonwealth of Virginia;

2. To encourage appropriate public participation in the process of watershed management through education, on-site training, and example, using macroinvertebrate and other monitoring as a base for action;
3. To coordinate activities and cooperate with other groups monitoring and managing water resources in this state, creating partnerships that work toward mutually beneficial goals;
4. To promote good management decisions, based on objective observations, that will allow future generations to enjoy improved and protected streams, rivers, and estuaries across Virginia;
5. To provide, or assist in finding, "user-friendly" assessments of water quality to the localities that request them for decision making and advocacy; and
6. To expose people, young and old, to the ecology of flowing water (Virginia SOS Staff 2000).

The SOS program calls for volunteers to employ biological water quality monitoring. This procedure rests on the assumption that in a healthy stream, the stream-bottom community will include a variety of pollution-sensitive macroinvertebrates. On the other hand, in an unhealthy stream, the sensitive organisms will have dropped out and only a few types of nonsensitive macroinvertebrates will be present. Volunteers learn to identify the different orders of possible macroinvertebrates, learn appropriate stream sampling techniques, periodically sample a designated or chosen stream, and record the types and numbers of macroinvertebrates found. These data are provided to appropriate planning and regulatory bodies, and if collected appropriately over time, can permit trend analyses on the health of the stream.

The Virginia Save Our Streams' program is funded in part by state money from the DCR and through grants from such key sponsors as the Virginia Environmental Endowment, the Chesapeake Bay Trust, and the Beirne Carter Foundation (Virginia SOS Staff 2000). The program has a statewide coordinator and regional coordinators. Citizen volunteers, however, do the water quality monitoring.

### **Becoming an SOS Volunteer**

In many ways, becoming a Save Our Streams volunteer involves a greater amount of time and physical and mental energy than is required of the typical supporter of one of the larger nationally known environmental voluntary associations (e.g., the Sierra Club or the Wilderness Society). This high level of commitment and dedication is one unique aspect of an SOS volunteer.

Volunteers complete an intensive training and certification process and are asked to monitor their streams four times a year. During training, the volunteers attend an initial session where they learn about the IWLA and the SOS program. The initial training session lasts approximately four hours and includes slides, videos, and hands-on (in-the-stream) experience. The volunteers specifically learn about stream ecosystems, the importance of clean water, the macroinvertebrate life in the stream, and how to tell whether a stream is impaired (Virginia SOS Staff 2000). In

addition, SOS leaders take the volunteers out into a stream and actually demonstrate how to properly perform an in-stream macroinvertebrate water quality sample. The SOS leader demonstrates all phases of the monitoring process: collecting the invertebrates, identifying the invertebrates, recording macroinvertebrate information, and performing a habitat assessment.

The second step in becoming a Save Our Streams volunteer is the certification process. There are two phases in becoming a certified SOS monitor. First, the volunteers must demonstrate to the leader that they are able to properly conduct stream samples. The volunteers must do a sample from start to finish, identify as many of the macroinvertebrates as they can, and fill out the SOS survey form. The second phase of becoming a certified SOS volunteer is the written invertebrate identification quiz. Volunteers must properly identify 17 out of 20 macroinvertebrate samples presented to them. Volunteers are allowed to use any identification sheets or macroinvertebrate identification keys they choose. Those who pass the quiz and have a solid understanding of the sampling method become certified SOS monitors.

Lastly, the volunteers are asked to monitor their stream site four times a year (e.g., January, April, July, and October), record the data onto the Stream Quality Survey, and send the data to the SOS regional coordinator. Recording the data onto the Stream Quality Survey (Appendix A) involves three steps. First, volunteers designate their sampled insects on the Stream Quality Survey form by the diversity of macroinvertebrate orders (e.g., Plecoptera, Decapoda, Hirudinea). These categories are ordered most typically by pollution sensitivity (e.g., sensitive, somewhat sensitive, and tolerant). Second, the volunteers count how many individual macroinvertebrates are in each category. Lastly, from these counts and a guide on the survey form, the volunteers are able to assign the stream an index value of excellent, good, fair, or poor. These data, if collected and recorded properly, assist state agencies, local governments, and concerned citizens in obtaining necessary resources and taking appropriate action to improve local water quality conditions.

## **RECRUITING AND RETAINING VOLUNTEERS**

Voluntary organizations rely on effectively recruiting, training, organizing, and retaining volunteers if they are to be successful. Loss of volunteers decreases organizational effectiveness and morale. But recruitment and retention of volunteers are very expensive in dollars and time, often among the most expensive and time-consuming of all activities performed by the organization (Heidrich 1990). Dollars spent on recruiting new volunteers to replace those who drop out are resources that could have been devoted to the achievement of service or program goals.

The problem this study begins to address is that we know relatively little about why people volunteer, and even less about why some volunteers become active, some of them cease to be active, and still others join but never become active. People appear to volunteer for reasons ranging from the self-indulgent to the altruistic, and their types of volunteering range from inactive monetary donations to active participation in daily organizational efforts. Socioeconomic characteristics explain only limited variance in people's decisions to volunteer in any organization. Volunteers tend to have more money (middle class) and more time (e.g.,

retired or lack parenting responsibilities) (Smith and Freedman 1972, and Heidrich 1990). Leisure research suggests that volunteers are motivated by experiences that are fun, match their abilities, and contribute meaning and identity to their lives (Henderson 1984 and Parker 1992).

Manzo and Weinstein (1987) found that active members of the Sierra Club were more likely than non-active members to believe they personally have suffered harm from an environmental problem, have joined other organizations, have a social network within the club, and believe their volunteer actions would have impact. Personal values and concerns about "contact with nature" or "making the world a better place" explained why some people joined the organization, but not whether they became active volunteers. Pearce (1983) and Martinez (1998) found that reasons for active volunteering change soon after volunteering begins, as one learns and becomes involved in the actual volunteering activities. The romantic ideals behind volunteering quickly wane and are replaced by concerns about doing relevant and meaningful tasks, the desire to be working with friends, the need to have clear and achievable objectives, and having opportunities for learning and personal growth. Additionally, Westphal (1993) found that "spiritual" meaning or "deep values" best-explained people's motivations for volunteering in urban forestry activities.

Martinez' (1998) recent study of the Rocky Mountain Elk Foundation and the Appalachian Trail Conference found that nearly half of all active volunteers had felt "burned out," although apparently they did not stop volunteering because of it. One of the main reasons people stopped volunteering was that they perceived their efforts as lacking relevance. Volunteers perceived irrelevance when their efforts seemed only tangential to the organization's success or mission and when the organization itself was perceived as being ineffective in achieving its stated goals. Other reasons volunteers became inactive include the failure of the volunteering activity to help them meet people of similar interests, learn new skills, and/or have fun. Life changes also cause attrition because volunteering can become difficult due to a career change, family change, moving away, or aging.

Of particular concern is what administrators of voluntary organizations can do to enhance the experiences of volunteers and to foster their continued active involvement. Still and Gerhold (1997) noted that, while most coordinators suggest that recognizing volunteer efforts enhanced volunteer commitment, their urban forestry volunteers said that special recognition was not necessary. For them, seeing the planted tree was reward enough. Others have said that the volunteer coordinator can promote volunteer motivation and retention by providing volunteers with a clear group goal and small, clear, sequential steps to achieve the goal (Ilsley 1990).

This evolving body of literature on the nature of volunteers and volunteerism guided our statement of study objectives, the development of our study procedures and instruments, and the interpretation of our findings.

## **STUDY OBJECTIVES**

Our overall study goal was to understand motivation, retention, and program preferences of volunteers in the SOS program. More specific objectives were:

1. To determine why people volunteer for the SOS program;
2. To determine SOS volunteers' evaluation of the SOS program and suggestions for program improvements;
3. To determine why SOS volunteers drop out of the program;
4. To determine whether motivations, evaluation of the SOS program, and preferences for program improvements vary by participation level in volunteerism; and
5. To suggest strategies for recruitment and retention of SOS volunteers.

## **OVERVIEW OF METHODS**

We used three general approaches to meet our study objectives: interviews with present and past Virginia SOS program leaders, focus group discussions with selected SOS volunteers, and a questionnaire survey of the Virginia SOS volunteer membership. Our first step was to conduct personal interviews with Karen Firehock (who started the Virginia SOS program), Jay Gilliam (current Virginia SOS Statewide Coordinator), and Wayne Teel (former Virginia SOS Science and Education Director). We then attended local SOS meetings and accompanied local SOS groups on their stream monitoring experiences. Through these efforts, we were able to gain a deeper understanding of the Save Our Streams program: its goals, its history, its organization, its methods and procedures, its apparent successes and failures, and its political, social, and environmental context. We supplanted this information-gathering procedure with a more general review of the volunteerism literature. This review focused on theoretical approaches to understanding volunteerism behavior, volunteer motivations, volunteers' satisfaction with their volunteerism and preferences for program changes, volunteer benefits, the relationship between volunteers' participation levels and their opinions, and, finally, reasons why people stop volunteering. This information guided the development and administration of our next two more focused data collection activities: the focus groups and the SOS volunteer population survey. In each of these two data collection activities, we discuss our methods and results in turn.

## **FOCUS GROUP METHODS**

Our next step in gaining a better understanding of Save Our Streams volunteers and the SOS program was to hold focus group discussions. We chose to use focus groups to collect these data because they are quick and inexpensive (Wells 1974), they bring the researcher into direct contact with the subject of the research (Kingsley, Brock, and DeBald 1988), the moderator/group discussion format facilitates more complete identification and understanding of relevant issues, and the focus groups provided us a guide for the design of our subsequent mail-out questionnaire.

We held six focus group meetings with Save Our Streams volunteers throughout the state to identify critical variables that shape recruitment, active involvement, and retention of volunteers. The focus groups were completely voluntary and confidential. The six focus group meetings were held in Blacksburg, Grundy, Charlottesville, Harrisonburg, and two in Fairfax. We held two focus groups in Fairfax because of the high interest there among the volunteers to participate in such a discussion.

### **Description of Focus Groups**

The six focus group meetings took place between January 27 and March 12, 1999. There were between five and nine volunteers at each focus group meeting, and the meetings ranged from one hour to three and one-half hours long. For the most part, each focus group had volunteers who were in a variety of different stages or involvement levels in the program (Table 1). For example, there were some volunteers in our focus groups who were currently active in stream monitoring and others who no longer monitored. We also had some volunteers who were SOS-certified, some who were currently involved in the certification process, and some who were not certified.

**Table 1. Description of volunteer focus group discussants by location and date.**

	<b>Harrisonburg*</b> (4/17/99)	<b>Fairfax #1</b> (3/1/99)	<b>Fairfax #2</b> (3/7/99)	<b>Blacksburg</b> (1/27/99)	<b>Charlottesville</b> (3/12/99)	<b>Grundy*</b> (3/13/99)
# participants	6	6	7	6	9	5
# SOS-certified	4	5	3	3	3	5
# not certified	2	1	4	3	6	0
# active	6	6	5	2	8	5
# not active	0	0	2	4	1	0

\* Unable to tape the focus group discussion.

### **Data Collection Procedures**

We relied on the SOS regional coordinators to choose the focus group participants, after we explained to them that we were looking for volunteers in a variety of stages in the Save Our Streams program. Typically, focus group participants received a phone call from the researchers explaining the general purpose and timing of the meeting at least two weeks prior to the focus group meeting.

The focus group meetings used the following sequence:

1. The meetings began with introductions and an explanation of the study. Focus group participants were asked to sign an “informed consent” form in which they were guaranteed anonymity and confidentiality.

2. Participants were asked to complete a brief eight-question survey in which they provided contact information (so we could send them our longer survey later), and information about how involved they were with the Save Our Streams program.
3. A tape recorder was turned on. Focus group discussions were not taped in Grundy and Harrisonburg.
4. The group moderator (the project's research assistant) then proceeded to ask five key general questions relating to motivations, recruitment, and retention of Save our Streams volunteers:
  - a. Why did you become involved in Save Our Streams initially?
  - b. For current volunteers, what keeps you involved in Save Our Streams?
  - c. For past volunteers, what kept you coming back to stream monitoring and Save Our Streams during your time of involvement?
  - d. For those who do not currently monitor a stream or are not currently in Save Our Streams, why did you stop participating or leave the program?
  - e. What more could the Save Our Streams program do to encourage you to volunteer or continue to volunteer?
5. The moderator or his assistant took notes during the focus group discussions.
6. At the conclusion of the discussion, the moderator provided an opportunity for the participants to add or clarify anything that was said during the meeting.

### **Data Analysis**

We first transcribed the taped focus group discussions. We recorded verbatim quotes describing volunteer motivations for joining SOS, reasons for continued involvement in SOS, and lastly, reasons for dropping out of the program. We also analyzed our notes taken during the discussions.

The transcriptions were organized into three sections:

- 1) a description of the motivations for involvement in Save Our Streams;
- 2) a description of how to maintain active participation in Save Our Streams; and
- 3) a description of reasons for dropping out of the Save Our Streams program.

## RESULTS: FOCUS GROUP DISCUSSIONS

### Motivations for Volunteering in Save Our Streams

#### Overview

From our six different focus groups, we found nine different motivations for becoming involved in SOS and stream monitoring. These findings seemed quite consistent across all the focus groups. We labeled these motivations nostalgia, protect the environment, guard against local threats, be of service, teach, learn, be social, enjoy nature, and career growth.

#### Nostalgia

Many of the volunteers in our focus groups discussed their past experiences (both positive and negative) with nature and the outdoors as a reason for getting involved in water quality monitoring. For many who grew up hunting, fishing, camping, and playing in the outdoors, stream monitoring was just a continuation of this involvement with the outdoors. Participating in outdoor activities as a child instilled in them a sense of respect and love for nature, which they carried into adulthood. Getting involved with water quality monitoring permitted volunteers to relive and extend their past experiences in nature. Following are some statements by volunteers that illustrate this theme.

*“I have always been interested in nature and things like that, ever since I was a kid, playing in ponds and streams... We spent a lot of time just out in the woods, out in the creek, turning over rocks looking at crayfish and seeing what was under there. It was kind of a natural progression. It just seemed to be a natural thing when I saw the volunteer sign- up sheet on the table; it was just the thing to do...”*

*“I guess I started out as a water rat as a pretty young person. ...Those days were very different from these;...life was simpler in some respect. We had lots of woods and a stream running right through our town, ...and that was our playground. ...I always liked water; I learned how to swim at a very young age. ...I always liked boats, and later in my life I learned how to sail and scuba dive...”*

*“I have always been an outdoors-type person. I enjoy hunting and just getting outdoors, and in my past history, I have done a lot of backpacking and hiking. That is kind of where I come from. ...Getting them [his 2 boys] involved in something like this [stream monitoring] just seems like a natural progression...”*

However, *negative* past experiences with nature also proved a motivation for some Save our Streams volunteers. For example:

*“When I was a kid, I grew up with woods across the street. My mom would always take me out to look for critters, but there never were any. It was gross, disgusting, and it smelled bad. ...I think that was one of the reasons I got interested in water quality to begin with. ...I got involved partly because I liked*

*looking for critters in the stream, but there weren't any, at least not in my stream. There were in other streams, but not in the one we lived by."*

## **Protect the Environment**

Volunteers expressed a concern for protecting streams and other waterways in Virginia. Because Save Our Streams is an environmental organization, and its goals are to help improve water quality and protect and preserve Virginia's streams and rivers, it is no surprise that protecting the environment was an essential motivation for these volunteers in our focus group discussions. For example:

*"I had goals of cleaning up the environment. ...I wanted to find an outlet in my life where I could still contribute to environmental protection..."*

*"Self-motivation, and a genuine care for the environment, for the water. It is an opportunity to go out and, it kind of is like a duty you have to do...like spring cleaning...I don't know, it's like waking up from hibernation, something you just gotta do" (emphasis added).*

*"I don't do it [stream monitoring] for outdoor recreation. ...I think of outdoor recreation as taking a hike or birding. ...It [stream monitoring] is fun, and it is great that it is outdoors. ...However, [stream monitoring] is more conservation and stewardship..." (emphasis added).*

## **Guard against Local Threats**

A number of volunteers expressed in the focus groups that they were motivated to get involved with the Save Our Streams program because of a variety of concerns over local threats to a stream nearby. Many volunteers were concerned about the health of their family and neighbors because of the potential environmental threats. Some of the environmental threats that were discussed in our focus groups included new housing developments, the creation of a new golf course, industrial dumping into streams, hog and chicken farms, timber harvesting, and mineral extraction. The emphasis of this motivation is that volunteers were concerned about streams on their property or in their community, and the impact that local industry, development, and agriculture had on the health of their family and friends.

*"We were interested in monitoring because our homes were back there...and we knew there was ground water pollution. We were curious how the stream water was affected."*

*"... We went down to the creek and [it was] absolutely picturesque. ...You couldn't have a postcard with a prettier picture of a creek, but there were no fish. ...The water is crystal clear, a babbling brook. It's wonderful, but there was no fish. ...I knew something was wrong because I didn't see any fish in this water, but I didn't have the training or understanding, the knowledge, to figure out why."*

*“The one thing that intrigued me was the opportunity to do the testing at the river just downstream of where I am. For me, it was interesting to test the river just downstream of [my property].”*

*“A section of the Rivanna River [was listed] in a DEQ report ... as not swimmable. That was printed in the paper, and the reaction of the public, understandably, was along the lines of: 'Oh my God, our rivers are in terrible shape.' ”*

*“The reason I got involved was because my husband and I bought a house. ... Directly behind our house is parkland with a stream in it that I could monitor. ...It's sort of like a natural area; it's not playgrounds and that sort of thing. My husband and I decided to organize a stream cleanup because we noticed the stream was littered, especially [with] plastic items. Once we actually physically got in the stream and started picking up stuff, we were appalled at the degradation of the stream. We started really noticing the development that was taking place in our area, and how that was affecting the degradation of our stream.”*

*“I lived in an area where you could go out and enjoy nature, and walk around and not feel like it is screaming, “help me” at you. But I just walk out in my backyard and feel like it [the stream] needs a lot of work, and it is not going to happen unless volunteers are involved in the solution.”*

## **Be of Service**

The fourth important motivation that surfaced from our SOS focus groups was that volunteers wanted to participate in an activity where they felt a sense of accomplishment, felt like they were doing something useful for the environment, felt like they could make a difference in their community, and saw tangible results from their volunteer activities. There was a genuine sense of wanting to do some real hands-on volunteer work where volunteers actually felt they were making a difference in improving water quality or protecting the streams in Virginia. Save Our Streams water quality monitoring provided them with an opportunity to actually get in the stream and do some real hands-on work.

*“We were looking for a project that was hands-on [as] opposed to [us] just complaining about things. ...This [stream monitoring] was something we could really do something [about] and make a contribution.”*

*“It is good to know that we are helping something....The [stream] monitoring that I do is because we think we can help somebody, somewhere, along the way. That is how it was presented to us, that this work is doing some good. Instead of just going out and enjoying it, we are actually doing something to be active in helping other people enjoy it. That is part of our motivation.”*

## Teach

The fifth motivation the volunteers expressed in our focus group discussions involved teaching. There was a genuine desire to teach stream monitoring, stream ecology, and water quality to their spouses, families, and especially children. Local elementary, junior high, and high school teachers found SOS to be a valuable tool for teaching stream ecology in a very hands-on, practical way.

*“I wanted to give children a positive exposure to anything nature.”*

*“That [stream monitoring] does a lot to help the kids know what kind of impact they have on ecosystems and the environment, is real valuable.”*

*“I have been active with two groups of home-schoolers. ... I take them monitoring, and I think it is nice when you take children because they are the future stewards in this country. I think it is really important to educate children to the environment because so many children and adults are totally out of touch with the streams and land around them.”*

*“My focus as a parent... is to keep trying to instill in my kids a sense of respect for where you live, taking care of it. I think about what I had as a child growing up. I could go out to the stream down behind the house, and spend days playing in the creek, catching crayfish, as kids do, and spend the entire days there. ...Just that whole identification process you go through while growing up, and I want my kids to know that stuff. ...I want to instill that in them so they have an opportunity to choose to go into the things that most interest them.”*

## Learn

The sixth motivation we labeled learning. Learning to identify macroinvertebrates, to be able to properly perform a stream sample, and learn about water quality were very important to Save Our Streams volunteers. Some volunteers expressed a desire to learn about stream ecosystems and water quality in general. For example:

*“I was just fascinated with the inter-connectability between what was taking place between individuals on the bank and how it affected the stream bed itself and what was in the stream bed.”*

*“I really didn’t understand until I became educated about SOS that you really could determine the quality of water from the bugs...”*

Others expressed interest in the SOS program because it permitted hands-on learning. For example:

*“I like getting my hands and feet in the stream.”*

*"...it [SOS] was right in my backyard; it was convenient, and I like that it is so hands-on. You can actually do some real science."*

*"The boys get big enjoyment out of picking the bugs, and classifying them and grouping them all together. I think for the young kids, that is what they enjoy..."*

Others were more interested in the specific task of identifying and learning the many microinvertebrates and the details of biological stream sampling. For example:

*"I was real excited about it, and feel passionate about it. I feel excited about the possibility of learning more of the technical aspects of it, which I am really limited on..."*

*"I asked a fellow monitor, 'How do you identify all of these invertebrates?' And he said to me, you look at them one time, a second time, and a third time and you just look at them and look at them and look at them, and that's how you learn."*

## **Be Social**

Seventh, the social element to stream monitoring was also very important to many Save Our Streams volunteers. Volunteers enjoyed spending time with friends, family, and neighbors while sampling a stream. Also, volunteering for SOS activities was a way to meet new people with similar interests. For example, some focus group participants said:

*"I am going out this weekend, and it should be fun. It will be cold. ...I went with my boyfriend, and he is not into that kind of stuff as much. ...It was December and he did not think there were going to be any bugs in the creek. He was really surprised, and it was kind of neat because he thought it was neat."*

*"I would monitor if it was just me, if my husband was not interested. I would hook up with someone [another monitor], who is a friend of mine. ...She and I just enjoy each other's company, and I would have no problem having her as a partner."*

*"I was new to the community,...and I thought it would be a good way to get out and meet people..."*

Stream sampling also provides an opportunity to share the joys and concerns of SOS volunteering, and to discuss water quality issues in Virginia. For example, these volunteers discuss the importance of social interaction with others with similar interests:

*"One of the things I like is getting to meet periodically with people who are doing the same thing. To me it is important because I don't want to feel that I am the only person out there when it is really cold and miserable, out there freezing my*

*hands in the stream, I want to know that there are other people, and I actually enjoy hearing what other people's motivations are."*

*"I have a girl friend who is in the training stage, but to be honest, it is like my day away, my day out. I know it sounds loony, it is just the two of us, sitting around, sorting bugs, and just chatting..."*

Lastly, for many of our volunteers, stream monitoring is also a great opportunity to spend time with family. Spending time bonding with one's spouse or children while stream monitoring is important. For example:

*"If you have a family, if they're involved, you are not taking time away from them, if they are coming out there with you. If you have to go out with someone else and leave them at home, then you have taken time away from your family. That is just not appealing to me; ...weekend time is precious."*

*"...We hope to pick up a new stream and maybe go out again as a family, bring the kids, and get them involved as well....Family is very important, when I go to do the monitoring; when it is with my family, it's a family thing..."*

*"For me, it was that my partner, my wife, was the one who was going to do this work with me....This is a great way for us to go outside and be together, and have the family do it as well....Getting my wife out there to work with me gives us a chance to be together, enjoy the outdoors, and do something that is helpful."*

*"...as long as these guys [his two boys] are interested, and it allows us to go out and have a different experience together, I think we will continue to do that, and I know my wife is interested in coming out and see what it is we do, because the way the boys have talked about the experience in and of itself."*

## **Enjoy Nature**

We labeled the eighth motivation to surface in the focus group discussions "enjoy nature." Enjoy nature includes such things as enjoying the outdoors, having fun in the streams, watching wildlife, escaping the stress and demands of every day life, and having an opportunity for solitude and reflection. For example, volunteers from our focus groups expressed how stream monitoring provides them the opportunity to enjoy nature:

*"We get to go outside, away from campus and away from the hustle, and it is so quiet out there."*

*"I guess it [stream monitoring] is like hiking. You don't mind going hiking, but when you are at a big steep hill, you are like 'ugh.' But once you get up there, it's like no big deal. We did it; it was fun."*

*“When I went this summer with all the girls, they were just the most fun. Some of them were like, 'yuck, yuck, yuck,' but others were like, this is so awesome. So it was fun to see them having a good time...”*

*“Personally, I’m a fisherman, and so I have some interest in the bugs...as a trout fisherman. There is a natural connection there, and I like getting in the streams and seeing what is in there.”*

*“I have to say, I am going to be honest here and say that the days that we planned to do stream monitoring, I’m kind of grumbling. I’m like 'Oh gosh, I was going to do this, and do that,' and you almost are like, 'I made this commitment, so okay we gotta go do it,' but I am kind of grumbling the whole way. Then I put my boots on, and we walk down there and get in the stream again. You are like a little kid again; you're splashing around...and you feel like you are doing something worthwhile. But you're really just having fun playing. It's like being a kid, but you're pretending to be grown up...so I always enjoy it by the end!”*

*“I love it, it’s just fun for me. I have a 5-year-old daughter, and we go down and look for bugs... and she is really good at holding the net. ...She doesn’t know the difference between a cadis fly and stonefly, but half the time I don’t either...”*

## **Career Growth**

Finally, some of the younger volunteers, especially those currently attending college, or those older volunteers in the process of a career change, explained that volunteering in Save Our Stream activity looked good on a resume, was an opportunity to meet natural resource professionals, was an opportunity to gain practical experience toward paid employment, and provided excellent training in biological water quality monitoring. For example:

*“ I don’t think I would do it, even with my interest. I really enjoy it and find it interesting, but generally that is not enough to pull me away from work. But, because it is community service, and because it will look very good when I leave college and say, 'Hey, I did this,' that is another big reason why I make time for it. If it didn’t have the certification and acknowledgments that it has, I wouldn’t be doing it.”*

*“I wanted to transition fairly quickly into something that provides me with some money, but I don’t have any practical experience. So I have been volunteering my efforts to get hands-on experience as soon as possible and as much as possible.”*

## How to Encourage Active Participation in SOS Activities

### Overview

Once individuals become involved in Save Our Streams' activities, volunteer managers still have the challenge and responsibility of keeping them properly motivated and enthusiastic about stream monitoring. The next goal of our focus group discussions was to identify the important goals, issues, and motivations for those individuals who are currently active in SOS activities. In essence, we felt the best volunteers could shed light on the best ways to retain Save Our Streams volunteers. Three main themes were mentioned time and time again by these volunteers: increased use of citizen water quality data by state and federal regulatory and protection agencies, more feedback from the SOS leaders about how volunteer data were being used to protect streams, and more effective leadership from regional coordinators.

### Increased Use of Citizen Water Quality Data by State Regulatory and Protection Agencies

The volunteers who participated in our six focus group discussions put a great deal of emphasis on their desire for the water quality data they collect to be useful in decisions to protect streams and water quality. The major potential users of citizen data at the state level are the Virginia Department of Environmental Quality (DEQ) and the Virginia Department of Conservation and Recreation (DCR), while the United States Environmental Protection Agency (EPA) is the major federal agency that potentially uses citizen data. While determining if the Save Our Streams' volunteer data are detailed and accurate enough to be used by these agencies or what the appropriate use of volunteer data should be within these protection agencies were not objectives of this study, this issue was in the forefront of the minds of the volunteers. It influences volunteers' morale and affects retention of the volunteers in the program. For example:

*“I would like to hear from the DEQ something like, we used your data for this project or we appreciate you going out every couple of months.”*

*“With all this information [citizen water quality data] going into an agency like the DEQ, is it getting lost in the bureaucratic shuffle or is something being done with it?”*

*“It is really discouraging...when they [state protection agencies] say that citizen data is unreliable. That makes me mad. It makes me really mad that they don't take the citizen data seriously.”*

*“I think in a program like this there is an interconnectedness of the people and knowing that the things you do lead to something... We need to know that what we are doing has validity, and somebody is doing something with it, or at least recording it and using it.... That they [state protection agencies] begin to use it is very important.”*

*“When the data is being used, it makes us feel like that we are doing some good. We are actually going out there and doing something, that other people are using*

*that information to plan programs, to set policies.... Having it [citizen data] recognized on the federal level even, is kind of a motivation, that, 'Hey, this stuff is important; people are looking at it.' It kind of gives you a little prompting to keep going with it, instead of just, 'No one is looking at it, so I can skip it this time.' ”*

*“I personally think that the [citizen data] results should go to, not only to the county, but to the state, and the national level.... Let's take sewage treatment plants, let's take the major users of water in the area, and have them take a look at our stream monitoring data...”*

### **Increased Feedback from SOS Leaders about How Citizen Data Are Being Used**

It is clear that many SOS volunteers want their data to be used in some way by state and federal protection agencies. In addition, current active participants in SOS stream monitoring desire more feedback from SOS leaders about how their data are being used to improve water quality in Virginia. This type of feedback can come from a variety of sources: the SOS newsletter, the SOS web page, and personally from regional coordinators. Regardless of how the feedback is given to the volunteers, our focus group discussants frequently stated how important it was to receive such feedback:

*“We need feedback every so often; like the newsletter is a great idea because you are reading about other people’s reports in the area that you are working in. ...You feel like a part of something. ...It gives you a feeling that if someone so chooses to use that data in some form, for some study, you have contributed...”*

*“I guess it is a little bit of a mystery to me actually. We turn in the clipboard at the end of the monitoring session, [but] where actually does it [the data] go? I know it is being compiled somewhere, somehow... but I think that it would be really cool to see, at some point, you know, how all this [the data] is being used. It would make it a lot more real to me.”*

*“If you could go out one week and collect all this [water quality] information, and then the next month, there it would be on some web site... then I could say, 'Wow, I helped create that information.'”*

### **Effective Leadership from SOS Regional Coordinators**

The last area in regard to more efficiently retaining SOS volunteers mentioned at the focus group meetings involved effective leadership from SOS regional coordinators. The volunteers said numerous times and in a number of different ways how important regional coordinators were to their continued involvement in SOS stream monitoring. Our focus group data suggest that because of the time and energy needed to properly motivate volunteers and retain them in the SOS program, regional coordinators should hold full-time paid positions so they could put all their time and energies into Save Our Streams. Several focus group discussants touched on this topic:

*“I think one of the big reasons I keep doing it is because of [the regional coordinator].... She has it really well organized.... I don’t think if she wasn’t writing me e-mails, and getting me set up with everything I needed, I probably wouldn’t do it [stream monitoring] either.”*

*“We are motivated, but we are more motivated because we know that we are part of your [regional coordinator] team and we know we are sort of accountable to you.”*

*“[the regional coordinator] goes above and beyond the call of her job description to make sure that the program gets run properly. I think that all volunteer organizations need some tie-in with someone who is actually employed, and it is part of their job description. Because people move, people get sick, people change jobs, there has got to be continuity. But when you just got volunteers, the organization has the chance of going great for a few years, then just falling flat and disappearing.... If all of us are volunteers, it just doesn’t work.”*

*“I kind of model you [the regional coordinator], because you take the crews out, you teach them.... Now if we could just put you on a Xerox machine, and make a few more, and put you here and there, and there, and there...”*

*“Having you all [the regional coordinators] coordinate that [citizen data], maintain all that information, and funnel it up to where it all should be, that kind of makes our job worthwhile.”*

Currently, the regional coordinators have their own separate full-time jobs and must do most of the SOS activities on their own personal time. In some cases, the regional coordinators may have a job (e.g., a Virginia Soil and Water District employee) that allows them to spend part of their time at work on volunteer activities. However, that still does not seem to be enough. For example, one such volunteer coordinator stated:

*“It has gotten to the point where so many people want to see [the data], then there is no staff time for me to do it. I have resigned myself to the fact that this is going to be a volunteer activity of mine to put it [stream data] on the web, but I so far have not gotten that done.”*

In summary, focus groups discussants felt that full-time paid regional coordinators would help substantially in retaining and satisfying current volunteers.

## Reasons for Dropping Out of the SOS Program

### Overview

Volunteers dropped out of the SOS program or stopped monitoring a stream for a number of reasons. The majority of volunteers in our focus group discussions gave lack of time or too many other obligations as the main reasons for discontinuing participation in stream monitoring. Other reasons for dropping out included not seeing enough results from their effort, not enough training or follow-up, and difficulty arranging and organizing a stream-monitoring event.

### Not Enough Time

Many of the focus group participants talked about the many other obligations that pull them in different directions and keep them from stream monitoring. For many, life just gets too busy, and they are forced to give up activities like SOS volunteering. For example, they are forced to devote more time to their careers, or their children have sports and school activities to attend. Consequently, their commitment to stream monitoring suffers. With regard to not enough time or other more important priorities, our volunteers said:

*“You can only do so much, and once you learn how to say no, then it is OK. And it is a relief.... You know, you are a mother, Sunday school teacher, and a Girl Scout leader, and this great naturalist; there is only so much you can do.”*

*“But then it [the decision to stop monitoring] was more a question of time. I really didn't have the time to offer a commitment to stay active...”*

*“I have hardly the time to go out and take a hike, let alone go splash around in the stream...”*

*“When I prioritize my time, I look for things that are effective and useful. If I were considering putting my energies into this again, I would really want to know that my data would be considered reliable and useful. Otherwise I feel like I should put my time into something that was more target-effective” (emphasis added).*

### Lack of Follow-up on the Part of SOS Leaders

Some SOS volunteers in our focus groups felt that the leaders of Save Our Streams could have done a better job of following up on the volunteers who were trained. For example, providing additional training, offering appropriate recognition for volunteer efforts, or simply providing information about where and when to monitor their stream next were all areas in which SOS leaders could improve. A number of volunteers discontinued participation in SOS activities because they felt there was not enough communication and follow-up after the initial contact. For example:

*“I think our group felt let loose a little early by the training volunteer.... He basically gave us a training manual and said good luck in the future.... They [the other monitors] needed a lot more handholding.... The first three times they*

*would have needed someone there telling them that they were doing it right, and to make sure they were counting crayfish and not crawdads.... If you want older women to do SOS, you need a little more hand-holding..."*

*"...trainers' failure to schedule a group of 20 volunteers that I enrolled. There was no response to three attempts to schedule. I and a score of volunteers were abandoned and neglected, even while I was attempting to set up a training session."*

*"I think it is important to keep volunteers engaged once they have taken the crucial first step of stepping in the door.... I would definitely do more monitoring, but no one has called me to keep the monitoring going."*

In addition, life cycle changes (e.g., got married, had children, changed jobs), problems with scheduling monitoring events with other monitors, stream monitoring took too much time, and other situational variables (e.g., bad weather) are all reasons volunteers gave for discontinuing participation in SOS activities:

*"We try to go up there as much as we can, but our schedules get in the way. The weather gets cold; the water gets cold, and nobody wants to do it."*

*"...due to weather and a few other things, we had to reschedule that [monitoring session] four different times. That is a lot of phone calls.... If I had to do that every time I monitored, I really would consider it just to be a chore."*

## **Conclusion**

Our in-depth discussions during the focus group sessions suggested that volunteers have a variety of motives for joining the SOS program and that many volunteers have multiple motives. The currently active volunteers believed that steps could be taken to encourage their continued participation and to increase the level of involvement of less active volunteers. Recommended actions included use of the volunteer data by environmental regulatory and protection agencies, increased feedback on how the citizens' data were being used, and more effective program leadership. These program improvements seem entirely possible. Reasons given for dropping out of the SOS program seem less responsive to change in program management. Not enough time, change in life cycle, change of job, or other situational variables of the volunteer were common reasons for dropping out. However, lack of attention and follow-up by SOS program leaders was an important reason mentioned for discontinuing participation, and this problem can at least potentially be solved.

These insights from focus group discussants into critical issues affecting volunteerism are in themselves useful, but they are not necessarily representative of the overall body of SOS volunteers. To obtain the views of this larger group, we used our focus group findings to construct a general population survey.

## **SURVEY METHODS**

### **Survey Population**

The SOS state coordinator's office provided us with a list of Virginia's 526 program volunteers, and this body of volunteers became the study population. The individuals on the list included volunteers who had simply received SOS training, others who were currently actively monitoring, and others who had monitored in the past but who were apparently no longer active. Thus, the study population appeared to vary in level of participation and commitment to the SOS program.

### **Survey Instrument**

We used the data from the six focus groups, our review of the literature, and interviews with SOS leaders to construct a 12-page mail-back questionnaire (see Appendix B for a copy of the survey). This survey instrument was designed to measure: (1) participation levels in the SOS program and volunteer activity in general; (2) motivations for volunteering to do stream quality monitoring; (3) evaluation of current services and materials provided by the SOS program to its volunteers; (4) suggestions on how SOS might improve its program; (5) reasons for stopping participation in the SOS program; (6) general socio-demographic information about SOS volunteers; and (7) additional open-ended comments for the SOS leadership about how to improve the program.

### **Survey Methodology**

Questionnaire booklets, cover letters, and postage-paid return envelopes were initially mailed in July 1999 to 526 SOS volunteers throughout the state who varied in their level of commitment and involvement in the SOS program. A modified Dillman (1978) strategy was used to encourage a high response rate. A follow-up postcard reminder was sent to all sampled individuals approximately one week after the initial mailing. Next, approximately five weeks after the initial mailing, non-respondents were mailed another copy of the survey, a postage-paid return envelope, and a stronger cover letter encouraging them to return the completed survey. Finally, seven weeks after the initial mailing, non-respondents received another copy of the questionnaire, a postage-paid return envelope, and a final cover letter informing them of the pending closure of the survey process and again encouraging them to complete the survey.

### **Data Analysis**

Several types of data analysis were used to address study objectives. We first developed summary descriptive statistics, typically percentages for categorical data and means and standard deviations for interval or interval-like data, to describe how respondents as a whole answered each survey question. We then subjected the motivation items to an orthogonal factor analysis (varimax rotation) to discover unique dimensions or factors among the motivation item pool. We then computed respondent scores on each of the derived factors, and respondents' calculated mean scores to determine the importance level of the motivation factors.

Both the volunteerism and the outdoor recreation literature have suggested that people with different participation histories and different intensities of current participation may differ in volunteer motivations (Caldwell and Anderek 1994, Ilsley 1990, and Pearce 1983), the benefits they seek (Prestby, Wandersman, Florin, Rich, and Davis 1990), their evaluation of current conditions (Schreyer, Lime, and Williams 1984), and their preferences for management actions (Hammitt and McDonald 1983 and Hammitt, Knauf, and Noe 1989). Given this, we sought to determine whether motivation, evaluation of the SOS program, and preferences for program improvements varied by participation levels in volunteerism.

To address this issue, we included five questions on the survey that we believed measured three participation level dimensions: intensity of current participation in SOS activities, length of involvement with SOS activities, and extent of participation in other voluntary associations. We used factor analysis to confirm whether these five items loaded on three unique dimensions as hypothesized. We then computed factor scores for each respondent based on their standardized scores on items making up each factor. The final step in creating a level of participation index rating for each respondent was to perform cluster analysis of respondents based on their three levels of participation factor scores. Cluster analysis is a multivariate procedure for detecting unique groups of respondents on multiple variables. It places people in categories based on their being most like people in their own group and most unlike people in other groups. We then proceeded to use ANOVA and stepwise discriminant analysis to see if people in different participation level clusters differed from each other on motivations, program preferences, and program evaluations. When we found significant differences using the ANOVA, we did a Duncan's multiple range test to see which specific clusters among all the clusters differed from each other.

## SURVEY RESULTS

### Survey Response Rate

We mailed a total of 526 surveys to possible Save Our Stream volunteers. Completed questionnaires were returned by 318 respondents. Another 50 questionnaires were undeliverable, either because of a wrong address or because the individual had never been part of the SOS program. Using the deliverable questionnaire sample as a base, our response rate was 67 percent.

### Social and Demographic Profile of SOS Volunteers

Volunteers in our sample averaged 41 years of age, with 34% between the ages of 40 and 49. The numbers of individuals in the 20-29, 30-39, and 50-59 groups were all quite similar at about 20% (Table 2). Slightly more than half (52.4%) of the volunteers were female (Table 3), and 98.1% of the respondents were white (Table 4). Educational levels were very high; about 78% had at least a college degree (Table 5), 30% had a master's degree, and almost 8% had a Ph.D. or equivalent. Occupations, too, were high-status; 45% were professional workers and another 10% were managers or executives. Students made up the second-highest occupation category at 14% (Table 6). In line with the educational and occupational status, household incomes of the volunteers were quite high. About 48% had household incomes above \$50,000. Nevertheless, incomes were distributed quite evenly among the income categories provided, and the most common household income category, at about 19%, was under \$20,000 (Table 7). This almost certainly reflects the large number of students in the sample.

**Table 2. Age of SOS volunteers.**

<b>Age Category</b>	<b>Frequency (n=312)</b>	<b>Percent</b>
<20	12	3.8
20-29	54	17.4
30-39	65	20.8
40-49	105	33.6
50-58	50	16.1
60 and over	26	8.3

**Table 3. Gender of SOS volunteers.**

<b>Sex</b>	<b>Frequency (n=313)</b>	<b>Percent</b>
Male	149	47.6
Female	164	52.4

**Table 4. Race of SOS volunteers.**

<b>Race</b>	<b>Frequency (n=313)</b>	<b>Percent</b>
White	307	98.1
African-American	1	0.3
Hispanic	0	0.3
Native American	1	0.3
Asian-American	1	0.3
Other	3	1.0

**Table 5. SOS volunteers' highest level of completed education.**

<b>Level of Education</b>	<b>Frequency (n=313)</b>	<b>Percent</b>
Grammar school	0	0.0
Some high school	2	0.6
High school diploma	5	1.6
Some college	63	20.1
Bachelor's degree or equivalent	72	23.0
Some graduate work	53	16.9
Master's degree	94	30.0
Ph.D., M.D., J.D., or equivalent	24	7.7

**Table 6. Current occupation of SOS volunteers.**

<b>Type of Occupation</b>	<b>Frequency (n=313)</b>	<b>Percent</b>
Manager or executive	33	10.5
Professional worker	142	45.4
Owner of business or farm	23	7.3
Skilled trade or craft	11	3.5
Semi-skilled worker, laborer	1	0.3
Clerical or office worker	8	2.6
Sales worker	1	0.3
Service worker	3	1.0
Unemployed	4	1.3
Retired	26	8.3
Student	43	13.7
Homemaker	18	5.8

**Table 7. SOS volunteers' household income before taxes.**

<b>Income (\$)</b>	<b>Frequency (n=271)</b>	<b>Percent</b>
Under 19,999	52	19.2
20,000 - 29,999	21	7.7
30,000 - 39,999	40	14.8
40,000 - 49,999	28	10.3
50,000 - 59,999	33	12.2
60,000 - 74,999	35	12.9
75,000 - 99,999	32	11.8
100,000 or more	30	11.1

About two-thirds (68%) of the SOS volunteers are married (Table 8), and 47% of the respondents had no children (Table 9). On average, married volunteers had 1.6 children. Sixty percent of the SOS volunteers had no children living in their households, and those households with children typically had only one or two (Table 10).

**Table 8. SOS volunteers' marital status.**

<b>Marital Status</b>	<b>Frequency (n=311)</b>	<b>Percent</b>
Single	83	26.7
Married	211	67.8
Separated/Divorced	16	5.1
Widowed	1	0.3

**Table 9. SOS volunteers' number of children.**

<b>Number of Children</b>	<b>Frequency (n=310)</b>	<b>Percent</b>
0	146	47.1
1	34	11.0
2	78	25.2
3	36	11.6
4	10	3.2
5	3	1.0
6	3	1.0

**Table 10. Number of children currently living in volunteers' households.**

<b>Number of Children</b>	<b>Frequency (n=310)</b>	<b>Percent</b>
0	186	60.0
1	46	14.8
2	58	18.7
3	18	5.8
4	2	0.6

The most common type of area where volunteers now live was rural, non-farm, at 29% of all respondents (Table 11). Somewhat surprisingly, the next most common community types were most different from each other, with 19% of the volunteers living on farms and 17% living in a metropolitan area of more than 100,000 people. However, all sizes of communities were represented in the sample. The majority of SOS volunteers had lived in their communities for extended periods. For example, about 53% had lived in their present community for 10 years or more (Table 12), and 63% intended to remain in their present communities for 10 or more years (Table 13). On the other hand, about 16% of volunteers intended to stay in their present community for less than two years.

**Table 11. Type of area where SOS volunteers currently live.**

<b>Type of Area</b>	<b>Frequency (n=311)</b>	<b>Percent</b>
Farm or ranch	59	19.0
Rural, non-farm	90	28.9
Town (under 5,000)	20	6.4
Town (5,000 - 10,000)	37	11.9
City (10,000 - 50,000)	41	13.2
Large city (50,000 - 100,000)	12	3.9
Metropolitan area (>100,000)	52	16.7

**Table 12. SOS volunteers' length of time in present community.**

<b>Length (yrs)</b>	<b>Frequency (n=311)</b>	<b>Percent</b>
Less than 2	43	13.8
2-4	43	13.8
5-9	60	19.2
10 or more	166	53.2

**Table 13. How long SOS volunteers intend to stay in present community.**

<b>Length (yrs)</b>	<b>Frequency (n=308)</b>	<b>Percent</b>
Less than 2	49	15.9
2-4	42	13.6
5-9	23	7.5
10 or more	194	63.0

### **Involvement in SOS Program**

#### **How Volunteers First Heard About SOS**

SOS volunteers heard about the program in a variety of ways, but the most common single way, at 25%, was through word of mouth (Table 14). However, about 40% learned of the program through the Izaak Walton League of America or other environmental organizations. Participants seemed to be making their decisions to join SOS quite independently. About 35%, the most common response, said they sought out the activity on their own; another 24% cited the important influence of a friend (Table 15).

**Table 14. How volunteers first heard about the SOS program.**

<b>Item</b>	<b>Frequency (n=315)</b>	<b>Percent</b>
Word of mouth	80	25.4
Environmental organization other than the Izaak Walton League	65	20.6
Izaak Walton League of America	59	18.7
Media (e.g., newspaper, internet, television, magazine)	33	10.5
Other	27	8.6
Governmental agency (e.g., DEQ, EPA, DCR)	22	7.0
Youth, school, or church group (e.g., Girl Scouts, 4-H)	18	5.7
Don't remember	11	3.5

**Table 15. Most influential person in getting volunteers involved with SOS.**

<b>Item</b>	<b>Frequency (n=307)</b>	<b>Percent</b>
Sought out activity on my own	109	35.5
Friend	74	24.1
Other	40	13.0
Co-worker	35	11.4
Spouse or partner	27	8.8
Teacher	16	5.2
Child	7	2.3
Public figure	6	2.0
Parent	5	1.6
Sibling	0	0.0
Religious leader	0	0.0

### **Level of Training in SOS**

Study respondents varied a great deal in their level of training in the SOS program. At the upper end, about 30%, were certified SOS stream monitors; another 9% were both certified monitors and certified to train others (Table 16). But 8% of volunteers in the survey said they had no training, and almost 30% said they had only some stream monitoring training. Another one-fifth of all volunteers were trained, but for various reasons were not yet certified. The most common amount of initial training (before a certification test) was 4 to 6 hours, followed by 1 to 3 hours (Table 17). These numbers may, however, be somewhat misleading. They not only include those who have taken the certification test, but also those who were involved in training but had

not yet taken the exam. Thus, volunteers may seek out and receive additional training before the certification exam. Finally, the most common regions where respondents received training were Blacksburg/Radford (27%), Northern Piedmont (17%), and Northern Virginia (15%) (Table 18). These findings are not surprising because they represent regions with program coordinators and many SOS volunteers.

**Table 16. Amount of training volunteers have received in the SOS program.**

<b>Item</b>	<b>Frequency (n=308)</b>	<b>Percent</b>
No training	24	7.8
Have some stream monitoring training	91	29.5
Have completed the training, but not yet certified	68	22.1
Certified SOS stream monitor	97	31.5
Certified to train and test other volunteers	28	9.1

**Table 17. Amount of initial training (before certification test) SOS volunteers received.**

<b>Number of Hours</b>	<b>Frequency (n=282)</b>	<b>Percent</b>
0	6	2.1
1-3	79	28.0
4-6	109	38.7
7-10	47	16.7
11-15	9	3.2
>15	32	11.3

**Table 18. Region where SOS volunteers received initial training.**

<b>Region</b>	<b>Frequency (n=286)</b>	<b>Percent</b>
Northern Virginia	44	15.0
Hampton Roads	1	0.3
Tidewater	2	0.7
Eastern Shore	0	0.0
Richmond/Petersburg	8	2.8
Northern Piedmont/Charlottesville	49	17.1
Southern Piedmont	9	3.1
Shenandoah Valley	36	12.6
Roanoke/Lynchburg	23	8.0
Blacksburg/Radford	77	26.9
Southwest Virginia	25	8.7
Other	12	4.2

### **Level of Participation in Volunteerism**

The survey queried SOS volunteers about three dimensions or aspects of participation in volunteerism. The first was to determine the intensity of current participation in SOS volunteer activities, and we asked this question in several ways. Table 19 reports the volunteers' self-assessment of their current level of involvement in SOS. About 25% of the respondents said they were just becoming interested in SOS or were involved in training. About 50% reported regularly or occasionally monitoring a stream. Just over 20% said they were no longer involved with SOS. Thus, our sample represents a range of levels of subjective involvement, and about as many recruits are coming into the program as are leaving.

**Table 19. SOS volunteers' self-assessment of current level of involvement in the SOS program.**

<b>Item</b>	<b>Frequency (n=313)</b>	<b>Percent</b>
Just becoming interested in water quality monitoring	34	10.9
Involved in the training process	43	13.7
Occasionally monitor a stream (3 or fewer times a year)	86	27.5
Regularly monitor a stream (more than 3 times a year)	66	21.1
No longer involved with SOS	67	21.4
Other	17	5.4

We then asked respondents who had not dropped out to tell us about how many times a year they monitored a stream using SOS procedures, and about how many hours a month they volunteered for SOS activities. Table 20 indicates that the monitoring intensity category with the largest number of volunteers was "less than once a year," at 34% of all active volunteers. The next most frequent intensity of stream monitoring by SOS volunteers was the prescribed 4 times a year, at 23% of all active volunteers. Table 21 suggests that over 50% of all active SOS volunteers contribute less than 1 hour per month to the program. Almost 20% contribute one or two hours a month, or about the minimum likely required by SOS procedures. Thus, while just over half of all SOS volunteers appear to contribute less time than required for a satisfactory performance, about 25% give the program more than the minimum necessary effort.

**Table 20. Number of times a year volunteers monitor a stream using SOS procedures.**

<b>Number of Times/Year</b>	<b>Frequency (n=231)</b>	<b>Percent</b>
Less than 1	79	34.2
1	22	9.5
2	30	13.0
3	35	15.2
4	53	22.9
More than 4	12	5.2

**Table 21. Number of hours per month volunteers contributes to the SOS program.**

<b>Number of Hours/Month</b>	<b>Frequency (n=237)</b>	<b>Percent</b>
Less than 1	134	56.5
1-2	43	18.1
3-5	37	15.6
6-10	13	5.5
11-20	6	2.5
More than 20	4	1.7

Another way to look at the level of participation in the SOS is to consider how long volunteers have been involved with the program. This is only a rough indicator of commitment, because a recent recruitment campaign by an organization can cause a bulge in the numbers of members

with short stays with the organization. We do know from Table 19 that about one-fourth of all SOS membership is new to the organization. We found confirmation of this when 25% of the respondents said they had been involved for less than a year, and another 55% reported a 1- to 3-year experience with the organization (Table 22). People with long histories of involvement are few.

**Table 22. Volunteers' length of involvement in the SOS program.**

<b>Length (years)</b>	<b>Frequency (n=309)</b>	<b>Percent</b>
Less than 1	78	25.2
1-3	170	55.0
4-6	39	12.6
7-10	18	5.8
More than 10	18	5.8

Finally, we were interested in the extent to which SOS volunteers are part of other volunteer organizations and efforts. Individuals involved in other volunteer organizations and activities might have unique motivations, and they might have suggestions for program improvement drawn from successes in the other organizations. Table 23 reports that 30% of all SOS volunteers were part of at least one other water quality monitoring volunteer organization. About 4% of all SOS volunteers are involved with Friends of the Shenandoah Valley; just over 3% said they were involved with water quality monitoring for each of the Sierra Club, Virginia Chapter, and the Alliance for the Chesapeake Bay. The SOS volunteers also contribute considerable time to other voluntary activities not related to water (such as church groups, Scouts, PTA, or other environmental groups). For example, almost a third of them give 10 or more hours a month to such endeavors (Table 24).

**Table 23. Volunteers' involvement with other water quality monitoring volunteer organizations.**

<b>Organization</b>	<b>Frequency (n=316)</b>	<b>Percent<sup>1</sup></b>
Friends of the Shenandoah River	12	3.8
Headwaters Association, Inc.	6	1.9
Friends of the Rappahannock	1	0.3
Alliance for the Chesapeake Bay	10	3.2
Friends of Urbanna Creek	0	0.0
Sierra Club, Virginia Chapter	11	3.5
River Network	5	1.6
Friends of Page Valley	2	0.6
Friends of Sugarland Run	3	0.9
Friends of the North River	6	1.9
Friends of Dragon Run, Inc.	0	0.0
Elizabeth River Association	0	0.0
Others	44	13.9
I do not belong to any other organizations	224	70.9

<sup>1</sup> Respondents were asked to select all that applied; thus, column does not add up to 100%.

**Table 24. Amount of time volunteers contribute to volunteer organizations other than SOS.**

<b>Hours/Month</b>	<b>Frequency (n=313)</b>	<b>Percent</b>
0	54	17.3
1-5	103	32.9
6-10	58	18.5
11-15	41	13.1
16-20	33	10.5
21-40	14	4.5
41-80	8	2.6
More than 80	2	0.6

## **What Motivates People to Volunteer for the SOS Program (Study Objective #1)**

A major objective of this study was to determine why the SOS participants volunteer to do water quality monitoring. This was done by asking the volunteers to indicate how important each of 39 possible reasons was for their involvement in SOS water quality monitoring on a 1 (not at all important) to 5 (very important) scale. Table 25 presents an overview of the volunteers' responses. Seven items (in order of importance: to protect Virginia's streams, to protect the biodiversity of Virginia's streams, I love the scenic beauty of streams, I feel a deep connection with nature, I am concerned about drinking water quality, to learn more about stream quality, and to teach children to respect the environment) were, on average, rated between moderately important and very important. Four items (volunteer experience will look good on my resume, it is part of my religious beliefs or practices, I am worried about my property value, and it will help me gain practical experience toward paid employment) had the lowest average ratings, scoring between not at all important and slightly important.

When we designed the motivation question, we included several items to measure each of several general reasons for volunteer activity that surfaced in our focus group discussions. Using multiple items helps to assure that the study constructs are measured validly and reliably. To determine whether our multiple items indeed measured the motivational constructs that we thought, and to simplify interpretation of the data, we used factor analysis to identify the unique dimensions or factors among our 39-item pool.

Factor analysis produced eight motivational factors that we characterized and labeled:

- to protect the environment
- learning
- teaching
- to be of service
- for nature enjoyment
- to be social
- to guard against local threats
- for career growth.

These eight factors accounted for a respectable 65% of the total variability across all items. Also, Cronbach's Alpha Coefficients (assessing the internal consistency of the items constituting a factor) ranged from .65 (to protect the environment) to .85 (to be of service), suggesting that the factors are relatively reliable (Tables 26 and 27).

The factor analysis identified nine items that were unique (i.e., didn't load on any factor) or loaded highly on more than one factor. These nine items could therefore not be considered reliable measures and were discarded: I love the scenic beauty of streams; I feel a deep connection with nature; I am concerned about drinking water quality; stream monitoring is fun; to network with natural resource professionals; to teach my children about streams; to do something more fulfilling than my current job; to spend time with my family; and it is part of my religious beliefs or practices. The first three of these nine items listed were rated among the most important of all reasons for volunteering, and future research on motivation for water quality

monitoring should attempt to examine, clarify, and better measure these potentially useful constructs.

We examined the items in the factors and gave each factor a name that appeared to express its content. Factor 1 (to be of service) consisted of seven items dealing with being useful and how volunteer efforts would produce some type of positive results. Factor 2 (teaching) consisted of three items dealing with teaching stream monitoring to others. Factor 3 (to guard against local threats) consisted of six items dealing with the volunteers' concern about local industry and other potential threats to water quality. Factor 4 (to be social) consisted of four items dealing with working with friends and meeting new people with similar interests. Factor 5 (nature enjoyment) consisted of three items relating to spending time outdoors and opportunities for escape and reflection. Factor 6 (learning) consisted of three items referring to learning about streams, water quality, and stream organisms. Factor 7 (to protect the environment) involved two items dealing with protecting streams and improving water quality. Finally, Factor 8 (career growth) contained two items dealing with gaining practical work experience and enhancing one's resume.

We then assigned each volunteer a score for each factor by summing all the scores for items in each factor and then taking the mean. Each item within a factor was considered to contribute equally. We were then able to perform descriptive statistics on the motivation factors for all the volunteers and for each factor to determine which motivations were most important (Table 28). Protecting the environment was by far the most important motivation to the volunteers ( $\xi = 4.63$ ), followed by learning ( $\xi = 4.00$ ), teaching ( $\xi = 3.67$ ), to be of service ( $\xi = 3.65$ ), for nature enjoyment ( $\xi = 3.00$ ), to be social ( $\xi = 2.76$ ), to guard against local threats ( $\xi = 2.64$ ), and lastly, for career growth ( $\xi = 1.83$ ).

**Table 25. SOS volunteers' motivations for water quality monitoring.<sup>1</sup>**

Item	N	Mean	Standard Deviation
To protect Virginia's streams.	307	4.72	.60
To protect the biodiversity of Virginia's streams.	304	4.54	.82
I love the scenic beauty of streams. <sup>2</sup>	304	4.34	1.00
I feel a deep connection with nature. <sup>2</sup>	305	4.33	.95
I am concerned about drinking water quality. <sup>2</sup>	308	4.29	1.02
To learn more about stream quality.	304	4.19	.98
To teach children to respect the environment.	305	4.00	1.30
I feel like I am doing something useful.	300	3.91	1.10
I like to be able to identify stream organisms.	304	3.88	1.10
My data are helping governmental agencies identify threats to streams.	297	3.80	1.18
It is an opportunity to spend time outdoors.	305	3.75	1.16
Collecting stream data provides a tool to monitor industry/ agriculture.	305	3.74	1.18
I felt I could make a difference.	306	3.73	1.26
I want to educate others about the importance of stream quality.	303	3.69	1.12
Stream monitoring is fun. <sup>2</sup>	303	3.63	1.16
To learn new skills.	303	3.60	1.16
It provides a sense of personal accomplishments.	300	3.50	1.17
I feel an obligation to help the community.	302	3.46	1.16
Government agencies need volunteers to assist with stream monitoring.	300	3.45	1.30
To teach stream monitoring to other people	302	3.31	1.36
To network with natural resource professionals. <sup>2</sup>	304	3.24	1.33
I am worried about the health of my family and neighbors.	305	3.21	1.41
Because a stream in my community was threatened	302	3.11	1.48
To teach my children about streams. <sup>2</sup>	293	3.06	1.69
To meet new people with similar interests.	306	2.96	1.25
To become a "watchdog" on local industry.	301	2.85	1.32
I don't trust governmental agencies to do a good job of monitoring streams.	302	2.77	1.43
I like being part of a larger community of volunteers.	300	2.76	1.30
To meet other members of my community.	302	2.72	1.21
To spend time with friends.	302	2.60	1.26
To do something more fulfilling than my current job. <sup>2</sup>	294	2.52	1.39
It provides a time for quiet reflection.	301	2.40	1.25
To spend time with family. <sup>2</sup>	301	2.21	1.33
It provides an escape from all the demands of life.	301	2.15	1.28
I wanted to help protect a special place of my youth.	295	2.03	1.43
It will help me gain practical experience toward paid employment.	303	1.88	1.29
I am worried about my property value.	300	1.85	1.30
It is part of my religious beliefs or practices. <sup>2</sup>	297	1.84	1.13
Volunteer experience will look good on my resume.	302	1.76	1.13

<sup>1</sup> Motivation question: How important is each of the following reasons to your involvement in SOS water quality monitoring? (1 = Not at all important, 2 = Slightly important, 3 = Somewhat important, 4 = Moderately important, 5 = Very important).

<sup>2</sup> Item did not load highly on any motivational factor.

**Table 26. Items and structure of the "to be of service," "teaching," "to guard against local threats," and "to be social" motivation factors.**

Items	Factor Loading			
<b>"To Be of Service" Motivation Factor:</b>				
My data are helping governmental agencies identify threats to streams.	.66			
I feel like I am doing something useful.	.65			
I felt I could make a difference.	.65			
It provides a sense of personal accomplishment.	.64			
Collecting stream data provides a tool to monitor industry/agriculture development.	.60			
Government agencies need volunteers to assist with stream monitoring.	.60			
I feel an obligation to help the community.	.58			
<b>"Teaching" Motivation Factor:</b>				
To teach stream monitoring to other people.		.78		
I want to educate others about the importance of water quality.		.77		
To teach children to respect the environment.		.76		
It provides a sense of personal accomplishment.		.64		
<b>"To Guard Against Local Threats" Motivation Factor:</b>				
I am worried about my property values.			.73	
I do not trust governmental agencies to do a good job of monitoring streams.			.66	
To become a "watchdog" on local industry.			.64	
Because a stream in my community was threatened.			.57	
I wanted to help protect a special place of my youth.			.54	
I am worried about the health of my family and neighbors.			.48	
<b>"To Be Social" Motivation Factor:</b>				
To meet new people with similar interests.				.81
To meet other members of my community.				.80
To spend time with friends.				.60
I like being part of a larger community of volunteers.				.54
<b>Cronbach's Alpha (scale reliability):</b>	<b>.85</b>	<b>.85</b>	<b>.75</b>	<b>.82</b>
<b>Percent of variance explained:</b>	<b>13.01%</b>	<b>8.79%</b>	<b>8.39%</b>	<b>8.07%</b>

**Table 27. Items and structure of the "nature enjoyment," "learning," "to protect the environment," and "career growth" motivation factors.**

Items	Factor Loading			
<b>"Nature Enjoyment" Motivation Factor:</b>				
It provides an escape from all the demands of life.	.80			
It provides a time for quiet reflection.	.69			
It is an opportunity to spend time outdoors.	.61			
<b>"Learning" Motivation Factor:</b>				
I like to be able to identify stream organisms.		.63		
To learn more about stream quality.		.61		
To learn new skills.		.54		
<b>"To Protect the Environment" Motivation Factor:</b>				
To protect Virginia's streams.			.77	
To protect the biodiversity of Virginia's streams.			.76	
<b>"Career Growth" Motivation Factor:</b>				
Volunteer experience will look good on my resume.				.87
It will help me gain practical experience toward paid employment.				.86
<b>Cronbach's Alpha (scale reliability):</b>	<b>.79</b>	<b>.70</b>	<b>.65</b>	<b>.80</b>
<b>Percent of variance explained:</b>	<b>7.59%</b>	<b>6.77%</b>	<b>6.77%</b>	<b>5.67%</b>

**Table 28. SOS volunteers' importance ratings for motivation factors for water quality monitoring.**

Motivation Factors	Mean Importance <sup>1</sup>
To protect the environment	4.63
Learning	4.00
Teaching	3.67
To be of service	3.65
For nature enjoyment	3.00
Social	2.76
To guard against local threats	2.64
For career growth	1.83

<sup>1</sup> 1 = not at all important; 2 = slightly important; 3 = somewhat important; 4 = moderately important; 5 = very important.

## Volunteers' Evaluation of Current SOS Program Services (Study Objective #2)

Our survey asked SOS volunteers for their own assessments of the program's water quality monitoring procedures and their evaluation of the services the program provides them. Table 29 reports that on a scale from 1 (not well at all) to 7 (extremely well), SOS volunteers rated the program's recommended procedures to accurately assess the overall health of a stream at  $\xi = 5.31$ . Of those with an opinion, just over half gave the program a rating of 6 or 7. An even larger percentage of volunteers felt that they were able to follow the SOS procedure when monitoring a stream. About 62% of the respondents rated themselves as a 6 or 7 on the 7-point scale; the mean response for the entire group was 5.82 (Table 30). Table 31 indicates that while one-third of the respondents were unsure of how well other SOS volunteers followed the recommended water quality monitoring procedures, those with an opinion gave their colleagues a mean overall evaluation of 5.39. Thus, it appears that the SOS volunteers, as a group, rate the validity of SOS water quality monitoring procedures, their own performance of the procedures, and the performance of their colleagues as quite good.

**Table 29. Volunteers' evaluation of how well the SOS procedure assesses the overall health of the stream.**

Evaluation <sup>1,2</sup>	Frequency (n = 311)	Percent
1	0	0.0
2	1	0.3
3	9	2.9
4	59	19.0
5	67	21.5
6	116	37.3
7	27	8.7
Not sure	27	10.3

<sup>1</sup> 1 = not well at all; 4 = fairly well; 7 = extremely well

<sup>2</sup> Overall mean of our sample was  $\xi = 5.31$ .

**Table 30. Volunteers' evaluation of how well they follow the recommended stream monitoring procedures.**

<b>Evaluation</b> <sup>1,2</sup>	<b>Frequency (n = 300)</b>	<b>Percent</b>
1	1	0.3
2	0	0.0
3	4	1.3
4	24	8.0
5	43	14.3
6	122	40.7
7	63	21.0
Not sure	43	14.3

<sup>1</sup> 1 = not well at all; 4 = fairly well; 7 = extremely well

<sup>2</sup> Overall mean of our sample was  $\xi = 5.82$ .

**Table 31. Volunteers' evaluation of how well other volunteers follow the recommended SOS monitoring procedures.**

<b>Evaluation</b> <sup>1,2</sup>	<b>Frequency (n = 309)</b>	<b>Percent</b>
1	1	0.3
2	0	0.0
3	5	1.6
4	38	12.3
5	52	16.8
6	78	25.2
7	31	10.0
Not sure	103	33.3

<sup>1</sup> 1 = not well at all; 4 = fairly well; 7 = extremely well

<sup>2</sup> Overall mean of our sample was  $\xi = 5.39$ .

We then asked study participants to rate how well the SOS program administrators were providing 14 different services to them on a 5-point scale (1 = poor to 5 = excellent) (Table 32). A surprising percentage of volunteers did not know enough about the SOS's administration or services to be able to make an evaluation. For example, 60% felt unable to rate the effectiveness of the distribution of collected volunteer data to those who could use it (e.g., the DEQ or the DCR). More than 40% couldn't judge the quality of the program's recruitment procedures for new volunteers and the way the certification test was being administered. More than 30% didn't know enough to evaluate the effectiveness of the certification test in measuring a volunteer's ability to monitor, how well the SOS program provided materials to educate others about SOS, **Table 32. SOS volunteers' evaluation of the program's current services or materials.**<sup>1</sup>

<b>Current Service or Material</b>	<b>N</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Don't Know<sup>2</sup> (%)</b>
The effectiveness of your initial training sessions to prepare you to properly monitor a stream.	264	4.13	.82	10.5
The effectiveness of the certification test to measure a volunteer's ability to monitor.	185	4.05	.78	37.6
The way the certification test is administered.	171	4.01	.73	41.9
The usefulness of the current field guide materials to confidently identify stream organisms.	258	3.84	.91	12.2
Availability of stream monitoring equipment (e.g., waders and mesh nets)	230	3.47	1.25	22.3
Opportunities for additional training and refresher courses for monitors.	199	3.44	1.17	32.4
Opportunities to meet other SOS volunteers.	191	3.42	1.15	22.0
Recognition/appreciation of volunteers.	229	3.41	1.14	34.9
Communication between SOS leaders and their volunteers (such as about upcoming events or when to monitor next).	219	3.22	1.38	25.9
The effective distribution of collected volunteer data to those who can use it (e.g., DEQ, DCR).	116	3.12	1.31	60.4
Recruitment of new stream monitoring volunteers.	171	3.05	1.15	41.9
Provision of materials to educate others about SOS.	188	3.02	1.12	36.1
Feedback from SOS leaders about how volunteer data are being used to protect streams.	219	2.89	1.32	25.7
Advertising/promotion of SOS program.	203	2.81	1.15	30.6

Current services or materials were evaluated as follows: 1 = poor, 2 = fair, 3 = average, 4 = good, 5 = excellent.

<sup>2</sup> Percent of respondents who checked the "Don't Know" category.

how well the program expressed recognition/appreciation of its volunteers, how well the program provided opportunities for additional training and refresher courses for monitors, and how well it advertised and promoted the SOS program. Some of this uncertainty reflects the 25% of all volunteers who are new to the SOS program, but there does seem to be a considerable lack of awareness about the program's services among the membership.

Among those with enough information to make an evaluation, the respondents, on average, rated the effectiveness of the initial training sessions to prepare them to properly monitor a stream, the effectiveness of the certification test to measure a volunteer's ability to monitor, and the way the certification test is administered as good to excellent. The only services/activities receiving a below average rating by the group as a whole were the feedback provided from SOS leaders about how volunteer data were being used to protect streams and the way the SOS program was advertised and promoted.

### **Volunteers' Support for Possible SOS Program Changes (Study Objective #2)**

The survey provided the volunteers with 14 possible changes to the SOS program, and measured support for these new services on a 5-point "strongly oppose" to "strongly support" scale. Table 33 indicates that only two changes were opposed by the group as a whole: to have an easier certification test and to focus monitoring efforts on the state's most impaired stream sections, rather than letting volunteers pick their own streams. The three most supported changes, i.e., standardized training procedures across Virginia, lobbying government agencies to use volunteer data in stream decision-making, and a Virginia SOS newsletter, had mean ratings between "support" and "strongly support." At the next highest tier of support was having special guest speakers talk about water and environmental quality, having an annual meeting with other volunteer water monitoring groups in Virginia, providing full-time paid SOS regional coordinators, and having random field spot-checks of SOS volunteers to assure quality data.

We also developed a specific question on how volunteers preferred to be recognized for their efforts. About two-thirds said they did not need to be recognized for their services (Table 34). About 15% responded that while it didn't matter how they were recognized, such recognition was important. Finally, about 10% of the volunteers preferred recognition certificates or a verbal or written "thank you" from SOS leaders.

**Table 33. Volunteers' support for possible changes to the SOS program.<sup>1</sup>**

Potential Changes	N	Mean	Standard Deviation
Standardized training procedures across Virginia.	295	4.13	.70
Lobbying government agencies to use volunteer data in stream decision-making.	292	4.03	.75
A Virginia SOS newsletter.	293	4.01	.72
Special guest speakers about water and environmental quality.	295	3.96	.64
Annual meeting with other volunteer water monitoring groups in Virginia.	291	3.86	.74
Provide full-time paid SOS regional coordinators.	288	3.81	.85
Random field spot-checks of SOS volunteers to assure quality data.	295	3.80	.73
Require re-certification testing (e.g., every 3 years) to assure high quality stream monitoring data.	291	3.66	.86
Social events like picnics or potlucks for volunteers.	292	3.40	.71
To minimize redundancy/boredom, have periodic monitoring of other volunteers' streams.	295	3.38	.78
A more rigorous certification test.	287	3.29	.71
Awards, certificates, or plaques for volunteers.	293	3.16	.83
Focus monitoring efforts on the state's most impaired stream sections, rather than letting volunteers pick their own streams.	294	2.81	1.12
An easier certification test.	282	2.18	.83

<sup>1</sup> Response categories are 1 = strongly oppose; 2 = oppose; 3 = neutral; 4 = support; and 5 = strongly support.

**Table 34. SOS volunteers' preferences for recognition for their efforts.**

Type of Recognition	Percent <sup>1</sup>
Recognition certificates	9.9
A verbal or written "Thank You" from SOS leaders	9.0
Awards banquet	3.2
It doesn't matter how I am recognized, but it is important	15.4
I do not need to be recognized for my efforts	63.7

<sup>1</sup> Respondents were able to mark all that apply; thus, column does not add up to 100%.

## Volunteers' Willingness to Participate in SOS Program Activities

Volunteers also indicated their willingness to participate in any of seven other SOS program activities besides water quality monitoring (Table 35). The only two activities that were supported by more than half of the respondents were stream clean up (e.g., trash and debris clean-up) and tree planting. Very few volunteers indicated interest in working to fund-raise, provide SOS office support, or lobby politicians/officials to protect streams.

**Table 35. Volunteers' willingness to participate in other SOS program activities.**

Activity (n = 312)	Percent <sup>1</sup>
Stream clean-up (e.g., trash and debris clean-up)	77.9
Tree planting	61.9
Storm drain painting warning against pollution	34.7
Streambank restoration (e.g., erosion control)	34.5
Lobbying politicians/officials to protect streams	11.8
SOS office support	5.9
Fund-raising	4.7

<sup>1</sup> Respondents were asked to select all that apply; thus, column does not add up to 100%.

## Why SOS Volunteers Stop Stream Monitoring (Study Objective #3)

Finally, the questionnaire listed 33 possible reasons that respondents who had not monitored a stream in the past 12 months might have for stopping participation in the SOS program. About 40% of all volunteers in the SOS program acknowledged that they had not monitored during the last year. (We suspect that the level of non-involvement is even higher than this because non-participation was probably high among the 33% of the volunteers who did not return their surveys.) Of all the reasons listed, by far, the group rated two the most important: "I had too many obligations" and "I did not have enough time." The next tier of most important reasons included: I moved; stream monitoring took too much time; there was not enough feedback from SOS leaders; there was not enough direction from SOS leaders; the program lacked effective leadership; and it was difficult to find a time when the monitoring partner could meet. However, these reasons were, on average, rated as only slightly important (Table 36). Lack of time and too many obligations were thus the overwhelming reasons why volunteers dropped out.

**Table 36. Importance of SOS volunteers' reasons for discontinuing participation.<sup>1</sup>**

<b>Reasons for Dropping out</b>	<b>N</b>	<b>Mean<sup>1</sup></b>	<b>Standard Deviation</b>
I had too many other obligations.	127	3.14	1.68
I did not have enough time.	127	3.07	1.67
I moved.	126	1.95	1.66
Stream monitoring took too much time.	127	1.94	1.40
There was not enough feedback from SOS leaders.	126	1.87	1.41
There was not enough direction from SOS leaders.	126	1.84	1.39
The program lacked effective leadership.	126	1.81	1.33
It was difficult to find a time when my monitoring partner(s) could meet.	126	1.79	1.31
I became active in other environmental organizations.	127	1.64	1.23
I didn't see any tangible results from my monitoring efforts.	127	1.58	1.19
I felt I was not adequately trained.	126	1.51	1.10
I did not feel my data were being used effectively.	125	1.47	1.08
I felt Virginia's protection agencies were not taking my data seriously.	127	1.45	1.04
The training did not give me the skills to monitor my stream properly.	126	1.44	1.12
The stream I monitored was too far away.	127	1.42	1.06
There were not enough opportunities to meet other volunteers.	127	1.34	1.04
I had health problems.	127	1.34	.83
I had done my volunteer duty.	127	1.33	.90
SOS leadership didn't seem to appreciate volunteers very much.	127	1.28	.87
My monitoring partner (s) quit.	127	1.27	.84
The environmental problems became too overwhelming.	126	1.25	.74
I felt there was little cooperation with other volunteer monitoring groups.	127	1.24	.74
Monitoring became boring.	127	1.23	.78
The certification test was too difficult.	127	1.23	.63
I didn't see any improvements in the quality of my stream.	127	1.20	.66
My marital status changed.	127	1.17	.72
My children grew up.	127	1.17	.63
I didn't make the friendships I had hoped.	126	1.13	.61
The environmental problem I was concerned about got resolved.	127	1.13	.54
There were not enough leadership opportunities.	127	1.11	.54
The certification test was too intimidating.	126	1.10	.52
I didn't like the stream to which I was assigned.	126	1.07	.44
I didn't get along with my monitoring partner (s).	127	1.04	.26

<sup>1</sup> Stopping participation was defined as not monitoring a stream in the past 12 months. Response format was: 1 = not at all important; 2 = slightly important; 3 = somewhat important; 4 = moderately important; 5 = very important.

## **Volunteerism Participation Level and SOS Motivations, Program Evaluation, and Preferences for Program Improvements (Study Objective #4)**

One of our goals in this study was to identify and understand highly committed volunteers, because we felt they might be able to give us information on what kinds of people to recruit and what program elements might be altered to retain active volunteers over long periods of time. We chose to define commitment by measuring the level of participation in volunteerism. The volunteerism/outdoor recreation literature suggests that people at different participation levels often do differ in motivations (Caldwell and Anderick 1994, Ilsley 1990, and Pearce 1983), the benefits they seek (Prestby et al. 1990), their evaluation of current conditions (Schreyer, Lime, and Williams 1984), and the preferences for management actions (Hammitt and McDonald 1983 and Hammitt, Knauf, and Noe 1989).

As described earlier, we measured the level of participation by creating an index variable based on these participation factors: intensity of participation in SOS water quality monitoring, length of time involved with SOS monitoring, and amount of participation in all volunteer activities. Our measure of the length of involvement was a single question asking the respondents how long they had been involved with the SOS program. Factor analysis of standardized scores on these participation items indicated two items measured intensity of involvement: how many times a year the respondent monitored, and how many hours a month the respondent volunteered in all SOS activities. Finally, intensity of participation in all volunteer activities was measured by asking study participants the total number of other water quality volunteer organizations they were involved with, and how much time they spent on all volunteer activities each month. Table 37 reports items, item loadings, and reliabilities of the three participation level factors.

Scores were computed for individuals on the multi-item factors (SOS intensity and general volunteer activity) by adding across the standardized items in the factor and then finding their mean response. On the single-item length of SOS involvement factor, an individual's score was his or her standardized score on the one length of participation question.

We then used K-means cluster analysis to attempt to cluster volunteers with similar combinations of scores on participation level factors. Cluster analysis places respondents into groups that are as much alike as possible and as different as possible from other groups on the basis of multiple variables. The number of clusters that emerges from the data set is somewhat subjective. For example, with K-means clustering, the researcher can pick the number of clusters he or she thinks is most meaningful. We chose to use four clusters after trying two, three, and five clusters. We found that four clusters had a large enough number of individuals in each cluster to permit meaningful inferences, and the characteristics of the four clusters seemed interpretable.

**Table 37. Factor loadings of five items used in developing an SOS participation level index.<sup>1</sup>**

<b>Question</b>	<b>SOS Intensity (n = 291)</b>	<b>General Volunteer Activity (n = 313)</b>	<b>Length of Involvement In SOS (n = 309)</b>
Approximately, how many times a year do you monitor your stream using SOS procedures?	.89		
Approximately how many hours do you volunteer in the SOS program?	.88		
How much time do you currently contribute to all other volunteer organizations besides SOS?		.86	
Are you currently involved with any other water quality monitoring volunteer organizations?		.73	
Approximately how long have you been involved with the SOS program?			.98
Cronbach's Alpha (scale reliability)	.75	.47	--- <sup>2</sup>
Percent of variance explained	37.79	22.54	18.65

<sup>1</sup> These three factors explained a respectable 78.98% of the total variability across all items.

<sup>2</sup> Only one question available for this factor, thus no reliability score.

We then checked to see if our four clusters did indeed differ from each other. This was to check against the possibility that we had forced the clustering routine to find four clusters when in fact there were fewer than four. In addition, perhaps our selection of four clusters was too few; because this would permit an undesirably high variance of participation level factors within clusters. We used ANOVA tests followed by Duncan's multiple range tests, when appropriate, to assess any differences among the clusters. We first performed these analyses on the five participation variables that defined the factors of the index, followed by the same analyses on the three participation level factors.

We then gave people in each cluster a label that seemed to express their values on the variables and factors used to define the clusters. These descriptive labels were:

*Rookies* (n = 94): Persons who were low for both length of involvement in SOS and general volunteer experience, and low/medium for SOS activity.

*Fading Veterans* (n = 108): Persons who have been in the SOS program a relatively long time, but who are not very active in SOS activities and only mildly active in other volunteer activities.

*Active Veterans* (n = 43): Persons who are mildly active in both SOS activities and other volunteer activities, and who have been active in the SOS program the longest.

*All-Stars* (n = 60): Persons who are the most active in both SOS activities and general volunteer activities, and who have been involved with the SOS program a medium length of time.

### **Confirming the Participation Level Clusters**

Table 38 reports the results of an ANOVA test for differences between the participation level clusters on each of the five variables that make up the index that defines the clusters. The clusters differed on all five variables at a  $p < 0.001$  level. Duncan's multiple range tests were then performed to identify which clusters differed from which within a given variable. The All-Stars were higher than all other clusters on three of the index variables: number of times monitoring a stream each year, number of SOS volunteer hours per month, and hours per month spent volunteering for other organizations. They had not been involved as long in SOS as the Active Veterans. The Rookies were significantly lower than other clusters on all variables except for number of times monitoring a stream per year and number of hours spent volunteering. Fading Veterans had the lowest scores on these two variables. Fading and Active Veterans were relatively similar on most level of participation variables, but the Active Veterans scored higher on the length of involvement variable and the two SOS stream monitoring intensity variables.

We then assigned the clusters a low, medium, or high label on each of the participation level index variables. These labels should be seen as relative ratings. For example, Active Veterans are considered high on length of involvement with SOS, but their average length of service is only about six years. Also, the All-Stars have a high rating on number of hours spent volunteering for SOS each month, but they only contribute an average of about four hours monthly. They are, however, high compared to all other clusters.

**Table 38. Mean ratings and tests for differences on variables that define SOS participation level clusters.<sup>1,2</sup>**

Participation Variables	Participation Level				F Ratio
	Rookies (n = 94)	Fading Veterans (n = 108)	Active Veterans (n = 43)	All-Stars (n = 60)	
Length of involvement in SOS (years) <sup>3</sup>	1.27 <sup>a</sup> (low)	2.09 <sup>b</sup> (medium)	3.60 <sup>c</sup> (high)	2.03 <sup>b</sup> (medium)	274.64
Number of stream monitorings per year <sup>4</sup>	2.55 <sup>b</sup>	1.71 <sup>a</sup>	3.50 <sup>c</sup>	4.83 <sup>d</sup>	78.11
SOS volunteer hours per month <sup>5</sup>	1.41 <sup>b</sup> (low)	1.04 <sup>a</sup> (low)	1.93 <sup>c</sup> (medium)	3.33 <sup>d</sup> (high)	136.63
Number of other voluntary organizations <sup>6</sup>	0.07 <sup>a</sup>	0.32 <sup>bc</sup>	0.47 <sup>ab</sup>	0.83 <sup>c</sup>	18.14
Hours per month in other voluntary organizations <sup>7</sup>	2.34 <sup>a</sup> (low)	3.06 <sup>b</sup> (medium)	2.82 <sup>b</sup> (medium)	3.65 <sup>c</sup> (high)	9.59

<sup>1</sup> ANOVA F-ratio significant at  $p < 0.001$  for all variables of the participation level clusters.

<sup>2</sup> Means with the same superscript are not significantly different, Duncan's multiple range test,  $p = 0.05$  level.

<sup>3</sup> 1 = less than 1 year; 2 = 1-3 years; 3 = 4-6 years; 4 = 7-10 years; 5 = more than 10 years.

<sup>4</sup> 1 = less than once per year; 2 = 1 time a year; 3 = 2 times a year; 4 = 3 times a year; 5 = 4 times a year; 6 = more than 4 times a year.

<sup>5</sup> 1 = less than 1 hour per month; 2 = 1-2 hours per month; 3 = 3-5 hours per month; 4 = 6-10 hours per month; 5 = 11-20 hours per month; 6 = more than 20 hours per month.

<sup>6</sup> Mean scores of number of other voluntary organizations involved with.

<sup>7</sup> 1 = 0 hours per month; 2 = 1-5 hours per month; 3 = 6-10 hours per month; 4 = 11-15 hours per month; 5 = 16-20 hours per month; 6 = 21-40 hours per month; 7 = 41-80 hours per month; 8 = more than 80 hours per month.

Table 39 is another way to look at the differences and meanings of the four participation level clusters. This analysis is based on the participation level factors. Again, as to be expected given the findings reported in Table 38, the clusters do differ significantly on all three participation level factors. The Duncan’s multiple range test examined all possible combinations of two clusters within each factor. The Rookies differed from the other clusters on all nine of the possible comparisons; the Active Veterans differed on eight, and the All-Stars and Fading Veterans differed significantly on seven of the possible nine comparisons. Thus, we concluded that the participation level clusters we developed do in fact differ.

**Table 39. Mean ratings and tests for differences on factors that define SOS participation level clusters.<sup>1,2</sup>**

Participation Factors	Participation Level				F Ratio
	Rookies (n = 94)	Fading Veterans (n = 108)	Active Veterans (n = 43)	All-Stars (n = 60)	
Length of involvement in Save Our Streams (years)	1.27 <sup>a</sup> (low)	2.09 <sup>b</sup> (medium)	3.60 <sup>c</sup> (high)	2.03 <sup>b</sup> (medium)	274.64
SOS intensity <sup>3</sup>	1.95 <sup>b</sup> (low/medium)	1.37 <sup>a</sup> (low)	2.76 <sup>c</sup> (medium)	4.06 <sup>d</sup> (high)	147.09
General volunteer experience <sup>3</sup>	1.21 <sup>a</sup> (low)	1.68 <sup>b</sup> (medium)	1.59 <sup>b</sup> (medium)	2.24 <sup>c</sup> (high)	16.54

<sup>1</sup> ANOVA F-ratio significant at  $p < 0.001$  for all factors of the participation level clusters.

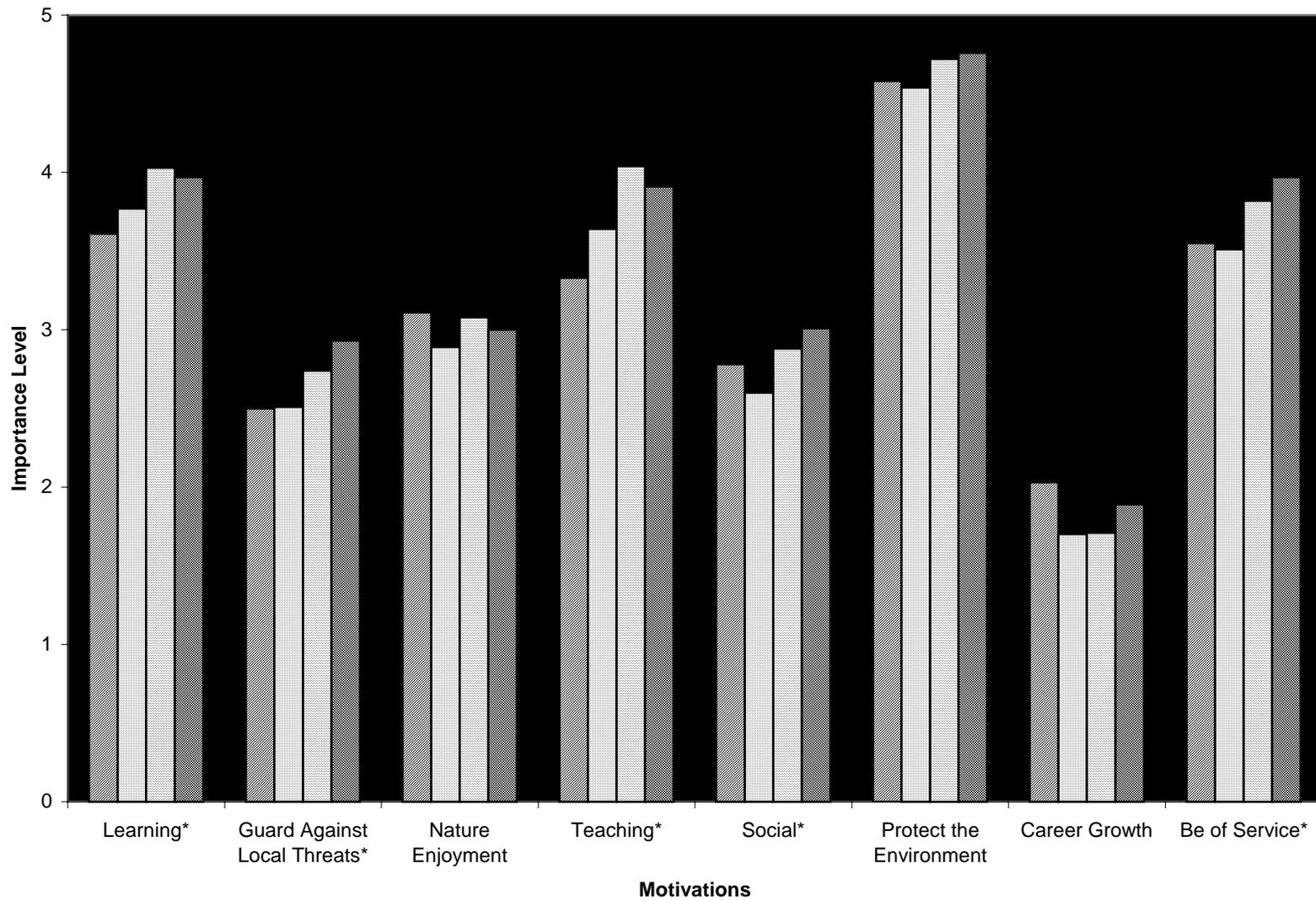
<sup>2</sup> Means with the same superscript are not significantly different, Duncan’s multiple range test,  $p \leq 0.05$  level.

<sup>3</sup> The numbers in the SOS intensity and general volunteer experience cells are uninterpretable as absolute values. This is because the numbers result from a combination of two variables, each of which represents a different unit of measurement. See Table 38. They do have value here in a relative context. Each value does have meaning relative to the values in other cells of a given factor.

#### **Level of Participation and Reasons for Volunteering (Study Objective #4)**

We used a one-way analysis of variance with Duncan’s multiple range test to see if motivations for involvement with SOS differed across clusters of volunteers classified by their participation level (Figure 1). At least two of the clusters differed in importance/ratings on five of the study’s eight motivation factors. These five included learning, to guard against local threats, teaching, being social, and to be of service. Within any given motivation factor, however, the differences among the clusters were typically few. For example, Rookies were lower on learning than all other clusters, but they only differed from the Active Veterans and the All-Stars on the teaching motive. The All-Stars and the Active Veterans were typically alike in their high scores on to guard against local threats, being social, and to be of service, but only the All-Stars were higher on to be of service and to guard against local threats than both the Rookies and the Fading Veterans. The All-Stars were alone in having higher scores on being social than did the Fading Veterans (Table 40).

Figure 1. Volunteers' motivations across different participation level clusters.



Mean importance level when 1 = not at all important and 5 = very important.

\*Significantly different at  $p \leq 0.05$ .

**Table 40. A comparison of volunteers' motivations across different participation level clusters.**<sup>1,2</sup>

Motivations	Participation Level				F-value
	Rookies n ≅ 94	Fading Veterans n ≅ 108	Active Veterans n ≅ 43	All-Stars n ≅ 60	
Learning	3.61 <sup>a</sup>	3.77 <sup>ab</sup>	4.03 <sup>b</sup>	3.97 <sup>b</sup>	2.85*
To guard against local threats	2.50 <sup>a</sup>	2.51 <sup>a</sup>	2.74 <sup>ab</sup>	2.93 <sup>b</sup>	3.50*
Nature enjoyment	3.11	2.89	3.08	3.00	.99
Teaching	3.33 <sup>a</sup>	3.64 <sup>ab</sup>	4.04 <sup>b</sup>	3.91 <sup>b</sup>	5.35*
Social	2.78 <sup>ab</sup>	2.60 <sup>a</sup>	2.88 <sup>ab</sup>	3.01 <sup>b</sup>	2.21*
To protect the environment	4.58	4.54	4.72	4.76	1.98
Career growth	2.03	1.70	1.71	1.89	1.62
To be of service	3.55 <sup>ab</sup>	3.51 <sup>a</sup>	3.82 <sup>bc</sup>	3.97 <sup>c</sup>	5.35*

\* Significant at  $p \leq 0.05$

<sup>1</sup> Mean values listed based on a 5-point Likert-type response format, where 1= not at all important and 5 = very important.

<sup>2</sup> Means with the same superscript are not significantly different; Duncan's multiple range test,  $p \leq 0.05$  level.

Performing a series of one-way analysis of variance tests, such as we have done for this study, is a commonly used data analysis procedure. However, it does have two significant weaknesses. First, it increases the chance of a Type I error, i.e., concluding a difference exists among groups when there is no difference. Second, and very importantly, it fails to take into consideration co-variation in the set of discriminating variables (in this case, the reasons for volunteering). To guard against these threats, we performed a multivariate test called a stepwise discriminant analysis to determine which motivations for volunteerism contributed most and in what order to any differences by level of participation.

The multivariate test for equality of means (Wilks' lambda), performed as part of the discriminant analysis routine, indicated that "to guard against local threats," "learning," "to be of service," and "teaching" differed at the  $p < 0.05$  level. Of these, and because of apparent multicollinearity among the motivational items/scales, only the "teaching" motive entered the model during the stepwise discriminant analysis. This indicates that volunteers at varying levels of participation differ most uniquely on their motivations to teach others about the environment, water quality, and stream monitoring.

**Level of Participation and Volunteers’ Evaluation of Current SOS Program Services (Study Objective #4)**

We approached the measure of the SOS volunteers’ evaluation of the current program in two ways. First, we asked the volunteers three questions about their own assessment of the validity of the SOS monitoring procedures, how well they believed they applied the required protocol when monitoring, and how well they thought other volunteers were following the recommended protocols (see Tables 29, 30, and 31).

We used three one-way ANOVAs with Duncan’s multiple range tests to see if the participation level clusters differed on these three subjective assessment variables. The only difference found was on the self-assessments on how well the volunteers themselves felt they were following the recommended procedures (Table 41). While all SOS volunteer clusters thought they were following the required protocol quite well, the All-Stars rated their own procedures as significantly higher than did the Rookies.

**Table 41. A comparison of the volunteers’ subjective assessment of how well they follow the recommended SOS stream monitoring practices across level of participation clusters.**<sup>1,2</sup>

Self-Assessment	Participation Level				F-value
	Rookies n = 68	Fading Veterans n = 86	Active Veterans n = 42	All-Stars n = 59	
How well volunteers rate themselves on following recommended SOS practices	5.63 <sup>a</sup>	5.76 <sup>ab</sup>	5.85 <sup>ab</sup>	6.13 <sup>b</sup>	2.93*

<sup>1</sup> Mean values based on a 1-7 Likert-type response format, where 1= not well at all and 7 = extremely well.

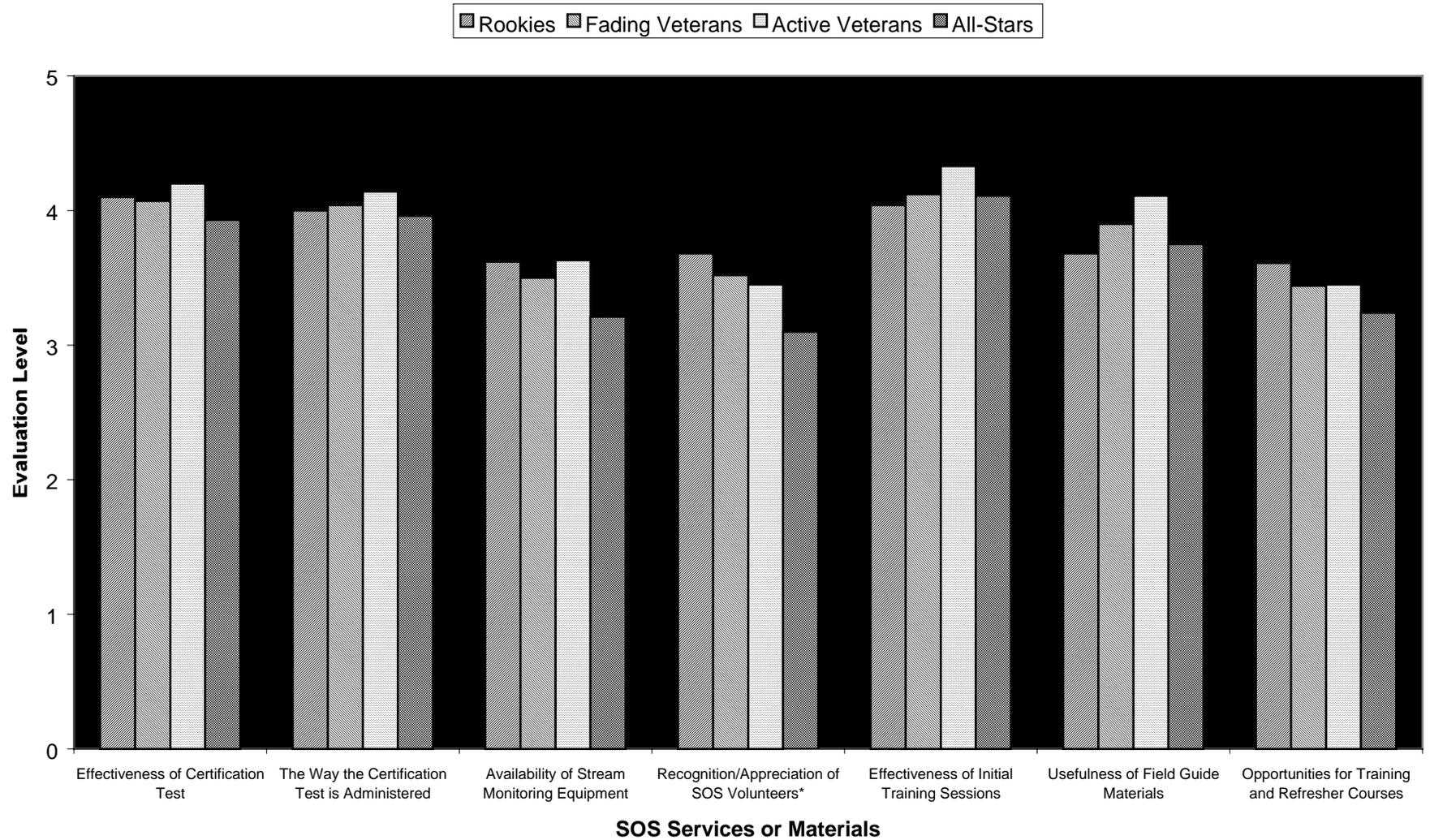
<sup>2</sup> Means with the same superscript are not significantly different; Duncan’s multiple range test,  $p \leq 0.05$  level.

\* ANOVA F-ratio significant at  $p \leq 0.05$  level.

The second effort to obtain the volunteers’ assessment of the current SOS program was to ask the volunteers to rate 14 services provided to them by the SOS (see Table 32). We again used a series of one-way ANOVA tests with Duncan’s multiple range tests to determine whether volunteers in the four participation level clusters varied in their program evaluations (Figure 2).

Table 42 indicates that out of the 14 tests run, the participation level groups differed on only two at the  $p \leq .05$  level. The Rookies rated the recognition/appreciation given to the volunteers by the SOS administrators as somewhat better than did the All-Stars. All the Rookies gave the SOS leaders better evaluations on communication with the volunteers than did the All-Stars and the Fading Veterans. However, the real differences seem small. We performed a stepwise discriminant analysis to examine these relationships in a multivariate context. When this was done, the only significant difference in mean scores by level of participation was on the recognition/appreciation of SOS volunteers. This variable did enter the stepwise model as a significant discriminating variable.

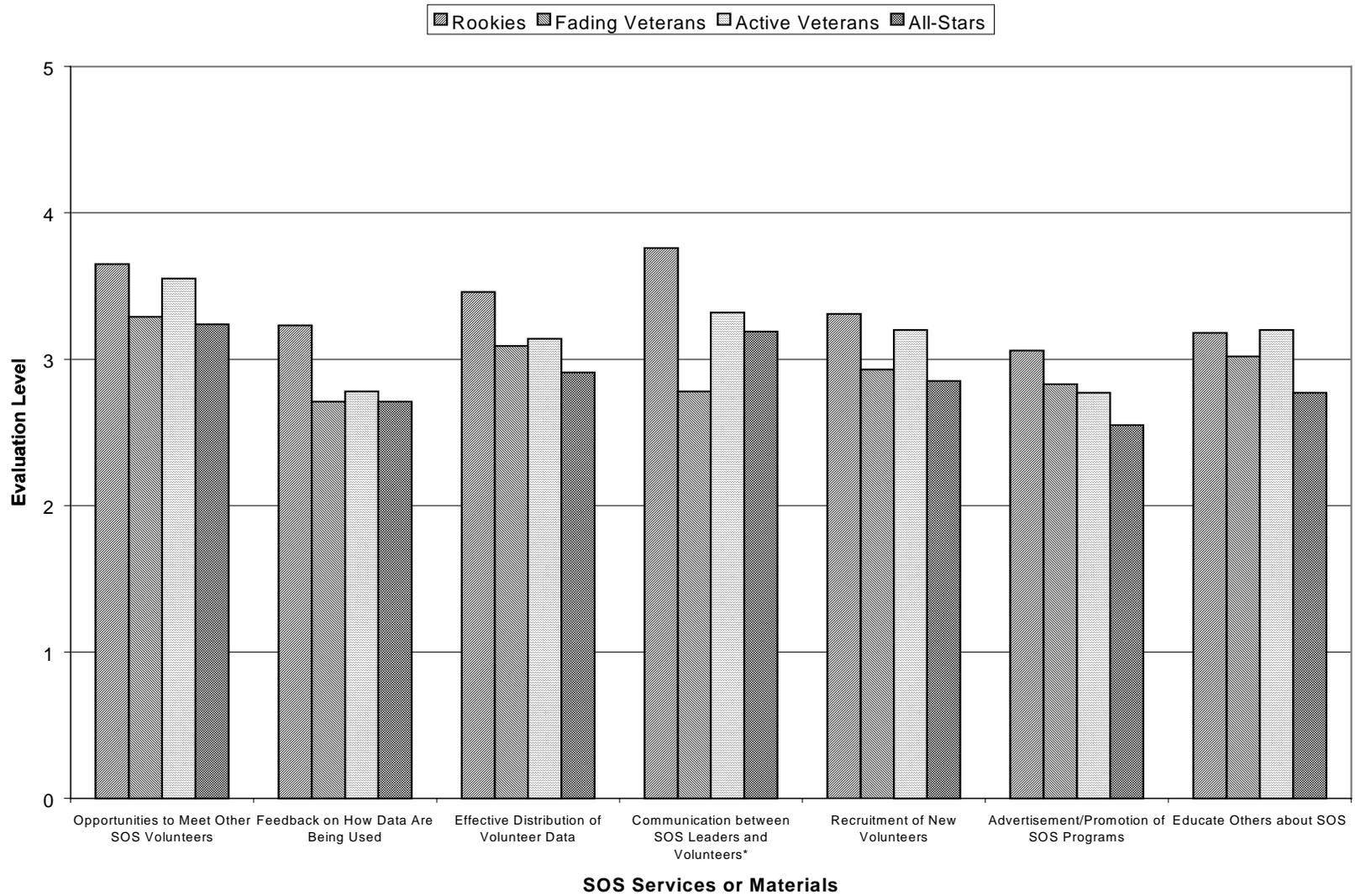
**Figure 2. Volunteers' evaluation of the current SOS services or materials across different participation levels.**



Mean evaluation level where 1 = poor and 5 = excellent.

\*Significantly different at  $p \leq 0.05$ .

**Figure 2 (continued). Volunteers' evaluation of the current SOS services or materials across different participation levels.**



Mean evaluation level where 1 = poor and 5 = excellent.

\*Significantly different at  $p \leq 0.05$ .

**Table 42. A comparison of the evaluation of the current services or materials provided by the SOS program across volunteers' participation level clusters.<sup>1</sup>**

Current Services or Materials	Participation Level Clusters				F-value
	Rookies	Fading Veterans	Active Veterans	All-Stars	
Effectiveness of the certification test to measure a volunteer's ability to monitor.	4.10	4.07	4.20	3.93	.91
The way the certification test is administered.	4.00	4.04	4.14	3.96	.38
Availability of stream monitoring equipment.	3.62	3.50	3.63	3.21	1.22
Recognition/appreciation of SOS volunteers.	3.68 <sup>b</sup>	3.52 <sup>ab</sup>	3.45 <sup>ab</sup>	3.10 <sup>a</sup>	2.36*
Effectiveness of your initial training sessions to prepare you to properly monitor a stream.	4.04	4.12	4.33	4.11	1.06
Usefulness of the current field guide materials to confidently identify stream organisms.	3.68	3.90	4.11	3.75	2.08
Opportunities for additional training and refresher courses for monitors.	3.61	3.44	3.45	3.24	.83
Opportunities to meet other SOS volunteers.	3.65	3.29	3.55	3.24	1.79
Feedback from SOS leaders about how volunteer data are being used to protect streams.	3.23	2.71	2.78	2.71	1.84
Effective distribution of collected volunteer data to those who can use it.	3.46	3.09	3.14	2.91	.81
Communication between SOS leaders and their volunteers.	3.76 <sup>b</sup>	2.78 <sup>a</sup>	3.32 <sup>ab</sup>	3.19 <sup>a</sup>	5.72*
Recruitment of new stream monitoring volunteers.	3.31	2.93	3.20	2.85	1.56
Advertising/promotion of SOS program.	3.06	2.83	2.77	2.55	1.63
Provision of materials to educate others about SOS.	3.18	3.02	3.20	2.77	1.41

<sup>1</sup> Mean values based on a 5-point Likert-type response format, where 1 = poor and 5 = excellent. Means with the same superscript are not significantly different; Duncan's multiple range test,  $p \leq 0.05$  level.

\* Significant at  $p \leq 0.05$ .

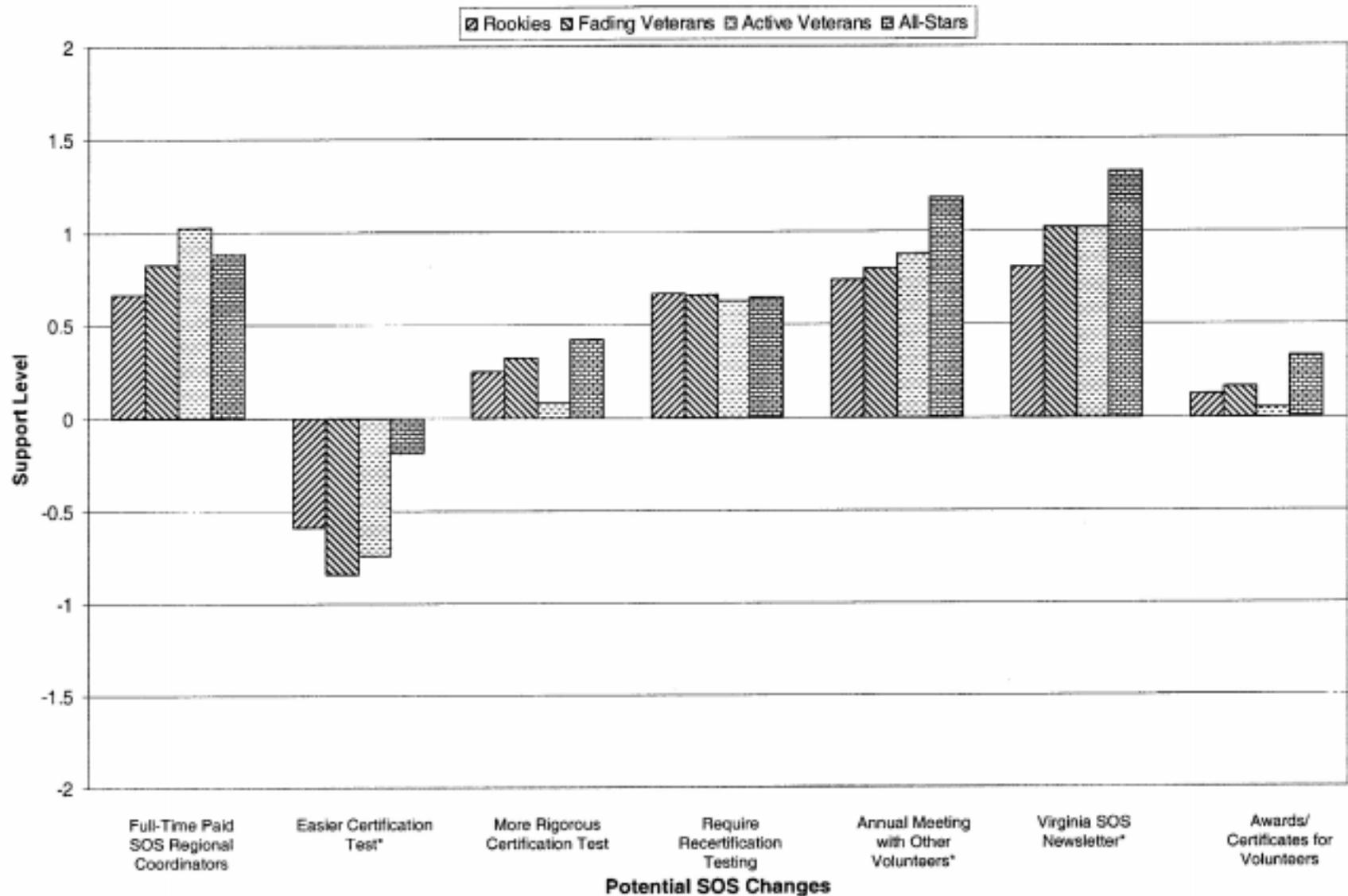
## **Level of Participation and Volunteers' Support for Possible Changes in the SOS Program (Study Objective #4)**

We had speculated that the volunteers with a greater level of participation in volunteerism might have very different suggestions for the SOS's program improvement. Given this, we again used a series of one-way ANOVAs with Duncan's multiple range tests to see if our four clusters of people classified by the level of participation differed on the 14 suggestions for the SOS's program improvement listed in Table 33 on page 42. The clusters differed from each other at the  $p \leq 0.05$  level on six of the 14 items (Figure 3).

As a group, all the volunteers supported all the suggestions for program improvement except two. All groups opposed making the certification test easier, but the All-Stars opposed the suggestion more than the other groups. As a group, the All-Stars, Active Veterans, and Fading Veterans tended to oppose a focus of monitoring efforts on the state's most impaired streams, rather than letting the volunteers pick their own streams. In contrast, the Rookies were about neutral or slightly in favor of this action. All groups gave strong support to publishing a Virginia SOS Newsletter, having an annual meeting with other volunteer monitoring groups in Virginia, and lobbying government agencies to use volunteer data in stream decision-making, but the All-Stars' support was even higher. Rookies, Fading Veterans, and All-Stars were similar in their mild support for social events like picnics or potlucks for volunteers, but the Active Veterans differed by being more neutral (Table 43). Thus, it appears that the level of participation is related to some preferences for new or changed SOS program initiatives. When there were differences in opinion, the All-Stars most often gave stronger support.

A stepwise discriminant analysis confirmed most of our conclusions. For example, the multivariate test for equality of means (Wilks' Lambda) indicated that the level of participation variable differed at the  $p \leq 0.05$  level on five of the potential changes to the SOS program. There was support for or opposition to an easier certification test, an annual meeting with other volunteer monitoring groups in Virginia, a Virginia SOS newsletter, social events like picnics or potlucks, and on focusing monitoring efforts on the state's most impaired streams, rather than letting volunteers pick their own streams. Of these variables, opinions on having an easier certification test, having a Virginia SOS newsletter, and focusing efforts on the state's most impaired streams differed significantly and uniquely, and in descending order of importance, by the volunteers' levels of participation.

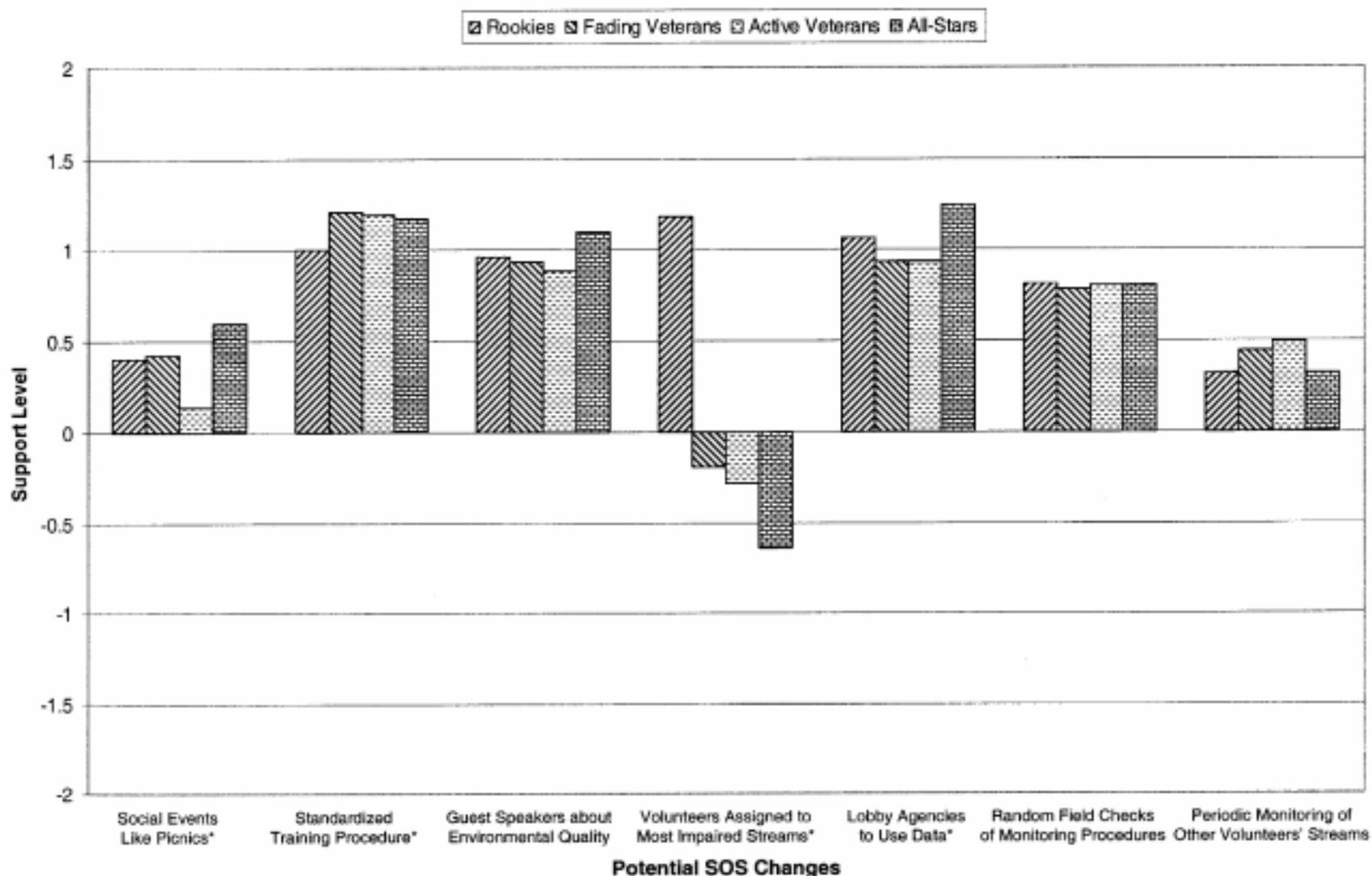
**Figure 3. Volunteers' support for potential SOS changes across different participation levels.**



Mean support levels where -2 = strongly oppose; 0 = neutral; and +2 = strongly support.

\*Significantly different at  $p \leq 0.05$ .

**Figure 3 (continued). Volunteers' support for potential SOS changes across different participation levels.**



Mean support levels where -2 = strongly oppose; 0 = neutral; and +2 = strongly support.

\*Significantly different at  $p \leq 0.05$ .

**Table 43. A comparison of support for potential changes to the SOS program across participation level clusters.<sup>1</sup>**

Changes to the SOS Program	Participation Level Clusters				F-value
	Rookies	Fading Veterans	Active Veterans	All-Stars	
Provide full-time paid SOS regional coordinators	0.67	0.83	1.03	0.89	1.78
An easier certification test	-0.59 <sup>b</sup>	-0.84 <sup>b</sup>	-0.74 <sup>b</sup>	-0.19 <sup>a</sup>	5.88*
A more rigorous certification test	0.25	0.32	0.08	0.42	1.94
Require re-certification testing to assure high quality stream data	0.67	0.66	0.63	0.65	.023
Annual meeting with other volunteer monitoring groups in Virginia	0.74 <sup>a</sup>	0.80 <sup>a</sup>	0.88 <sup>a</sup>	1.18 <sup>b</sup>	4.42*
A Virginia SOS newsletter	0.81 <sup>a</sup>	1.02 <sup>a</sup>	1.02 <sup>a</sup>	1.32 <sup>b</sup>	5.89*
Awards, certificates, or plaques for volunteers	0.12	0.16	0.05	0.33	1.06
Social events like picnics or potlucks for volunteers	0.40 <sup>b</sup>	0.42 <sup>b</sup>	0.14 <sup>a</sup>	0.53 <sup>b</sup>	2.42*
Standardized training procedures across Virginia	1.00	1.21	1.19	1.17	1.60
Special guest speakers about environmental quality	0.96	0.93	0.88	1.10	1.22
Focus monitoring efforts on the state's most impaired streams, rather than letting volunteers pick their own stream	0.18 <sup>c</sup>	-0.19 <sup>bc</sup>	-0.28 <sup>ab</sup>	-0.64 <sup>a</sup>	6.31*
Lobbying government agencies to use volunteer data in stream decision making	1.06 <sup>ab</sup>	0.93 <sup>a</sup>	0.93 <sup>a</sup>	1.24 <sup>b</sup>	2.42*
Random field spot-checks of SOS volunteers	0.81	0.78	0.80	0.80	.03
To minimize boredom, have periodic monitoring of other volunteers' streams	0.32	0.44	0.49	0.32	.69

<sup>1</sup> Mean values based on a 5-point Likert-type response format, where -2 = strongly oppose, 0 = neutral, and +2 = strongly support. Means with the same superscript are not significantly different; Duncan's multiple range test,  $p \leq 0.05$  level.

\* Significant at  $p \leq 0.05$ .

As a further look at the volunteer’s preferences for program changes, we listed five ways that the SOS could recognize volunteer efforts, and asked respondents what method they preferred or didn’t prefer (see Table 34 on page 42). We used cross-tabulation with a chi-square test for significant difference to see if the four participation level clusters differed on each of the five types of recognition. The four groups did not differ in preferences for recognition certificates, a verbal or written "thank you" from the SOS leaders, awards banquets, or that there is no need to recognize their volunteer efforts. They did, however, differ at the  $p \leq 0.05$  level in the number who said "the kind of recognition they receive didn’t matter, but it was important to be recognized" (Table 44). About 72% or more of the volunteers in all groups did not check the need for this kind of recognition, but about 28% of the All-Stars and 11% of the Rookies felt this way.

**Table 44. A comparison of the support for the "importance of some recognition, but it doesn’t matter how" statement by the SOS volunteers in different participation level clusters.<sup>1</sup>**

Support for Statement		Participation Level Cluster			
		Rookies	Fading Veterans	Active Veterans	All-Stars
No	N	82	93	37	43
	Row %	32	37	14	17
	Column %	89	86	86	72
Yes	N	10	15	6	17
	Row %	21	31	13	35
	Column%	11	14	14	28

<sup>1</sup> Pearson’s chi square = 9.15, significant at  $p = 0.027$ .

#### **Level of Participation and Willingness to Participate in SOS Program Activities (Study Objective #4)**

Our final analysis of any effect of the level of participation in volunteerism on opinions about the SOS’s program activities was to ask the volunteers about their willingness to participate in the SOS’s activities in addition to stream monitoring. We listed seven such activities: stream clean-up, tree planting, storm drain painting to warn against pollution, streambank restoration, lobbying politicians/officials to protect streams, SOS office support, and fund-raising ( Table 35). While few volunteers in any level of participation cluster indicated willingness to help in lobbying efforts and in fund-raising, the groups did differ at a statistically significant level on these two variables. Table 45 suggests that about 35% of the Active Veterans and All-Stars were willing to help in lobbying; only about 20% of the Rookies and Fading Veterans were willing to do so. The SOS volunteers were generally unwilling to help out in fund-raising, but 18% of the All-Stars said they would do so. This is much higher than the other three participation level groups (Table 46).

**Table 45. A comparison of the willingness to participate in lobbying politicians/officials to protect streams among SOS volunteers in different participation level clusters.<sup>1</sup>**

Willingness to Lobby		Participation Level Cluster			
		Rookies	Fading Veterans	Active Veterans	All-Stars
No	N	73	90	34	39
	Row %	31	38	14	17
	Column %	79	84	64	65
Yes	N	19	17	19	21
	Row %	29	26	13	32
	Column%	21	16	36	35

<sup>1</sup> Pearson's chi square = 8.40, significant at p = 0.027.

**Table 46. A comparison of the willingness to participate in fund-raising activities among SOS volunteers in different participation level clusters.<sup>1</sup>**

Willingness to Fund-Raise		Participation Level Cluster			
		Rookies	Fading Veterans	Active Veterans	All-Stars
No	N	85	102	41	49
	Row %	31	37	15	17
	Column %	92	94	95	82
Yes	N	7	6	2	11
	Row %	27	23	8	42
	Column%	8	6	5	18

<sup>1</sup> Pearson's chi square = 9.15, significant at p = 0.027.

### **Volunteers' Open-Ended Comments on How to Improve the SOS Program**

We left space on the final page of the questionnaire for the respondents to give their own suggestions and comments on the SOS program and its improvement. Many volunteers did so, and we included those comments verbatim in Appendix C of this report. We believe that most of the open-ended suggestions for program improvement have already been covered in this report. However, two deserve further mention. Several of the respondents noted the need for better identification cards and other illustrative materials for learning macroinvertebrates during training. Second, some individuals called for chemical testing of water quality along with the biological monitoring. This may have three advantages. It might give greater reliability to the water quality data gathered, chemical data may be more appropriate for some streams, and collecting both biological and chemical data may attract and retain a greater diversity of volunteers.

## **SUMMARY OF FINDINGS**

### **Focus Groups**

Thirty-nine SOS volunteers representing a range of involvement levels attended six focus group sessions. They provided the following important insights:

- Important motivations for SOS stream monitoring:
  - nostalgia (reliving childhood/youthful experiences in nature)
  - protect the environment
  - guard against local threats
  - be of service
  - teach
  - learn
  - be sociable
  - enjoy nature
  - career growth
  
- How to encourage active participation in the SOS program:
  - increase the use of citizen water quality data by appropriate environmental regulatory and protection agencies
  - provide increased feedback from SOS leaders to volunteers on how the citizens' data are being used
  - provide effective leadership by regional SOS coordinators
  
- Reasons why volunteers stop monitoring:
  - not enough time
  - lack of follow-up by SOS program leaders

### **Survey of SOS Volunteers**

All 526 SOS volunteers on a Virginia SOS membership list were sent a 12-page questionnaire. Fifty individuals on the list could not be reached by mail or returned the survey blank because they were not SOS members. About 67% of the remaining volunteers, or 318 people, returned the completed survey.

Survey data suggest the following:

- Socio-demographic characteristics of the SOS volunteers:
  - Age -- Slightly over half of all the SOS volunteers were in their 30s or 40s. About 20% were in their 20s and in their 50s, respectively.
  - Gender -- Volunteers were about evenly split between males and females.
  - Race -- Virtually all volunteers were white.
  - Education -- 77% of the volunteers had a college degree; 38% had graduate degrees.
  - Occupation -- Almost 50% of the SOS volunteers were professional workers, and 14% were students.
  - Household income -- Income level was quite evenly split among all the income categories. Between 10% and 15% of the respondents fell into each of the 30, 40, 50, 60-75, 75-100, and over 100,000-dollar annual income ranges.
  - Marital status -- About two-thirds of all the volunteers were married. Almost half of the respondents had no children, and 60% had no children living with them.
  - Type of present community -- Almost half of all SOS volunteers lived on a farm or in a rural, non-farm community. The remaining volunteers were about evenly split among small towns, small cities, and large metropolitan areas.
  - Community roots -- About half of all the volunteers had lived in their communities for 10 or more years; almost two-thirds intended to live in their current communities for 10 or more years.
  
- How volunteers got involved with SOS:
  - First heard about SOS -- About 25% heard about the SOS through word of mouth; another 40% learned about the program from the IWLA or from other environmental organizations.
  - Influence agents on the decision to join the SOS -- About one-third of the volunteers sought out the SOS activity on their own; about one-fourth cited a friend as the most influential person.
  
- Level of volunteer training in SOS monitoring procedures:
  - Certification -- About 40% of the SOS volunteers are certified to conduct SOS monitoring; almost one-fourth have completed the training but are not certified.
  - Training level before taking the certification test -- The most common amounts of training in the SOS monitoring procedures before taking the SOS certification test were 4 to 6 hours and 7 to 10 hours.
  
- Level of participation in SOS and other volunteerism:
  - Subjective assessment of SOS involvement -- About one-fourth of all the SOS volunteers report just getting involved, occasionally monitoring, regularly monitoring, and no longer monitoring, respectively.
  - Objective measures of monitoring intensity -- About one-third of all the SOS volunteers monitor a stream less than once a year; about 20% do so the recommended four times a year.

- Time spent monitoring -- Over half of all the SOS monitors spend, on average, less than one hour a month monitoring a stream. Another one-third average between 1 and 5 hours a month.
  - Length of involvement with the SOS -- The most common length of time of involvement with the SOS program among the current volunteers is one to three years (55% of all the volunteers). About one-fourth of all the volunteers have been associated with the SOS for less than a year. Among those SOS volunteers who were no longer involved, about 55% said they were active for one to three years; another 30% were involved for less than a year.
  - Involvement with other water conservation organizations -- About 30% of all the SOS volunteers were involved with other volunteer organizations that concerned themselves with water quality.
  - Involvement with other volunteerism -- About 80% of the SOS volunteers were contributing time to other volunteer organizations. About one-third contributed 1 to 5 hours per month; another one-third volunteered 6 to 15 hours per month.
- Motivations of the SOS volunteers for stream monitoring:
  - Rank order of highest motivation, i.e., motivations that averaged at least somewhat important --
    - protect environment
    - learning
    - teaching
    - be of service
    - nature enjoyment
  - Motives rated as only slightly important by the SOS volunteer group as a whole were:
    - social
    - to guard against local threats
    - for career growth
- Volunteers' assessment of the validity and reliability of the SOS water quality monitoring procedures and their implementation:
  - Validity of assessment -- Almost 70% of the SOS volunteers felt that the SOS monitoring procedures do provide a quite or very accurate measure of stream health.
  - Validity and reliability of the citizen data collection procedures -- About 14% of the SOS volunteers were not sure on how well they carried out the SOS-mandated practices, and 75% felt they did quite or very well. Volunteers are less sure and less confident about how well others were carrying out the mandated the SOS's monitoring procedures.
- Volunteers' evaluation of current the SOS program services:
  - Programs rated good to excellent -- Rated highest were:
    - effectiveness of the initial training sessions to prepare volunteers to properly monitor a stream
    - effectiveness of the certification test to measure a volunteer's ability to monitor
    - the way the certification test is administered

- Program services rated below average -- Rated lowest were:
    - advertising/promotion of the SOS program
    - feedback from the SOS leaders about how volunteer data are being used to protect streams
  
- Volunteers' preferences for the SOS program changes:
  - Services most preferred:
    - standardized training procedures across Virginia
    - lobbying government agencies to use volunteer data in stream decision-making
    - a Virginia SOS newsletter
  - Second tier of preferred services:
    - special guest speakers about water and environmental quality
    - annual meeting with other volunteer water monitoring groups in Virginia
    - provide full-time paid SOS regional coordinators
    - random field spot-checks of the SOS volunteers to assure quality data
  - Opposed changes:
    - an easier certification test
    - focus monitoring efforts on the state's most impaired stream sections, rather than letting volunteers pick their own streams
  
- Volunteers' need for recognition:
  - About 64% of the volunteers expressed no need for recognition.
  
- Volunteers' willingness to perform other SOS program activities:
  - Almost 80% were willing to help with stream clean up, and almost two-thirds said they would help plant trees.
  - Few (about 5%) were willing to help fund-raise or help with SOS office support.
  
- Volunteers' reasons for ceasing to participate in the SOS program:
  - Two most important reasons (rated somewhat important):
    - too many other obligations
    - not enough time
  - Other reasons were all rated less than slightly important.

## Importance of Level of Participation

- SOS volunteers can be classified on the basis of their level of participation (i.e., intensity of SOS participation, length of involvement in SOS, and general amount of volunteerism) into four distinct groups. These groups can be labeled:
  - Rookies
  - Fading Veterans
  - Active Veterans
  - All-Stars
  
- The level of participation index variable seemed to have some relationship to motivation, program preferences, and program evaluations, but the effects seemed small.
  - The participation level groups differed in a statistical sense in five of eight motives for volunteering. While all differences were small, Active Veterans and All-Stars were much more motivated by teaching.
  - All-Stars rated their own performance on implementing the SOS monitoring protocol as higher than did other groups.
  - All-Stars opposed "focusing efforts on the state's impaired streams rather than allowing the volunteers to pick their own streams" even more than did the other groups.
  - A small minority of All-Stars and Active Veterans were willing to help SOS leaders in lobbying, but this number was much higher than for other groups.
  - An even smaller minority of All-Stars were willing to help SOS leaders with fund-raising, but this number was much higher than for other groups.

## **RECOMMENDATIONS (Study Objective #5)**

### **Recruitment**

Based on the suggestions of the focus group discussants and the survey results from our sample of the SOS volunteers, we make the following recommendations regarding SOS recruitment:

- Advertise/promote the SOS.

SOS volunteers currently believe the SOS leadership do this more poorly than any other aspect of the SOS program. Our data suggest that effective promotion might be accomplished by:

- Advertising the SOS program among the membership of other water quality and environmental organizations.
  - Encouraging, facilitating, and rewarding current SOS volunteers to "spread the word" to friends and acquaintances on the personal, social, and environmental benefits of the SOS.
- Emphasize to prospective SOS recruits that stream monitoring has many and varied personal and social benefits. Through the SOS, volunteers can help protect the environment, but they can also teach and learn, be with friends, and enjoy nature by actually getting into nature.
  - Focus advertisement efforts on individuals involved with education. Teachers and students make up a large part of the SOS volunteers now, and we think this is because the SOS monitoring procedures are ideal for teaching people about nature and for people to learn about nature by direct contact. Many of our respondents found this field learning to be highly rewarding. In addition, committed teachers could provide the SOS with a steady stream of recruits from student bodies. Also, the SOS might focus promotions on student environmental and service clubs.
  - Focus recruitment efforts on the neighborhoods and communities near threatened streams. While not all current SOS members volunteered because of a threat to a local stream, our focus group discussions indicated that such a threat can be highly motivating. Also, All-Stars and Active Veterans (the most ideal volunteers) rated this motive higher than did other volunteer clusters.

### **Retention**

Survey respondents and focus group discussants provided us much insight from which to make recommendations on retention of the SOS volunteers.

- Ensure that appropriate agencies (e.g., the Virginia DEQ, the Virginia DCR, and county planning boards) use the SOS volunteers' water quality data in decision-making.

This concern was one of the highest of all expressed by both focus group discussants and survey respondents. The lack of use of the water quality data and lack of knowledge on how the data were used were seen as troubling, and lobbying for use of the data was seen as one of the biggest SOS challenges. When data are not used, volunteers begin to lose faith in the program and in their own work.

- Make efforts to increase the validity and reliability of the SOS water quality monitoring data.
  - Standardize the SOS training procedures across all regions of the state. SOS volunteers are currently quite satisfied with their training, but the most favored potential change in the SOS program was to standardize training procedures.
  - Get more people certified to conduct the SOS monitoring. Currently only about 40% of the SOS membership is certified; 22% have completed the training but have not yet taken the certification exam. Program leaders should increase the frequency of the training and certification testing sessions. Volunteers are happy with the certification testing and procedures; the SOS program leaders need to offer the evaluation more frequently and more conveniently.
  - Provide more follow-up training sessions for the volunteers after certification.
  - Encourage the SOS volunteers to monitor more often per year and monitor over longer periods. How SOS leaders are to accomplish this recommendation is difficult because most volunteers who stop monitoring cite a lack of time and other obligations. But only about 22% of all SOS volunteers currently monitor a stream four times a year, and most monitor for one to three years. More on how to accomplish this recommendation will be provided below.
  - Have random field spot-checks of SOS volunteers to assure data quality control. The volunteers did not see this action as a threat. Indeed, such a change in the SOS program services received quite high support.
- Develop effective and efficient means to distribute volunteer data to those who can use it. Currently, a full 60% of SOS volunteers do not know how or how well their data are forwarded to decision-makers. Those who felt capable of judging only gave the SOS leadership an average rating on this issue.
  - Lobby governmental agencies to use volunteer data in decision making about stream protection. This was the volunteers' second most favored change to SOS program management. Few volunteers themselves wanted to help in the lobbying effort.
- Inform SOS volunteers how their data are being used by water resource protection and regulatory agencies. Our focus group discussants noted this recommendation as one of their highest needs. Yet, the survey respondents rated the provision of this service as the second lowest of all the SOS activities evaluated. Also, improving communication about program successes was among the most preferred changes to the SOS administration.

- Provide more communication to volunteer membership about SOS program activities, SOS volunteers, and SOS successes.

Some participants in the focus group discussions cited their efforts to recruit SOS volunteers, only to feel abandoned by the SOS leaders when they tried to organize training and follow-through. Survey respondents rated communication between the SOS leaders and their volunteers as only about average. The respondents rated a Virginia SOS newsletter the third most preferred suggested change among the 14 listed, and we are pleased that the Virginia SOS has now initiated such a newsletter, *The Riffle*.

- Encourage and facilitate volunteers to perform other stream protection activities besides water quality monitoring.

Volunteers need to see tangible progress from their efforts, both for the cause and for the organization. By definition, monitoring is an activity that does not lead to direct and immediate results. Indeed, one of our focus group discussants noted that the monitoring activities might even harm the stream in the short term. Volunteers need to see some immediate step-by-step progress toward program goals. A large majority of program volunteers expressed a willingness to participate in stream clean-ups and tree planting. These activities should be incorporated into the SOS's activities.

- Provide volunteers with opportunities to teach and to learn.

After protecting the environment, these motives were the highest of all studied. They were especially high among the Active Veterans and the All-Stars, the very volunteers that the SOS leadership should want to retain. The SOS leadership should periodically provide guest speakers on water and environmental quality, on stream ecosystems, and on other methods besides the SOS biological water quality monitoring system to assess stream quality. Over time, the veteran monitors could incorporate these other monitoring procedures into their stream assessments. This would help maintain the interests of the veterans, provide additional measures of stream quality, and increase confidence in monitoring data. Finally, the SOS should encourage its All-Stars and Active Veterans to teach others in the program.

- Permit volunteers to monitor streams of their choice.

Volunteers opposed focusing their efforts on the state's most impaired streams. Instead, they wanted to choose their own. This likely reflects the volunteers' desire to use their free time efficiently. Also, volunteers seem to care most about the streams in their own backyards.

- Permit/facilitate the efficient use of the volunteers' time.

Our data show that the lack of time is a primary reason why volunteers cease to monitor. At the same time, the majority of volunteers do not monitor their streams the recommended four times a year. If the volunteer data are to be considered valid and reliable measurements of stream quality, then more measurements seem necessary. The only way this will happen is if the SOS program allows some flexibility in the time of the week or month of monitoring, and if regional or local coordinators facilitate the actual monitoring sessions. This might be done by making phone call reminders, providing easy access to monitoring equipment, facilitating car pools, and allowing the volunteers to choose a stream close to home.

- Provide recognition to volunteers.

Our survey suggested that more than 60% of the SOS volunteers did not seek any special recognition. However, a significant minority did, and some members of our focus groups said this was important. Also, other researchers on volunteer participation have found that volunteers sometime feel it is socially undesirable to express a need for recognition for an activity that is often seen as altruistic. However, more in-depth studies of volunteer opinions have shown that recognition can increase volunteer satisfaction (Smith 1981, and Still and Gerhold 1997). Also, our own study showed that while volunteers as a whole rated recognition/appreciation of volunteers by the SOS leadership as between average and good, assessments by the All-Stars were significantly less positive.

- Hire full-time paid regional SOS coordinators throughout Virginia.

Our focus group discussants clearly pointed out to us the benefits of active regional coordinators, and the problems that ensue without such leaders. The survey data suggest that the SOS membership supports paid coordinators. Paid coordinators can provide continuity across time in the program. They can work with other SOS regional coordinators and a state director to promote and advertise the SOS program, increase the level of training and certification among the membership, increase the validity and reliability of the citizens' SOS data, efficiently submit the SOS data to the appropriate environmental decision-makers, lobby to gain acceptance and use of the SOS data, communicate with the SOS members on matters of water quality and the SOS program, coordinate stream monitoring efforts, organize speakers, meetings, and social events, and provide appropriate recognition of highly committed volunteers.

In conclusion, while we feel that all of our recommendations are important, we emphasize two above all the others. First, the SOS leadership must continue to work to gain acceptance of the credibility of the citizen water quality data. We believe this involves at least two steps. The SOS leaders must help to assure high-quality water monitoring data. Then, the SOS leaders must convince skeptical scientists that citizen data can be good enough. Second, we firmly believe that the SOS coordinators need to be hired in all regions of the Commonwealth. Today, we see the success of active coordinators in some regions. We need such leaders in all regions of the Commonwealth. For these leaders to provide continuity and effective program management, we believe they should be paid.

## LITERATURE CITED

- Caldwell, L. L., and Andereck, K. L. 1994. Motives for initiating and continuing membership in a recreation-related voluntary associations. *Leisure Sciences* 16:33-44.
- Dillman, D. A. 1978. *Mail and Telephone Surveys: The Total Design Method*. John Wiley and Sons, New York.
- Hammitt, W. E., Knauf, L. R., and Noe, F. P. 1989. A comparison of user vs. researcher determined level of past experience on recreation preference. *Journal of Leisure Research* 21(2):202-213.
- Hammitt, W. E., and McDonald, C. D. 1983. Past on-site experience and its relationship to managing river recreation resources. *Forest Science* 29(2):262-266.
- Heidrich, K. W. 1990. Volunteers' life-styles: Market segmentation based on volunteers' role choices. *Nonprofit and Voluntary Sector Quarterly* 19(1):21-31.
- Henderson, K. A. 1984. Volunteerism as leisure. *Journal of Voluntary Action Research* 13(1):55-63.
- Ilsley, P. 1990. *Enhancing the Volunteer Experience: New Insights on Strengthening Volunteer Participation, Learning, and Commitment*. Jossey-Bass Publishers, San Francisco.
- Kingsley, N. P., Brock, S. M., and DeBald, P. S. 1988. Focus group interviewing applied to retired West Virginia nonindustrial private forest landowners. *Northern Journal of Applied Forestry* 88(5):198-200.
- Manzo, L. C., and Weinstein, N. D. 1987. Behavioral commitment to environmental protection: A study of active and nonactive members of the Sierra Club. *Environment and Behavior* 19(6):673-694.
- Martinez, T. 1998. *Motivations and Characteristics of Active and Nonactive Members belonging to Natural Resource Nongovernmental Organizations*. Master's Thesis. Department of Fisheries and Wildlife Sciences, Virginia Tech, Blacksburg, VA.
- Parker, S. 1992. Volunteering as serious leisure. *Journal of Applied Recreation Research* 17(1):1-11.
- Pearce, J. 1983. Participation in voluntary associations: How membership in a formal organization changes the rewards of participation. In: D. Smith and J. Van Til (eds). *International Perspectives on Voluntary Action Research*. Univ. Press of America, Washington, DC. pp. 148-156.

- Prestby, J. E., Wandersman, A., Florin, P., Rich, R., and Chavis, D. 1990. Benefits, costs, incentive management and participation in voluntary organizations: A means to understanding and promoting empowerment. *American Journal of Community Psychology* 18(1):117-149.
- Schreyer, R., Lime, D. W., and Williams, D. R. 1984. Characterizing the influence of past experience on recreation behavior. *Journal of Leisure Research* 16(1):34-50.
- Smith, C., and Freedman, A. 1972. *Voluntary Associations*. Harvard Univ. Press, Cambridge, MA.
- Still, D. T., and Gerhold, H. D. 1997. Motivations and task preferences of urban forestry volunteers. *Journal of Arboriculture* 23(3):116-130.
- United States Environmental Protection Agency. 2000. *The Quality of Our Nation's Waters: A Summary of the National Water Quality Inventory: 1998 Report to Congress*. Office of Water. Washington, DC. EPA 894-5-00-001.
- Virginia Department of Environmental Quality. 1999a. "1999 letter of agreement news release: Agreement signed to support citizen water quality monitoring." <http://www.deq.state.va.us/cmonitor/pressrelease.html> (4 June 2000).
- Virginia Department of Environmental Quality. 1999b. "Letter of agreement between the Virginia Department of Environmental Quality, The Virginia Department of Conservation and Recreation, and the Virginia Division Izaak Walton League of America, Virginia Save Our Streams Program." <http://www.deq.state.va.us/cmonitor/loa.html> (16 June 2000).
- Virginia Save Our Streams Staff. 2000. "The Izaak Walton League of America: The Virginia Save Our Streams Homepage." 13 July 2000. <http://www.sosva.com> (20 July 2000).
- Wells, W. D. 1974. Group interviewing, Part 2. p.133-46 In: *Handbook of Marketing Research*. McGraw-Hill Book Co., New York.
- Westphal, L. M. 1993. Why trees? Urban forestry volunteers' values and motivations. In: P. H. Gobster (ed.). *Managing Urban and High-Use Recreation Settings*. USDA Forest Service General Technical Report NC-163, St. Paul, MN. pp.19-23.

# APPENDIX A:

## Virginia SOS Stream Quality Survey

Sponsored by the Virginia Division of the Izaak Walton League

Name: \_\_\_\_\_ Date: \_\_\_\_\_

The purpose of this form is to aid you in gathering and recording important data about the health of your stream. By keeping accurate and consistent records of your observations and data from your macroinvertebrate count, you can document changes in water quality. Refer to the SOS insect card and the standard operating procedures to learn how to trap and identify stream macroinvertebrates and how to complete this form. It is assumed that you are using a rocky bottom sampling strategy, you select three riffle-testing sites where water depth is between 3 and 12 inches, of moderate speed, and the bed consists primarily of cobble-sized stones. Sampling size should be 3 X 3 feet.

Stream: \_\_\_\_\_ Station: \_\_\_\_\_ # of participants: \_\_\_\_\_  
 County: \_\_\_\_\_ State: \_\_\_\_ Group: \_\_\_\_\_  
 Location: \_\_\_\_\_  
 Latitude: \_\_\_\_\_ Longitude: \_\_\_\_\_ Flow: High \_\_\_\_ Normal \_\_\_\_ Low \_\_\_\_  
 Weather conditions (last 72 hours): \_\_\_\_\_  
 Average stream width: \_\_\_\_\_ ft. Average stream depth: \_\_\_\_\_ inches or feet  
 Water temperature: \_\_\_\_\_ F or C. Water depth in riffle: \_\_\_\_\_ inches or feet

**Macroinvertebrate count:**

Use the stream monitoring instructions to conduct a macroinvertebrate count. The three columns, numbered 1, 2, and 3 are for the three samples. The three categories of macroinvertebrate orders are divided based on the organism's sensitivity to pollution. Use letter codes (A= 1-9, B= 10-99, C = 100 or more) to record the number of organisms found in each sampling site. Add up the number of letters in each column and multiply by the indicated index value. Use the data from the same sample in all three categories that has highest diversity and score to calculate the index value.

<p>Sensitive 1 2 3</p> <p>____ caddis fly larvae                      ____ hellgrammite                      ____ mayfly nymphs                      ____ gilled snails                      ____ riffle beetle adult                      ____ stonefly nymphs                      ____ water penny larvae</p>	<p>Somewhat Sensitive 1 2 3</p> <p>____ beetle larvae                      ____ clams                      ____ crane fly larvae                      ____ crayfish                      ____ dragonfly nymphs                      ____ damselfly nymphs                      ____ scuds                      ____ sow bugs                      ____ fish fly larvae                      ____ alderfly larvae                      ____ atherix</p>	<p>Tolerant 1 2 3</p> <p>____ aquatic worms                      ____ black fly larvae                      ____ leeches                      ____ midge larvae                      ____ pouch (and other                      snails</p>
<p>highest count x 3 = index value</p>	<p>highest count x 2 = index value</p>	<p>highest count x 1 = index value</p>

Now add together the three index values from each column for your total and place it in one of the following water quality rating categories:

\_\_\_\_\_ Excellent (>22) \_\_\_\_\_ Good (17-22) \_\_\_\_\_ Fair (11-16) \_\_\_\_\_ Poor (<11)

<b>Fish water quality indicators</b> scattered individuals scattered schools trout (pollution sensitive) bass (somewhat sensitive) catfish (pollution tolerant) carp (pollution tolerant)	<b>Barriers to fish movement</b> beaver dams man-made dams waterfalls (>1ft.) other none	<b>Surface water appearance</b> clear clear, tea colored colored sheen (oily) foamy milky muddy black gray other
<b>Stream bed deposit</b> (bottom) gray orange/red yellow black brown silt sand other _____	<b>Odor:</b> none musky oil sewage other _____	<b>Stability of steam bed:</b> Bed sinks beneath your feet in: no spots a few spots many spots
<b>Algae color:</b> light green dark green brown coated matted on stream bed hairy	<b>Algae located:</b> everywhere in spots _____ % bed covered	<b>Stream Channel Shade:</b> >75% full 50%-74% high 25%-49% moderate 1%-24% slight none
<b>Stream bank composition</b> ___ % trees ___ % shrubs ___ % grass ___ % bare soil ___ % rocks ___ % other _____	<b>Stream bank erosion potential</b> >75% severe 50%-75% high 25%-49% moderate 1% - 24% slight none	<b>Riffle composition (=100%)</b> ___ % silt (mud) ___ % sand (1/64"-1/4" grains) ___ % gravel (1/4"-2" stones) ___ % cobbles (2"-10" stones) ___ % boulders (>10" stones)

**Land uses in the watershed:** Record all land uses observed in the watershed area upstream and surrounding your sampling site. Indicate whether the following land uses have a high (H), moderate (M), or slight (S) potential to affect the quality of your steam. (Leave the space blank if there is no impact or if the land use is not present in your watershed.) Refer to the SOS standard operating procedures to determine how to assess H, M, or S.

Oil & gas drilling ___ Housing developments ___ Forest Logging ___ Urban uses (parking lots, highways, etc.	Sanitary landfill ___ Active construction ___ Mining (types) ___ Cropland (types)	Trash dump ___ Fields ___ Livestock pasture Other _____
--	--	---

Describe the amount of litter in and around the stream. Also, describe the type of litter in and around the stream.

Comments: Indicate what you think are the current and potential threats to your stream's health. Feel free to attach additional pages or photographs to better describe the condition of your stream.

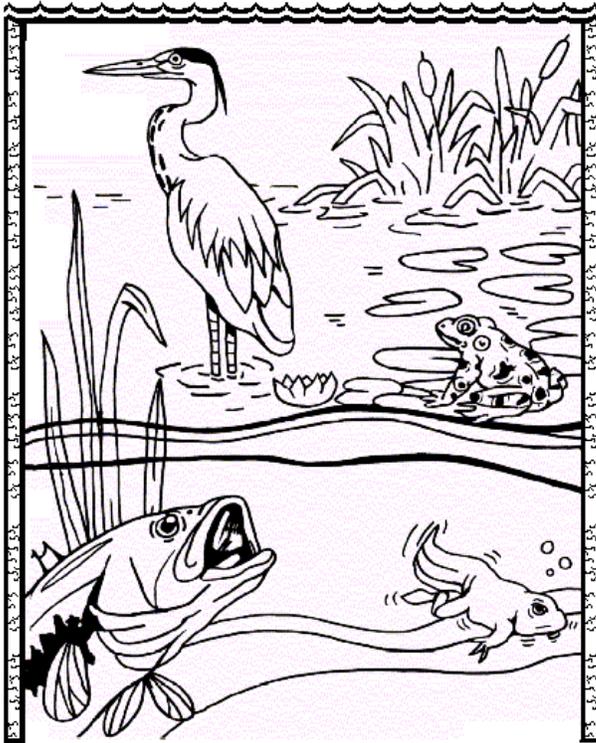
Send one copy of completed survey forms to your regional SOS coordinator or to:

IWLA Virginia SOS Program  
7598 Lee Highway  
Raphine, VA 24472

## APPENDIX B:

### Virginia SOS Volunteer Characteristics Questionnaire

#### Volunteer Water Quality Monitoring Survey Save our Streams Program



Social Sciences in Natural Resources  
Department of Forestry  
Virginia Tech  
Blacksburg, VA

Please take a few minutes to answer the following questions. **Your answers will be completely confidential.**

Section 1: The following questions ask about your involvement in the Save Our Streams (SOS) program and your volunteer activity in general.

1. What is your **current** level of involvement in the SOS program? (Mark one.)
  - Just becoming interested in water quality monitoring
  - Involved in the training process
  - Occasionally monitor a stream (3 or fewer times a year)
  - Regularly monitor a stream (more than 3 times a year)
  - No longer involved with SOS
  - Other: \_\_\_\_\_
  
2. What is your **primary** purpose for learning/using SOS monitoring procedures? (Mark one.)
  - So I can teach stream ecology to school children
  - So I can learn about stream ecology
  - To collect data to help in long term stream protection
  - Other: \_\_\_\_\_
  
3. How did you **first** hear about the Save Our Streams program? (Mark one.)
  - Word of mouth (for example, friend or family)
  - Through the media (such as, newspaper, internet, television, magazine)
  - Through the Izaak Walton League of America
  - Through an environmental organization **other** than the Izaak Walton League
  - Please list: \_\_\_\_\_
  - Through a youth, school, or church group (for example, Girl Scouts, 4-H)
  - Please list: \_\_\_\_\_
  - Through a governmental agency (such as, Department of Environmental Quality, Environmental Protection Agency)
  - Please list: \_\_\_\_\_
  - Don't remember
  - Other: \_\_\_\_\_
  
4. Which one person most influenced you to get involved with SOS monitoring? (Mark one.)

<input type="checkbox"/> Parent	<input type="checkbox"/> Teacher
<input type="checkbox"/> Sibling	<input type="checkbox"/> Public figure
<input type="checkbox"/> Child	<input type="checkbox"/> Religious leader
<input type="checkbox"/> Spouse or partner	<input type="checkbox"/> Co-worker
<input type="checkbox"/> Friend	<input type="checkbox"/> Sought out activity on my own
	<input type="checkbox"/> Other: _____
  
5. How much training have you received in the SOS program? (Mark one.)
  - No training (**Go to question 8**)
  - Have some stream monitoring training
  - Have completed the training, but not yet certified
  - A certified SOS stream monitor
  - Certified to train and test other volunteers
  
6. About how many hours of initial training (**before certification test**) have you received in the SOS program?

<input type="checkbox"/> 0 hours	<input type="checkbox"/> 4-6 hours
----------------------------------	------------------------------------



14. How do you prefer to be recognized for your volunteer efforts? (Mark all that apply.)

- Recognition certificates
- A verbal or written "Thank You" from SOS leaders
- Awards banquet
- It doesn't matter how I am recognized, but it is important
- I do not need to be recognized for my efforts
- Other: \_\_\_\_\_

15. Which activities would you be willing to participate in as a SOS volunteer? (Mark all that apply.)

- |  |   |
|--|---|
| <input type="checkbox"/> Stream clean-up<br>(such as, trash and debris clean up)   | <input type="checkbox"/> Fund raising   |
| <input type="checkbox"/> Tree planting   | <input type="checkbox"/> SOS office support                                   |
| <input type="checkbox"/> Storm drain painting warning<br>against pollution         | <input type="checkbox"/> Lobbying politicians/officials<br>to protect streams |
| <input type="checkbox"/> Stream bank restoration<br>(for example, erosion control) | <input type="checkbox"/> Other: _____   |

16. Are you currently involved with any other water quality monitoring volunteer organizations? (Mark all that apply.)

- |  |  |
|--|--|
| <input type="checkbox"/> No                              | <input type="checkbox"/> River Network               |
| <input type="checkbox"/> Friends of the Shenandoah River | <input type="checkbox"/> Friends of Page Valley      |
| <input type="checkbox"/> Headwaters Association, Inc.    | <input type="checkbox"/> Friends of Sugarland Run    |
| <input type="checkbox"/> Friends of the Rappahannock     | <input type="checkbox"/> Friends of the North River  |
| <input type="checkbox"/> Alliance for the Chesapeake Bay | <input type="checkbox"/> Friends of Dragon Run, Inc. |
| <input type="checkbox"/> Friends of Urbanna Creek        | <input type="checkbox"/> Elizabeth River Association |
| <input type="checkbox"/> Sierra Club, Virginia Chapter   | <input type="checkbox"/> Other: _____                |

17. How much time do you currently contribute to all other volunteer organizations **besides** SOS? (such as, church group, scouts, hospital, PTA, or other environmental.)

- |  |   |
|--|---|
| <input type="checkbox"/> 0 hours per month     | <input type="checkbox"/> 16-20 hours per month        |
| <input type="checkbox"/> 1-5 hours per month   | <input type="checkbox"/> 21-40 hours per month        |
| <input type="checkbox"/> 6-10 hours per month  | <input type="checkbox"/> 41-80 hours per month        |
| <input type="checkbox"/> 11-15 hours per month | <input type="checkbox"/> More than 80 hours per month |

Section 2: Volunteers have many reasons for volunteering. The following questions ask what **motivates you** to monitor stream quality for the Save Our Streams (SOS) program.

18. How important is each of the following reasons to your involvement in **SOS water quality monitoring**.

	Not At All Important	Slightly Important	Somewhat Important	Moderately Important	Very Important
I feel a deep connection with nature.	<input type="checkbox"/>				
To do something more fulfilling than my current job.	<input type="checkbox"/>				
To teach stream monitoring to other people.	<input type="checkbox"/>				
To learn new skills.	<input type="checkbox"/>				
To meet other members of my community.	<input type="checkbox"/>				
It is an opportunity to spend time outdoors.	<input type="checkbox"/>				
To network with natural resource professionals.	<input type="checkbox"/>				
It will help me gain practical experience toward paid employment.	<input type="checkbox"/>				

	Not At All Important	Slightly Important	Somewhat Important	Moderately Important	Very Important
To meet new people with similar interests.	<input type="checkbox"/>				
To protect Virginia's streams.	<input type="checkbox"/>				
I am concerned about drinking water quality.	<input type="checkbox"/>				
To spend time with family.	<input type="checkbox"/>				
Volunteer experience will look good on my resume.	<input type="checkbox"/>				
I am worried about the health of my family and neighbors.	<input type="checkbox"/>				
To protect the bio-diversity of Virginia's streams.	<input type="checkbox"/>				
To spend time with friends.	<input type="checkbox"/>				
To teach children to respect the environment.	<input type="checkbox"/>				
Because a stream in my community was threatened.	<input type="checkbox"/>				
To teach my children about streams.	<input type="checkbox"/>				
To learn more about stream quality	<input type="checkbox"/>				
To become a "watchdog" on local industry.	<input type="checkbox"/>				
I am worried about my property value.	<input type="checkbox"/>				
I do not trust governmental agencies to do a good job of monitoring streams.	<input type="checkbox"/>				
I feel an obligation to help the community.	<input type="checkbox"/>				
I love the scenic beauty of streams.	<input type="checkbox"/>				
I like to be able to identify stream organisms.	<input type="checkbox"/>				
I felt I could make a difference.	<input type="checkbox"/>				
Stream monitoring is fun.	<input type="checkbox"/>				
Collecting stream data provides a tool to monitor industry/agriculture development.	<input type="checkbox"/>				
I feel like I am doing something useful.	<input type="checkbox"/>				
It provides a sense of personal accomplishment.	<input type="checkbox"/>				
My data are helping governmental agencies identify threats to streams.	<input type="checkbox"/>				
It provides an escape from all the demands of life.	<input type="checkbox"/>				
I want to educate others about the importance of stream quality.	<input type="checkbox"/>				
It provides a time for quiet reflection.	<input type="checkbox"/>				
I like being part of a larger community of volunteers.	<input type="checkbox"/>				
Government agencies need volunteers to assist with stream monitoring.	<input type="checkbox"/>				
It is a part of my religious beliefs or practices.	<input type="checkbox"/>				
I wanted to help protect a special place of my youth.	<input type="checkbox"/>				
OTHER: _____	<input type="checkbox"/>				

Section 3: To help us make recommendations on improving the Save Our Streams program, we would like you to evaluate the **current** services and materials the program provides its volunteers.

19. Please mark the appropriate box on how you would **evaluate the current services or materials** the Save Our Streams program provides its volunteers.

	Poor	Fair	Average	Good	Excellent	Don't Know
The effectiveness of the certification test to measure a volunteer's ability to monitor.	<input type="checkbox"/>					
The way the certification test is administered.	<input type="checkbox"/>					
Availability of stream monitoring equipment (for example, waders and mesh nets).	<input type="checkbox"/>					
Recognition/appreciation of its volunteers.	<input type="checkbox"/>					
The effectiveness of your initial training sessions to prepare you to properly monitor a stream	<input type="checkbox"/>					
The usefulness of the current field guide materials to <b>confidently</b> identify stream organisms.	<input type="checkbox"/>					
Opportunities for additional training and refresher courses for monitors.	<input type="checkbox"/>					
Opportunities to meet other SOS volunteers.	<input type="checkbox"/>					
Feedback from SOS leaders about how volunteer data are being used to protect streams.	<input type="checkbox"/>					
The effective <b>distribution</b> of collected volunteer data to those who can use it (e.g., DEQ, DCR).	<input type="checkbox"/>					
Communication between SOS leaders and their volunteers (such as, about upcoming events or when to monitor next).	<input type="checkbox"/>					
Recruitment of new stream monitoring volunteers.	<input type="checkbox"/>					
Advertising/promotion of SOS program.	<input type="checkbox"/>					
Provision of materials to educate <b>others</b> about SOS.	<input type="checkbox"/>					
Other: _____	<input type="checkbox"/>					

Section 4: There have been many suggestions on how to improve and enhance the Save Our Streams program. The following questions ask you how SOS can improve its program.

20. Please mark the box that best indicates how much you would **support** these changes to the SOS program.

	Strongly Oppose	Oppose	Neutral	Support	Strongly Support
Provide <b>full-time paid</b> SOS regional coordinators.	<input type="checkbox"/>				
An easier certification test.	<input type="checkbox"/>				
A more rigorous certification test.	<input type="checkbox"/>				
Require <b>re-certification</b> testing (e.g., every 3 years) to assure high quality stream monitoring data.	<input type="checkbox"/>				

	<b>Strongly Oppose</b>	<b>Oppose</b>	<b>Neutral</b>	<b>Support</b>	<b>Strongly Support</b>
Annual meeting with other volunteer water monitoring groups in Virginia.	<input type="checkbox"/>				
A Virginia SOS newsletter.	<input type="checkbox"/>				
Awards, certificates, or plaques for volunteers.	<input type="checkbox"/>				
Social events like picnics or potlucks for volunteers.	<input type="checkbox"/>				
Standardized training procedures across Virginia.	<input type="checkbox"/>				
Special guest speakers about water and environmental quality.	<input type="checkbox"/>				
Focus monitoring efforts on the state's most impaired stream sections, rather than letting volunteers pick their own stream.	<input type="checkbox"/>				
Lobbying government agencies to use volunteer data in stream decision-making.	<input type="checkbox"/>				
Random field spot-checks of SOS volunteers to assure quality data.	<input type="checkbox"/>				
To minimize redundancy/boredom, have periodic monitoring of other volunteers' streams.	<input type="checkbox"/>				

**OTHER SUGGESTIONS:** \_\_\_\_\_

Section 5: The following questions address possible reasons why volunteers stop participation in the Save Our Streams program. **Only those SOS volunteers who have not monitored a stream in the past 12 months should answer questions in this section.** If you are still involved with Save Our Streams water quality monitoring, skip to section 6, question #22 on page 11.

21. Please check the appropriate box to indicate which of the following were important in your decision to **stop participation.**

**I stopped participating because...**

	Not At All Important	Slightly Important	Somewhat Important	Moderately Important	Very Important
The certification test was too difficult.	<input type="checkbox"/>				
I didn't have enough time.	<input type="checkbox"/>				
I had health problems.	<input type="checkbox"/>				
I didn't get along with my monitoring partner(s).	<input type="checkbox"/>				
The stream I monitored was too far away.	<input type="checkbox"/>				
Stream monitoring took too much time.	<input type="checkbox"/>				
Monitoring became boring.	<input type="checkbox"/>				
There was not enough direction from SOS leaders.	<input type="checkbox"/>				
It was too difficult to find a time when my monitoring partner(s) could meet.	<input type="checkbox"/>				
The environmental problem I was concerned about got resolved.	<input type="checkbox"/>				
I had too many other obligations.	<input type="checkbox"/>				
The environmental problems became too overwhelming.	<input type="checkbox"/>				
There was not enough feedback from SOS leaders.	<input type="checkbox"/>				
I had done my volunteer duty.	<input type="checkbox"/>				

**I stopped participating because...**

Not At All   Slightly   Somewhat   Moderately   Very  
Important   Important   Important   Important   Important

The program lacked effective leadership.	<input type="checkbox"/>				
My marital status changed.	<input type="checkbox"/>				
I moved.	<input type="checkbox"/>				
I became active in other environmental organizations.	<input type="checkbox"/>				
I did not feel my data were being used effectively.	<input type="checkbox"/>				
SOS leadership didn't seem to appreciate volunteers very much.	<input type="checkbox"/>				
I felt I was not adequately trained.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
There were not enough opportunities to meet other volunteers.	<input type="checkbox"/>				
The training did not give me the skills to monitor my stream properly.	<input type="checkbox"/>				
I didn't make the friendships I had hoped.	<input type="checkbox"/>				
I didn't like the stream to which I was assigned.	<input type="checkbox"/>				
There were not enough leadership opportunities.	<input type="checkbox"/>				
I didn't see any tangible results from my monitoring efforts.	<input type="checkbox"/>				
I felt Virginia's protection agencies were not taking my data seriously.	<input type="checkbox"/>				
My monitoring partner(s) quit.	<input type="checkbox"/>				
My children grew up.	<input type="checkbox"/>				
I felt there was little cooperation with other volunteer water monitoring groups.	<input type="checkbox"/>				
I didn't see any improvements in the quality of my stream.	<input type="checkbox"/>				
The certification test was too intimidating.	<input type="checkbox"/>				

OTHER REASONS: \_\_\_\_\_

Section 6: Finally, we would like some information about you. This information will only be used for statistical purposes to make general statements about the types of people who are part of the Save Our Streams program. **All information is voluntary and confidential, and will not be identified with your name.**

22. Your present age: \_\_\_\_\_ years
23. Are you  Male or  Female?
24. What is your race?
- |   |  |
|---|--|
| <input type="checkbox"/> White            | <input type="checkbox"/> Native American |
| <input type="checkbox"/> African-American | <input type="checkbox"/> Asian-American  |
| <input type="checkbox"/> Hispanic         | <input type="checkbox"/> Other _____     |
25. What is your current occupation? (Mark one.)
- |   |   |
|---|---|
| <input type="checkbox"/> Manager or executive         | <input type="checkbox"/> Sales worker   |
| <input type="checkbox"/> Professional worker          | <input type="checkbox"/> Service worker |
| <input type="checkbox"/> Owner of business or farm    | <input type="checkbox"/> Unemployed     |
| <input type="checkbox"/> Skilled trade or craft       | <input type="checkbox"/> Retired        |
| <input type="checkbox"/> Semi-skilled worker, laborer | <input type="checkbox"/> Student        |
| <input type="checkbox"/> Clerical or office worker    | <input type="checkbox"/> Home-maker     |

26. What is your job title \_\_\_\_\_ and the kind of company or organization for which you work \_\_\_\_\_?
27. What was your approximate total household income before taxes last year?
- |  |  |
|--|--|
| <input type="checkbox"/> under \$19,999  | <input type="checkbox"/> \$50,000-59,999   |
| <input type="checkbox"/> \$20,000-29,999 | <input type="checkbox"/> \$60,000-74,999   |
| <input type="checkbox"/> \$30,000-39,999 | <input type="checkbox"/> \$75,000-99,999   |
| <input type="checkbox"/> \$40,000-49,999 | <input type="checkbox"/> \$100,000 or more |
28. What is the highest level of education you have completed? (Mark one.)
- |  |   |
|--|---|
| <input type="checkbox"/> Grammar school      | <input type="checkbox"/> Bachelor's degree or equivalent  |
| <input type="checkbox"/> Some high school    | <input type="checkbox"/> Some graduate work               |
| <input type="checkbox"/> High school diploma | <input type="checkbox"/> Master's degree                  |
| <input type="checkbox"/> Some college        | <input type="checkbox"/> Ph.D., M.D., J.D., or equivalent |
29. Your present marital status:
- |                                  |   |
|----------------------------------|---|
| <input type="checkbox"/> Single  | <input type="checkbox"/> Separated/Divorced |
| <input type="checkbox"/> Married | <input type="checkbox"/> Widowed            |
30. How many children do you have? \_\_\_\_\_ children
31. How many children are **currently living in your household**? \_\_\_\_\_ children
32. How long have you been residing in your present community?
- |  |   |
|--|---|
| <input type="checkbox"/> Less than 2 years | <input type="checkbox"/> 5-9 years        |
| <input type="checkbox"/> 2-4 years         | <input type="checkbox"/> 10 years or more |
33. How long do you **intend to stay** in your present community?
- |  |   |
|--|---|
| <input type="checkbox"/> Less than 2 years | <input type="checkbox"/> 5-9 years        |
| <input type="checkbox"/> 2-4 years         | <input type="checkbox"/> 10 years or more |
34. In what type of area do you **currently live**? (Mark one.)
- |  |  |
|--|--|
| <input type="checkbox"/> Farm or ranch       | <input type="checkbox"/> City (10,000-50,000)                  |
| <input type="checkbox"/> Rural, non-farm     | <input type="checkbox"/> Large city (50,000-100,000)           |
| <input type="checkbox"/> Town (under 5,000)  | <input type="checkbox"/> Metropolitan area (more than 100,000) |
| <input type="checkbox"/> Town (5,000-10,000) |  |

**Do you have any additional comments for the SOS leadership about how to improve the Save Our Streams program?**

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**Thank you for your time!**

## APPENDIX C

### VOLUNTEERS' OPEN-ENDED COMMENTS ON SOS PROGRAM IMPROVEMENT

IN RESPONSE TO THE FOLLOWING QUESTION:

**Do You Have Any Additional Comments for the SOS Leadership  
About How To Improve the Save Our Stream Program?**

Do not give up; keep working hard hand and hand. Encourage volunteers to get involved. Employ my mother, she is a water resources/watershed specialist.

I began working with SOS when I was a freshman at Tech & stayed very active for a long time. However, when I moved there was no system in place to help me find other SOS groups, so I have not been able to remain active.

Thanks for your work!

I am glad I got this opportunity to express my feelings about the SOS program. I would be interested in the results of this survey!

Just at the time I was beginning to be involved I had problems with my back, which now prevent my participation. I tried to call to discuss this with you, but the line was always busy. I am now unemployed and cannot spend the money to drive, so this period of my life is not reflective of what I would otherwise do.

Please keep on with your good work. To help ensure the accuracy and credibility of our macroinvertebrate reporting, each monitor should be equipped with a manual specific to our protocol, with high quality color plates and life history text comparable to McCafferty's "Aquatic Entomology." Development of this manual should receive very high priority. Also, the Brock Microscopes you have furnished are very effective. They are especially useful when identifying critters in their early stages (1 to 5mm).

I work with middle school students to monitor local streams that are not monitored or are "under-monitored" by DEQ. The SOS rocky bottom method is not applicable to most of the streams we monitor. We need a reliable muddy bottom protocol and the training to go with it. There seems to be some reluctance about providing training on the current protocol described in the SOS monitor's guide. This is an urgent need for those of us who do not live in the land of the riffles. Help!

I apologize for my not feeling able to make a commitment to this organization, but this had nothing to do with my perception of the quality of your organization.

More publicity.

Distribute information to government biologists. Many of us would organize and start efforts in our local communities. Is there a similar program in NC? Please send me information.

Photographs of organisms (at all life stages).

Annual report to volunteers of efforts and effects

More consistent training (and verification) prior to lobbying governmental agencies. Data are too questionable for use by most agencies. Additional hands-on activities will be required to ensure volunteers are properly sampling and identifying. Most volunteers wish to see results- increase activities like stream clean up, erosion control, etc.

Emphasize that the microinvertebrate sampling is not a definite indicator of stream health.

Encourage volunteers to speak with landowners. Organize projects that aid in riparian restoration (ex: fencing out cattle). Develop a protocol for walking entire stream to observe habitat characteristics and potential problems.

I am a teacher; it would be very helpful to have a preserved specimen to look at and study before going out. [The students] would know what to look for, and also [it would help] to study for the monitoring test.

They should implement a regular evaluation program using elements similar to the parts of this survey. Evaluation is always needed.

I'd be happy to start up again- even go for certification, IF it made a difference to Blacksburg development/community.

No follow through on my part as well as SOS's! I monitored our stream a couple times-and that was it.

I monitor and work with Friends of the Shenandoah and the Opequon Watershed Inc. in the Winchester area. I took the SOS training and use it in summer camps and school settings. Perhaps SOS leadership could coordinate better with other water organizations. Thank you for your efforts. Stay in touch!

Great program- I'm just over-committed.

I am so glad that citizen monitoring is accepted as data!

I think it is a great program for those citizens who live inland near freshwater streams who wish to monitor water quality. If I lived in such an area, I might consider this volunteer activity in the future. I wish IWLA-SOS program all the best!

Design a more user-friendly critter ID card. Use of actual photos would be helpful. Post-actual photos of critters on websites. Develop a more detailed physical evaluation of stream station.

Post volunteer's data on web site. Provide training for muddy bottom method. Place Planarian [on] ID card (sensitive).

For informational purposes, provide photos/drawings of the adult form of the immature critters. I find volunteers better able to relate to the immature once they recognize the flying adult stage.

I believe in and enjoy the program. In retrospect, I think I would be more active if asked or reminded to monitor my stream. I took and passed the certification program but never received anything. Maybe the word should be "feedback." More feedback and some push to the volunteers would help.

Call me!

It is hard to get settled on a stream site or reach anyone by phone to get the equipment.

There is a lack of effective compilation and assessment of the data.

Couple data collection with an accessible GIS data presentation, which includes rainfall and areas of concern.

I think this is a very worthwhile project/endeavor. I have a stream on my property and love the Cowpasture River!

Keep up the good work! ... We need to get more people involved. Complacency is alive and well in communities. We seem to be crisis-oriented.

Newsletters. Put comments in local newspaper.

A new taxonomic key should be made. Hire full-time trainers.

In SW Virginia (New River Valley), I am concerned about air pollution. I believe if we have no pollution in the air, our streams and waterways will improve greatly.

Good job!

SOS should ensure that membership in a local environmental group is NOT a prerequisite in participating in SOS programs. This is a good program and should be open to all who care to use it.

I am concerned that obtaining SOS data results in the death of many microinvertebrates. Thus SOS monitoring may harm the bio-diversity of some streams instead of protecting the bio-diversity.

I want to know that SOS data is being used and to get feedback on its use (Otherwise, what is the point?)

Connect with future TMDL efforts.

I like ... I admire their efforts, enthusiasm, and endurance. They are role models for all who want to make a difference for others and for Virginia.

I haven't stopped monitoring; however, I have found that most of the classes I got started didn't stick with the program. The adults I got started were far too casual. "I should do that," they would say, but follow up didn't happen.

Support for those working in their own communities: it is important to let the skeptics in rural areas see that this organization is NOT a government agency that is going to try and tell people "what to do with their land."

Support preventive monitoring and education in areas where streams are not yet threatened, before a problem arises.

We need more people like ... - more small pay positions to help his outreach reach further.

Monitors need to see results of monitoring. Data goes in and then what? State water quality agencies need to use SOS data instead of inventing new systems.

Let the volunteer pick the stream he/she is interested in- like the one nearest to them- not told to go monitor a certain stream.

I was raised in Minnesota and taught to love water and view it as a precious natural resource. I watched places I lived become polluted and habitat lost.

I quit monitoring because of poor organization of the program! When I signed up, I had hoped to become a monitor. I was not informed about being certified.

Give people responsibility, training, awards, and ownership of their sites. Good communication and a strong group awareness.

Trainers' failure to schedule a group of 20 volunteers that I enrolled. No response to three attempts to schedule. Have someone contact me. I and a score of volunteers were abandoned/neglected, even while I was attempting to set up a training session. No confidentiality is necessary for my comments or information.

Keep the funding coming! Need to use our recorded data to try to establish a standard water quality for streams

where no monitoring has occurred. Virginia has many streams where nothing has been checked. Keep up the good work.

I think it would be very useful if there were a network that would put folks interested in monitoring a stream in touch with leaders needing volunteers. Some people, like me, who are interested in the SOS program, do not have a ready-made pool of volunteers (such as a school class) to draw on.

Focus on students and retired volunteers.  
Please notify me on your next training sessions.

The most common complaint I hear locally is that we have no confidence that anyone is making use of our data.

I am used to more activism. Why aren't the polluters exposed to the community and held responsible? The data could be used in a more activist way!

I'm lazy and the family is involved in other things. I feel bad about it (not getting involved).

I need lots of help, but I am on a feeder stream of the Powell and would like to monitor if I could identify the organisms and had some equipment.

I am very happy to be a part in SOS. Hopefully, people like myself will join, and together we can help our streams, rivers, lake, and resources.

Standardize sampling dates. Thanks for a good sound questionnaire.

I no longer live in Virginia or participate in Virginia SOS program. I did participate while living in Virginia.

Train more volunteers to get more clubs involved [and have] better communication and planning on training dates.

If community and grassroots efforts are crucial to environmental health, then the education system is a prime vehicle for priming our citizens to consider volunteering. Is the high school setting an important target audience?

Our data was not taken seriously!

My primary concern with SOS or other citizen monitoring is consistency (QA/QC) of accurate data collection over time. Without this, the information is fairly useless in terms of looking at trends and comparing between sites. This is not to say that without more stringent training and QA/QC, the program is a waste -- just not as scientifically useful, but still important for education and raising local awareness.

Please contact me when there is a training session.

There did not appear to be a well-managed group to oversee an SOS program in our area. Without structure, monitoring efforts would be in vain.

No communication from leaders.

Volunteers/leaders need to be more specific about what is expected when recruiting new volunteers. The club feels like they were lied to about how much time and effort was involved.

More publicity at how to get involved, or about web site or other information.

Try to gain more elementary schools' involvement to get kids started to become active members of their community at an earlier age.

Provide feedback to monitors. Remind them when it is time to monitor, if they have not done so.

More advertising about what you do- to clubs and environmental groups across the state who could also help. School groups can be Key Clubs, or a teacher who will keep up monitoring after students leave and new ones enter. Make materials (the hardware for doing) more readily available and less expensive.

With some additional training, I would like to start my students monitoring the Clinch River in Scott County. Our school is located along the Clinch, and it would be a great opportunity for our school. I have had some training but no certification test or anything like that!

Definitely, need a paid coordinator to carry workload.

Please mail me my certification certificate. I've been waiting for it since I passed my test September 1998 on the Mayo River in Stuart, Virginia.

I would like some kind of water testing kit for pH, chlorine, etc. Something for SOS volunteers [so they] can pair [it] up with SOS kit.

I took the Aquatic Entomology course from Dr. ... three years ago.

Additional recruiting and publicity about the need for volunteer data. Ongoing cooperation with ALL relevant state agencies.

Offer an intensive course on freshwater biology and how it relates to the insects we find when we monitor. I'd like to learn more about life cycles of specific insects, what they are doing at each season of the year, etc. I'd also like to learn how to I.D. more specifically, i.e. which caddis fly larva are more sensitive to pollution. Or why do we find more hellgrammites in one particular stream...

The program in our area is great- well-organized, good training, informative newsletter, and lots of helpful knowledgeable volunteers. I feel fortunate! (Northern Virginia)

I feel it is an excellent program that has huge benefits for the quality of life. I am sorry I have not had the time to continue. I hope to have my environmental staff trained in the future.

I was monitoring with my teenage daughter. A test showed the water had E. coli bacteria. I did not feel we had proper protective clothing to continue, and I could not afford to buy waterproof boots, etc.

Three complete samples at one site are too time consuming. If first sample is excellent, shouldn't that be adequate?

Reflecting on the training, I find the critter identification and analysis was stronger than the physical traits training, and that would be a training weakness. In addition, I would like to learn more about streambed geology.

Communicate!

I would like to see the SOS website kept as current as possible. When the website is fully operational, all county governments, universities, etc. in Virginia should receive notification that the websites information is available.

Get the state to enact and ENFORCE some stringent anti-pollution laws, and have the DEQ monitor the worst streams to OUR satisfaction.

Require elected officials to drink river water downstream from their districts.

When I found out that SOS does not provoke enforcement, I dropped out.

Well designed survey! Can I have a blank copy to show my research class?

Thanks for doing this study!

I'd like to monitor without a partner and enter data into a database on my computer. I'd also like a report yearly of stream health and agencies' use of the data. My trainer accompanied our team each time so I bet his data collection is being used, not mine—so why go? Let volunteers be responsible.

This was a good survey. Please continue on annual basis. One-year snapshot is not enough for long-term trends.

Development of protocol and procedures for muddy bottom—like James River Area—would be nice to have.

I would like to have more contact with the great person who trained me—I have sought contact, but he is a busy person, and lives about 70 miles away.

None of my friends have even heard of it, so I would suggest getting the message out to more people. Maybe making it more appealing to all ages.

Having difficulty finding a partner.

Stations have been set up around the town of Orange for the purpose of obtaining base data; so [far], annual checks have only been done when known pollution takes place.

Provide a list/notice of workshops.

When someone is willing, anxious to help----don't IGNORE them---stay in contact---offer the next required step—what do I do or go next?!!!

There was no opportunity to continue training, was never contacted again!

I would support lobbying once the SOS program was more rigorous, and you could trust the data.

It is necessary to have experienced people out there with inexperienced to protect the integrity of the data.

I do not feel it is quality data. The data needs to be standardized—too much variability.

Feedback would be good. Start chemical monitoring as well.

We will be moving soon, and hope to become more involved with SOS if career changes allow.

A handbook on contacts/resources (i.e. State Biologists, Game and Inland Fisheries, labs, environmental non-profit organizations, etc.) would be very beneficial.

PLEASE give us ways to improve the quality of streams -- my stream is horrible (i.e., almost nothing alive there), and no one can tell me what I can do to improve it. I would like to not only monitor the stream, but to SAVE it!!!

Feel free to contact me.

Good program. I encourage periodic retraining or recertification to maintain quality of data.

Throw parties in celebration of monitors helping and trying to keep our streams safe. Good job SOS!!

Provide some feedback to volunteers, not necessarily a newsletter because I probably would not read a lot of it; perhaps a yearly report on the really important stuff, or a local update on the compiled data- something to show what happened to the data we collected!

I regularly teach youth groups regarding benthics as part of water quality programs. I have also taught aquatic biology at the college level. I never bothered with SOS certification, but use benthic monitoring as a supplement to the Friends of the Shenandoah basin-wide chemical and physical monitoring program. I think the benthic monitoring and chemical-physical monitoring compliment and provide interrelated data, however, there are deficiencies in each. Benthic changes reflect past toxic episodes, oxygen deficiencies, pH extremes, or severe sedimentation-but do not reflect moderate to severe static nutrient problems or coliform contamination. Chemical and physical data are required to identify what caused the demise of the mayfly! The stonefly or the caddis fly!

Lots of grant money available from EPA to fund efforts—should be an effort to secure grant funding from several sources. Part of this money could fund internships for students or graduate students who are in environmental programs (or economic programs, or law programs with an environmental focus). These internships should be substantial enough to allow students to pursue studies and the goals of the internship intensively without needing to work additionally. The environmental program at the University of North Carolina at Chapel Hill offers some models.

Make materials cheaper. Make training easier to get for groups (i.e., cheaper).

I loved the training & learning aquatic invertebrate I.D. Keep up the great work and actively seek out new volunteer resources through local environmental nongovernmental organizations, clubs, etc.!

I think the program is great and much needed to help teach the public.

I firmly believe an effective program can grow only as fast as the infrastructure to support it. I have noticed the commitment to the program comes when they [volunteers] establish their own site and begin sending in data. Those that just practice and never establish their own site rarely stay with the program.

I would definitely support the need for local program coordinators/managers. The multitude of administrative details-promoting, tracking, record-keeping, reminding and encouraging, as well as coordinating sessions, meetings, watershed groups, picnics and newsletters-all take considerable time and effort!

The particular program concluded—no further call from leaders to continue.

Important to keep volunteers engaged once they have taken that crucial first step of “stepping in the door.” I would definitely do more monitoring, but no one has called me to keep the monitoring going. (This is mostly a function of the fact that I was in a program with a definite end.)

They are doing a great job providing more structure, but of course, could use more support from the state to reinforce the regional networks, provide training, follow up, etc.

Provide better feedback; provide higher quality education and training opportunities. Local/area meetings with “experts,” data evaluators, data users, etc. ...

Continue to coordinate with agencies. Provide information to local governments. Encourage them to develop monitoring teams. Refine monitoring protocols. Network with other environmental organizations. Keep up the great work!

None. Keep up the great work!

We have since moved, and I haven't had time to adopt a new stream. I am wondering if I can find a new stream or perhaps find a location on the Little River that I could monitor. I want to stay involved.

Follow-up was lacking, and/or I was not given enough information and direction to form my own group.

Take advantage of folks who volunteer -- I was ready to help, but not contacted.

The program is well structured, committed to the cause, and provides excellent avenues for training, education and experience. I really regret that time has prevented me from participating more.

As an SOS trainer, I feel that volunteers should be more involved in lobbying rather than the leaders alone. I wrote progress reports to the DEQ & DCR regarding the monitoring of Stroubles Creek, an impaired stream in our backyard. The Virginia Tech Museum of Natural History was a wealth of information on Stroubles and many other streams in the area, including progress reports and data sheets.

After the training, I reviewed my stream (and there was a BIG drought) so I started looking at my stream (Olde Creek) and realized that it is no longer a stream but an urban rain drain. It was depressing.

Place emphasis on saving with monitoring playing a supportive role. For a given watershed, what really are the proactive commitments that must be solidified before we can know that we have saved a stream? An additional data form could be a regular assessment of the degree to which a stream is saved (from current and future threats). This is a different question than measuring its current health.

Include chemical analysis in stream monitoring; try to encourage farms to fence streams off from cattle. I feel counting organisms isn't enough, stream monitoring should also involve chemical analysis.

Yes, I haven't heard from anyone since I was introduced to the program. I think #'s 22-34 should not be asked at all.

I think it is a worthwhile program. It was a very interesting project for our home school family. We simply drifted away from it and felt new owners of property, through which the stream we were concerned about [ran], might prefer to do monitoring on their own. I would still like to receive information. [This] could make a good scout project for us, and we would be interested in certification.

Home school project for family to monitor stream near our property and gauge effects of impending road construction.

#### **SURVEY QUESTION #20:**

##### **Open-Ended Suggestions on How SOS Can Improve its Program**

Volunteers must be "invested" in the stream monitored.

In the long term, the greatest contribution of SOS volunteers may be the collection of "base line" data for streams that are not yet impaired. Let the DEQ deal with the stream sections that we already know are bad.

Limited monitoring during FREEZING TEMPERATURES.

Offer and make clear a sequence of progressively more advanced training/skill level. Ultimately you might have mentors in sampling, identification, interpretation, etc. who could advise other volunteers.

Have a weekend regional conference to invite volunteers & speakers, social events, etc.

Since a lot of us are citizens with no former training in all this, I would NOT like to see the test so hard that it cannot be passed by lay-people, but a good sample bug book with large pictures would be good for monitors to carry with them and study often.

Share stream data among regional coordinators and volunteers.

Include organism abundance in test.

More structure to program [is needed] in the beginning, (e.g., assign new volunteers to established stream monitoring teams).

Get paid SOS people to do organized outreach to school and communities IN THEIR OWN watersheds.

Promote as monitoring water quality, not policing agriculture, industry, etc. Have a team of two people go out. They would both monitor two sites.

More training and more help getting started at your own site. A place to send samples that need to be identified.

Advertise your program more.

Re-certification improves credibility with DEQ and courts, if needed.

We should be able to do some kind of pH test when we monitor macro-invertebrates.

Feedback from DEQ.

Revision of the “Stream Insect and Crustaceans” (IWLA) to repeal science that indicates that some of the critters are not appropriately placed in categories for sensitivity to pollution resulting in lowered dissolved oxygen levels.

Central roster of volunteers made available.

Rewrite the data form -- we really don't like the subjective percentage stuff on the back- it does not seem to have much of a scientific purpose. Why not get groups and individuals together at a meeting to hash out a new form? Also, we need better critter-identifying materials. I would love to improve my identifying skills.

I think one way to reduce redundancy or feelings of redundancy is to have available a good number of options for learning more about water bodies and watersheds that are not part of the micro-invertebrate analysis but would be related indirectly. For example, I would like to recognize algae, mussels, etc.

Make regional coordinators more publicized -- Virginia SOS page has Blacksburg's coordinator, but no one else as far as regional coordinators [are listed] as contacts.

We took the training, but in an area where monitoring techniques were different. We intended to monitor but tidal creeks here are difficult; we got busy with other things...

Electronic database on WWW for data entry.

Require re-certification ONLY if not actively in monitoring/training sessions.

SOS data cannot be effectively used because identification is not specific enough, i.e., some mayflies are LESS tolerant than others—we can't tell which is which!

Create a document, preferably on the web, that shows how all the SOS organizations are related, and their web addresses.

Full-time SOS coordinator could find volunteers for un-monitored streams. Let people pick their own stream to monitor!

Streamline procedures, and add simple chemical tests (like pH).

I would like to know how our protocol meets the requirements of other states to be able to be certified in those states. For example, I could monitor streams in North Carolina, etc...

Provide good waders.

Time constraints, lack of feedback of overall program, lack of contact with highly knowledgeable individuals.

I never reached certification stage. Stream we monitored changed ownership, and I felt new owners of property probably would prefer to do monitoring themselves.

