

**Citizen Science
Toolkit Conference**

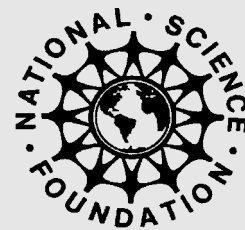
June 20 - 23, 2007

engaging, enhancing, and expanding
community-based monitoring programs

Linda Green
University of Rhode Island Cooperative Extension
USDA-CSREES Volunteer Water Quality National Facilitation Project



Photo: University of New Hampshire Cooperative Extension



CORNELL LAB OF ORNITHOLOGY

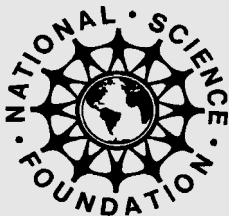
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This presentation took place at the Citizen Science Toolkit Conference at the Cornell Lab of Ornithology in Ithaca, New York on June 20-23, 2007.

Note that this document did not originate as a formal paper. Rather, it combines an oral presentation with accompanying PowerPoint slides and reflects the more informal, idiosyncratic nature of a delivery prepared specifically for this live event.

Documentation of the conference is meant to serve as a resource for those who attended and for others in the field. It does not necessarily reflect the views of the Cornell Lab of Ornithology or individual symposium participants.



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The following is the opening talk of the session titled "Community Building for Citizen Science" on day three of the Citizen Science Toolkit Conference

For complete documentation of conference proceedings and to learn more about citizen science and the Citizen Science Toolkit, or to join the ongoing citizen science community, go to:

<http://www.citizenscience.org>

Engaging, Enhancing, and Expanding Community-Based Monitoring Programs

Linda Green,
University of Rhode Island
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Facilitation Project

About Volunteer Monitoring

Introduction

This morning I would like to chat with you a little bit about community-based monitoring programs. What I have started doing lately is starting my talk at the end, which is kind of fun because I spend a lot of time convincing people why volunteer monitoring is an appropriate thing to do and how to get involved in volunteer monitoring. I'm actually going to use that term as opposed to "citizen science" because I've been used to the term "volunteer monitoring."

We've found that there are many reasons why folks get involved in volunteer monitoring and participate in citizen science programs. They raise awareness and educate. We're involving people in real science, something that we've seen such fabulous examples of at this workshop—there are so many watches that I am going to volunteer to be a part of when I get home. Our focus is local involvement, solving our problems locally, involving our citizens.

I will have to apologize and say that I was not too familiar with the term "citizen science" except that I always say that volunteer monitors are citizen scientists. This is the definition I found on the Web when I looked up the information, and I thought it was very interesting. I was thinking about this and I realized that to a certain extent, many of the programs that I've heard discussed here really were focusing on the science and the big questions, the very important ecological questions that are being addressed by citizen science programs.

In the world that I have been involved in, we have been more involved with the citizen end of it, the people end of it, the community awareness, and the community-building programs. I actually looked up "citizen," "science," "volunteer," and "monitor" in the dictionary to make

Volunteer Monitoring Makes a Difference

- Raises awareness and educates
- Involves people in real science
- Provides info on places where no one else is looking
- Creates an informed constituency
- Creates stewards
- Identifies & solves problems locally



"It is a partnership between the public and professional scientists. People across the continent are gathering data to better understand and conserve birds."

- From <http://www.birds.cornell.edu/LabPrograms/CitSci/index.html>

Definitions

Citizen

- Inhabitant
- Resident (legal)
- National
- Voter
- Civilian
- City dweller

Science

- Discipline/knowledge/skill
- Art
- Study of the physical world
- Branch of Science
- Knowledge gained from science
- Systematic body of knowledge
- Something studied or performed methodically
- Blind somebody with science
 - To confuse or overwhelm somebody by giving an impenetrable explanation using technical terms and concepts (see science)

More Definitions

Volunteer

- Somebody who works for free
- Somebody who does something by choice
- Somebody acting without legal obligation
- Unpaid helper
- Unpaid assistant
- Helper

Monitor

- Check
- Watch
- Observe
- Keep an eye on
- Supervise
- Scrutinize
- Examine
- Somebody ensuring proper conduct
- Check regularly for developments

What Is Volunteer Monitoring?

- Unpaid people who willingly...check/watch/observe/keep an eye on/scrutinize...various environments
- People who watch over the health of their watersheds because they care

sure I had a good definition of what was going on.

The definition we tend to use for volunteer monitoring is “unpaid people.” People have said, “Don’t you have paid volunteers?” Well, if they’re paid, they’re not volunteers, but I do know community programs that pay their volunteers. I think it’s kind of like paying people for good grades, but that’s a different discussion. These are folks who are watching, they’re scrutinizing, they’re checking out their environment, what we tend to view as ecological monitoring, making repeated measurements over time to record conditions and track trends.

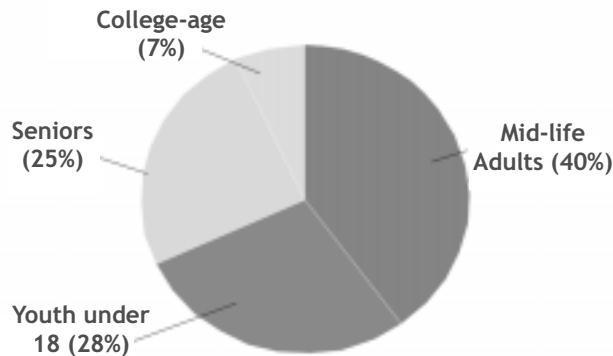
Who Becomes Engaged in Volunteer Monitoring?

This is very much based on what we call enlightened self-interest. They do it because they care. They also get involved because there is something going on that concerns them, something that they have a passion for in their own community.



The next couple of slides I have are based on a survey that was done about ten years ago on volunteer monitoring and some inquiries we have done through Cooperative Extension about folks who are involved in volunteer monitoring. We see that most of our volunteers are mid-

Who Are These Volunteers?



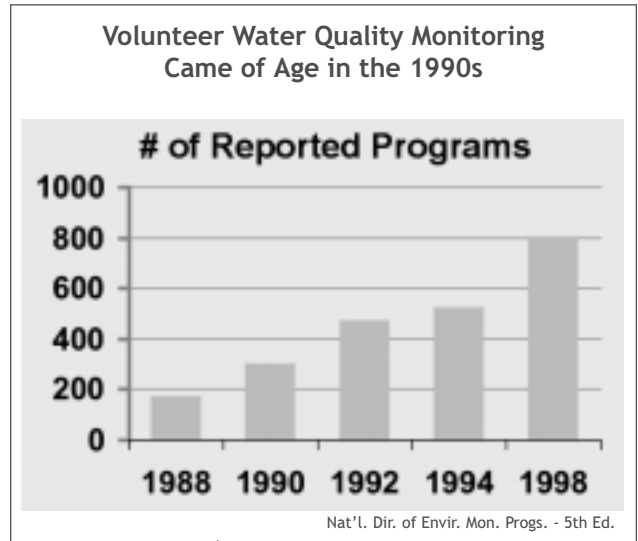
CSREES Volunteer Water Quality Monitoring National Facilitation Project

life folks, senior citizens, people who are often on the boards in local communities, and a lot of the decision-makers in the community. We have a lot of youth involved in volunteer monitoring, mainly through school-based programs, and a good number of college-age students also. So there is a good variety of folks.

Volunteer monitoring has a long history as a program. It really came of age in the 1990s. The first National Volunteer Monitoring Conference, and there have been six of those, was in 1988 in Narragansett, Rhode Island. I had nothing to do with the start of it and as a matter of fact, I found out about it just the day before the

conference started and I was just starting my program. At that point there were not many folks who were identifying themselves as doing volunteer monitoring. Those numbers have increased quite a bit, mostly because people found out about it and the things that were going on, and there was great support from the Environmental Protection Agency.

Our current estimates are that there are somewhere in the vicinity of 800 to 1,200 volunteer monitoring programs going on across the country. This photo here is of about 100 volunteer monitoring coordinators who were gathered at the 2006 National Water Quality Monitoring Conference held in California, and they are about ten percent of the folks who were at this conference.

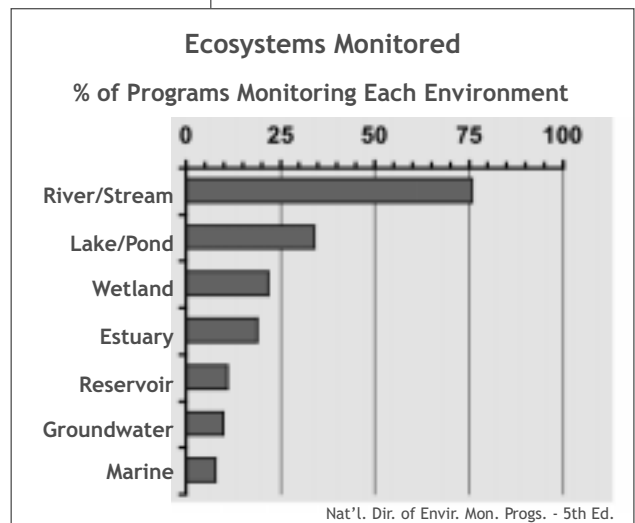


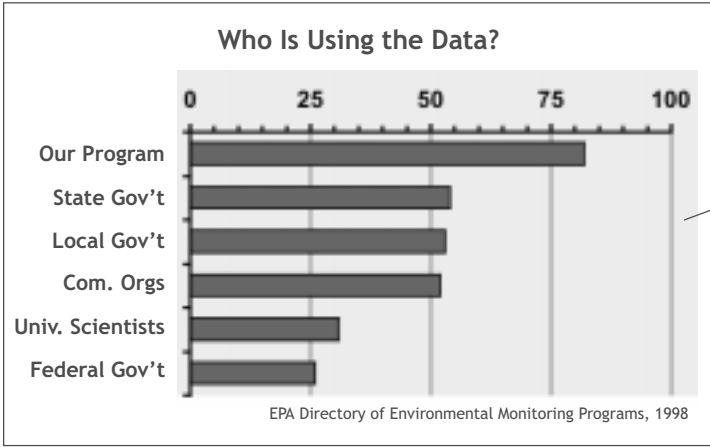
What Volunteer Monitors are Doing

As might be expected, whatever ecosystems are out there are being monitored by our volunteers. The vast preponderance of programs, about seventy-five percent, monitor rivers and streams. Some of that is because many of these are school-based programs and it is easier to go out onto your local river and stream than to go out to the lake or to the ocean. We see over the years increasing issues of getting students on the water because of liability issues. You can't get them on the lake, you can't get them on the ocean, but you can get them to walk down to the stream.

Who Uses the Data and How?

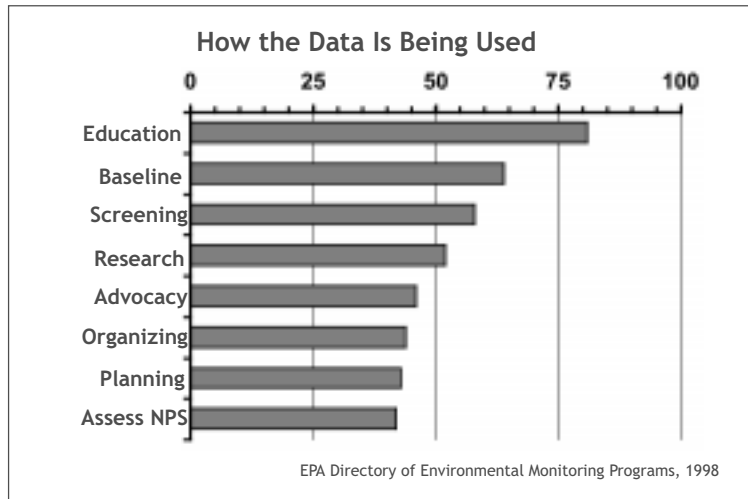
Who uses the data? This is very interesting. We would like to see 100% of volunteer monitoring programs using their own data because we don't think these programs should necessarily exist to provide data to others, but that is always an admirable goal. We





would like to see volunteers using their own data. We saw great examples of that with what Candie Wilderman does and what some other groups are doing. Governments are strong users of volunteer monitoring data, whether state, local, community organizations, scientists, or federal government. These actual percentages may have changed by now, we're not sure, but they give you a range of what is going on.

And how is volunteer monitoring data being used?



There is a whole gamut of uses. Education represents a huge use of data. I think in just about anything we do, we can't avoid educating people, and that is an admirable and very important use. There is baseline monitoring, where we had no information about what was out there before; screening for problems; research; advocacy; organizing; planning; all the way to assessing non-pointsource pollution.

Successes

Introduction

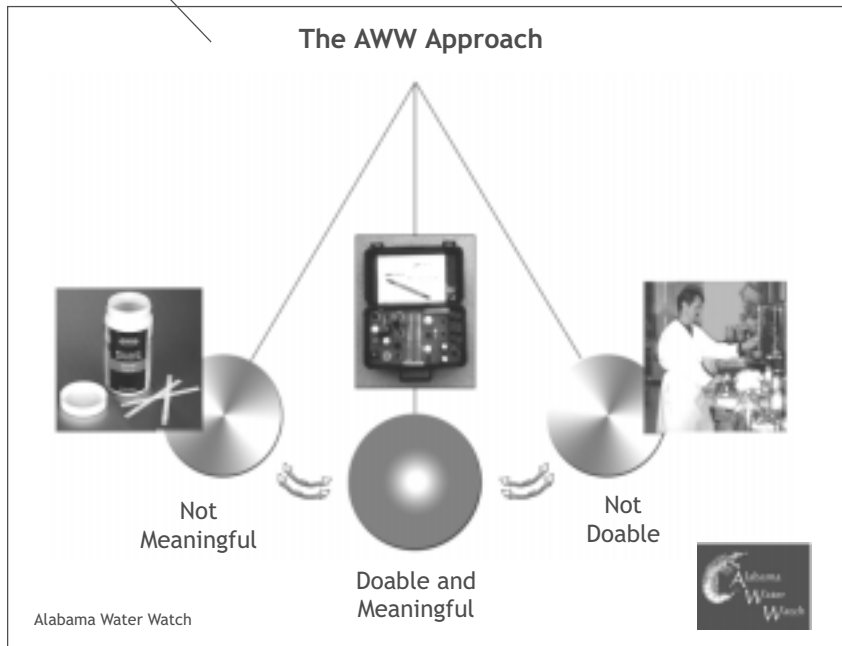
In the course of studying these programs, we have recognized that there are a number of characteristics for a successful program, and I don't really think it makes a difference whether it's butterfly monitoring or water quality monitoring or any kind of a program. You need to have a program that is well-organized. You need to start with the end in mind, which was a fabulous title for one of the earlier conference presentations. It is important that the programs have a sound scientific basis, that our programs report the results, that they have support. Many of our most successful volunteer monitoring programs have multiple areas of support. I think the average is three to four sponsoring organizations so that you are not relying on one source of

Characteristics of Successful Volunteer Water Quality Monitoring Programs

- Well-organized
- Sound scientific basis
- Report results
- Strong institutional support
- Make a difference

support. And finally, it is important that our programs make a difference. That is why we are all here, to make a difference.

This is a great slide. It is from the Alabama Water Watch program, which is about eighteen years old. Bill Deutsch, the organizer of that program, commented that this is a slide they used in their very first presentation and they have used it all along.



What Is Volunteer Monitoring?

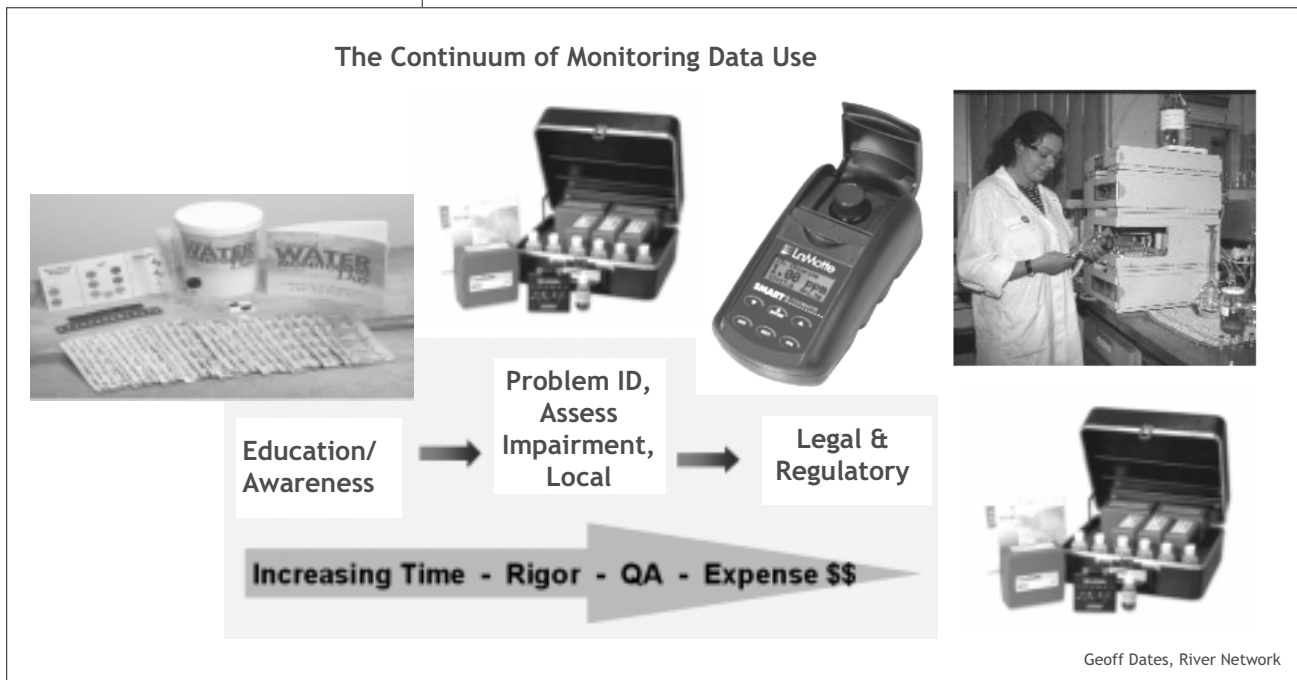
- Unpaid people who willingly...check/watch/observe/keep an eye on/scrutinize...various environments
- People who watch over the health of their watersheds because they care

We realize that there are two themes as we approach our volunteer monitoring. One is how to best collect useful data. That gets into the design, the credibility, the documentation. The other theme is how to best use the data, the data-to-action. So there is a pendulum. There are a number of kits available that we can use that might have value for education, but don't necessarily provide usable, meaningful data. On the other hand, you can use some very esoteric measurements that are very expensive. I get some calls asking whether we do pesticide monitoring as part of our program. The answer is no, we can't afford it, it is too expensive and too difficult. So there is always this pendulum swinging back and forth regarding method, accessibility, and usability.

The reality is, we feel that there is a continuum, depending on what you are going to be doing with your program. You may be starting the continuum with education and awareness. How many of you are familiar with World Water Monitoring Day? That was actually started as a celebration of the twenty-fifth anniversary of the Clean Water Act. At the upper left in the slide below, you can see the \$17 kit you can buy to do monitoring as part of World Water Monitoring Day. That day is actually a month, but actually you can do it any time of year. That was sponsored by the Environmental Protection Agency and ASIWPCA, and now Water Environment Federation is a sponsor. So a

lot of classroom groups can go out and do the monitoring and enter the data on a national database and see what other groups have found. You don't have to use this kit, but it is at one end of the continuum.

In the middle we see a lot of kits being used, LaMotte and other kits, and some of the less expensive meters for programs that focus on identifying problems, assessing impairment and local decisions. At the far extreme are the methods that might be used for programs whose focus is legal and regulatory issues, and there are not as many of them. If you look inside the arrow you can see that as you go across this continuum, to move from a program that is educationally based to the other types really involves more time, more thought, and more rigor in your program, more development of quality assurance procedures, and it is going to be more expensive.



A couple of years ago I was being interviewed by an environmental reporter I've become very familiar with over the years from our statewide paper. As we talked about volunteer monitoring I said something about the expenses of the program and he said, "It's not free?"

I said, "Volunteer monitoring is cost effective, it is not free."

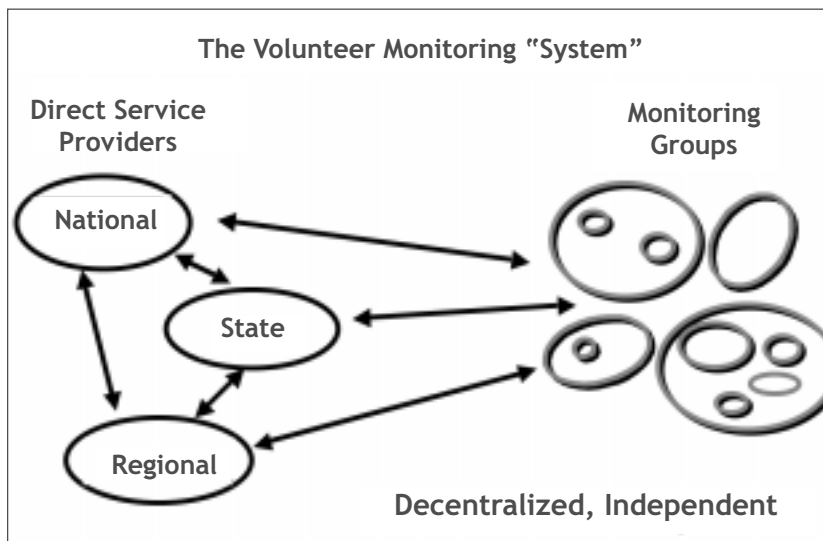
He said, "I never realized that."

We have our volunteers contributing their time and their effort and energy, but to coordinate the program costs money. This is a concept that a lot of people have to wrap their minds around, that there are expenses in any good program, as we all well know.

But I think whether your program is focusing on education, on out-

reach, on screening, on regulatory issues, on changing laws, what we really want to remember and stress for all of our programs is credibility. This is one of my favorite quotes by a gal who works with me and ran a River Rescue program for many years. It doesn't mean having the most exacting techniques, it means delivering on your promises, doing what you say you're going to do, developing data quality objectives, setting up a study design, and then achieving those things that you have set up for yourself to do.

I want to talk a little about the volunteer monitoring system, which really falls under the "herding cats" category. It is kind of mooshy. There are a number of different groups involved in volunteer monitoring, there are a number of direct service providers, there are some national organizations, statewide organizations, regional organizations, nonprofits, universities, extension services, and counties, and they have various aspects of ways they work with volunteer monitoring programs.



There are also different kinds of monitoring groups. I actually was working on organizing a session at a conference and it suddenly dawned on me that one presenter was talking about a volunteer monitoring program of one person. But that is the exception. There are groups that are groups of individuals, there are groups of groups, there are confederations, there are statewide programs, there are programs that range in size from one to ten, there are Texas-size programs with thousands and thousands of volunteers, so there is a whole gamut. It is kind of another continuum, but they are generally characterized as being very decentralized and very independent of each other.

From the start, the EPA has been a staunch supporter of volunteer monitoring. Not so much now, but they have really led the charge, and they have provided a lot of services to the volunteer monitoring



"Credibility doesn't mean having the most exacting techniques. It means delivering on your promises, no matter how small or large they are."

- Meg Kerr
RI River Rescue

US EPA

- Numerous Web sites (<http://www.epa.gov/owow/>)
- Volunteer Monitoring Guides
 - Lakes
 - Streams
 - Estuaries
 - Quality Assurance Project Plans
- *National Directory of Volunteer Programs*
- *Volunteer Monitor Newsletter*
- Volunteer Monitoring Listserv
- National Conferences '88-'00
- Webcasts



State Programs

Agency Operated or Supported

- Study design: standardized content or process
- Coordination: groups or services
- Program management: agency, university, or nonprofit
- Training: direct or train trainers
- Data: management or guidance



community, particularly in the early days. And everything now, of course, is online and accessible. They developed very detailed monitoring guides for monitoring lakes, streams, and estuaries, and for developing the Quality Assurance Project Plans that anybody who has an EPA grant has to have. They have developed various national directories of volunteer monitoring programs, and Ellie Ely, who is at this conference, has done a tremendous amount of work on those. The last one was done about ten years ago and that is online on the EPA Office of Water Oceans and Wetlands (OWOW) site, so you can look at that to see who is doing what. They are the financial sponsor for the eighteen-year-old *Volunteer Monitoring Newsletter*, which has been a fabulous way of disseminating information about volunteer monitoring on a topical basis. They have a Volunteer Monitoring Listserve with about 500 program coordinators on it. They were the major sponsor for our six national conferences, and recently they got involved in Webcasts. I did one last year with them on getting started in volunteer monitoring, and all of their Webcasts are archived, so if you want to listen to me from last October you can do that.

There are volunteer monitoring programs in every state. A number of states have agency-operated or supported programs. They may help with the study design, how you organize your program, identifying the questions you want to address and how you proceed to answer those questions. They may coordinate groups or services. I know several of our states have arranged grant programs for volunteer monitoring programs so that if they want to get chemical analyses done they can be done at reduced rates at the statewide laboratory. They may help with program management. They may have training or train-the-trainer programs, and they offer direct management or guidance of programs. These are examples of just a few of the states that are involved in that.

One state in particular that I would like to mention is New Jersey, which has developed a tiered approach. In a way it took that continuum and developed four tiers for their community-based programs, ranging from education, stewardship, and assessment, to indicators and regulatory response. And for each of those tiers the community groups need to figure out what the intended purpose of their program is, who they are defining as the data users, and what are the uses of the data.

The woman who runs the program, Danielle Donkersloot, is very energetic and she has worked very hard to get her community groups to decide what they want to do and then see what tier they fit in rather than designing their programs to match the tier. In other words, she has worked very hard to see that the groups organize and meet the goals that they themselves have identified. She has a group

New Jersey's Tiered Approach

- Tier A: Environmental Education
- Tier B: Stewardship
- Tier C: Community Assessment
- Tier D: Indicators/Regulatory Response



monitoring water quality in a watershed that is 98% impervious. Pretty amazing. And what she has also done, which is very interesting among the state agencies, is that she has gone to the various departments in the New Jersey DEP and told the folks who use water quality monitoring data or other environmental data to determine which tier of data is needed to meet the objectives of their program. And she will say, "And you can't say it is Tier D unless you can prove it to me that you need the most expensive and highest quality data."

So it has engendered a lot of thinking within that agency in terms of how to involve volunteer monitors in what they're doing, how to incorporate the data, and what kind of data they really need to make their decisions.

Thrown into this mix are a number of national, regional, and other programs that also work to train-the-trainer and have some wonderful programs for enhancing environmental and community-based monitoring: the Izaak Walton League, River Rescue, the Sea Grant program across the country, the ALLARM program we heard about at this conference, and an unpronounceable acronym, CSREES, the Cooperative State Research, Education, and Extension Service.

I would like to talk a little bit about the Volunteer Water Quality National Facilitation program that I operate with a grant from CSREES. Rick Bonney suggested this might be a model when we think about citizen science. This was developed as a part of a National Facilitation Project grant that we originally got in 2000 after being sure there was no way in the world we would get it, so it is all the more satisfying. We realized there were any number of volunteer monitoring programs in the Extension system that were operating in a very isolated manner. No one knew what the other was really doing, no one knew how to make contact, but we kept seeing this overwhelming interest in and concern about improving all of our programs. Because this was an Extension grant, I had to say that I was doing this for Extension-based programs, but the reality was that we knew everything we were sending out would be applicable to community-based programs no matter what their origin was.

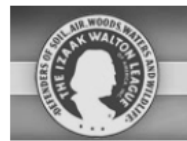
In essence, what we wanted to do was create a one-stop shopping place for support for the volunteer monitoring communities so that everybody else doesn't have to go through thirty-five Google pages on a topic to figure out how to get going and what to do. So we have developed a Web site as everybody else does, and the Web address is listed below.

We have a listing of all of our Extension affiliated programs. There are

State, County, Academic, and Nonprofit Organizations

Provide organizational and technical service to program coordinators at all levels

- Organizational development and support
- Study design
- Technical training and support
- Analytical services
- Data management and interpretation
- Networking with other programs



USDA CSREES National Facilitation Project

www.usawaterquality.org/volunteer

- Build a comprehensive support system for Extension volunteer water quality monitoring efforts
- Expand & strengthen the capacity of existing (Extension) volunteer monitoring programs
- Support development of new groups



Volunteer Monitoring
National Facilitation
Project

Extension Volunteer
Monitoring Programs

Related Research
and Educational
Efforts

Guide for Growing
Programs

Guidebook Modules

- Designing your monitoring strategy
- Effective training techniques
- Quality assurance issues
- Databases and data management
- Volunteer management and support
- Outreach tools In progress
- Fund raising



about fifty on it, so that is a small portion of the actual volunteer monitoring world. It was actually really hard to find those programs and I was amazed at how difficult it was, but we have direct links to those and all of the program coordinators. They are all listed under "Extension Volunteer Monitoring Programs." Because of concerns about and interests in how volunteer results compare to professional results and how volunteer monitoring has been integrated into research projects, we queried folks and asked them to give us examples. We have developed an annotated bibliography here under "Related Research and Educational Efforts," which includes anything we happen to come upon that relates to those topics. I can see, looking at the Cornell citizen science Web site, that we are going to be adding a lot of Cornell references to that list.

One of the main things we wanted to do was develop our guide for growing volunteer monitoring programs, which is comprised of topical fact sheet learning modules, shown on the Web site under "Guide for Growing Programs." We distilled the knowledge and information that is out there so that folks didn't have to reinvent the wheel. The modules are in hard-copy, they are online, and they all have numerous live links. Every six months I have a student go through and check every single link to make sure they are still active. The main topics we have come up with so far include designing your monitoring strategy and identification of effective training techniques, developed by people who are expert at doing this out in the field with their programs. What are some of the data credibility

and quality assurance issues, the things you need to think about? A lot of these are things we call “things to think about before getting your feet wet.” The final two topics, outreach and fund raising, are ones that we are still working on.

To get a lot of this information out, we developed a listserv. We have about 400 folks on it right now. Folks will typically post questions and we’ll get answers, and we use this as a way to find out what is out there in terms of knowledge for our programs. One of the things we realized is that there were some delightful discussions going on when someone would ask a question.

I then realized my e-mail box was getting full of all of those requests and I didn’t want to get rid of the replies because they had such

The screenshot shows the homepage of the Volunteer Water Quality Monitoring National Facilitation Project. At the top, the logo features a stylized bird and the text "Volunteer Water Quality Monitoring National Facilitation Project". Below the logo is the email address "CSREESvolmon-list@uwex.edu". The main content area is divided into several sections: "Volunteer Monitoring National Facilitation Project", "Project Description", "Outreach Materials and Activities", "Nationalwide Inquiry", "Online Databases", "Extension Volunteer Monitoring Programs", "Related Research and Educational Efforts", "Researching Volunteer Monitoring Using Volunteer Monitoring Sites in Research", "Select Archives of Volunteer Monitoring Listserv Discussions" (circled in red), "Publications", "Training Modules", "Other National Facilitation Projects", "NERO", "Increasing Tribal Involvement in the Water Quality Network", and "Additional Facilitation Projects". A central image shows a person in a field using a water sampling device. To the right of the image is a "Guide for Growing Programs" section with various sub-topics like "Getting Started", "Why Monitoring Matters", "Designing Your Monitoring Strategy", "Monitoring Matrix", "Effective Training", "Monitoring Suppliers", "Direct Links to Monitoring Programs", "Building Credibility", "Sharing Information Through Internet Exchanges" (circled in red), "Volunteer Management", "Planning Your Program's Data Management System", "Outreach Tools", and "Locating Support and Funding". At the bottom right, there is a "Special Topics" section with "Current Highlights: Utah Lake Watch", "Highlighted Program Archives", "Job Postings", "Beck's Dip-In", "World Water Monitoring Day", and "Volunteer E. Coli Monitoring Project".

Select Archives of Volunteer Monitoring Listserv Discussions

Sharing Information Through Internet Exchanges

useful information. So we developed an archive for the listserv exchanges so that we could really preserve the spontaneity of the exchanges, and we got permission from everybody. We will post the question that was posted on the listserv and we will then post what all of the answers were. I could now clear out my e-mail box and people could link who said what and maybe go back to that and get more information.

They are arranged topically and we have a little fact sheet about it, and we now have over sixty topics in our archive, everything from ammonia monitoring to getting programs started, to liability issues, to long-term programs. So any time that a topic comes up and there have been a couple of responses, either from the EPA listserv or our Extension listserv it’s up there. What is now interesting is that every couple of years we start seeing the same questions come up again, so

it is very much of a cycle as new people come on board and more experienced people move on. We can point them to the exchange that has already happened and add to that exchange with the new information that has come on board.

The question arose, who has online databases for volunteer monitoring programs? We investigated and learned that there are about twenty-two programs that we know of that have online databases, so we set up a section on our Web site with direct links to those twenty-two programs. You can now go right in and see what that program has and how they developed it.

Then we developed a factsheet learning module about planning data management systems, the things to think about before you get

Online Databases

Volunteer Monitoring National Facilitation Project
Project Description (2011) (pdf)
Outreach Materials and Activities
Nationwide Issues
Online Databases
Extension-Volunteer Monitoring Programs
Related Research and Educational Efforts
Researching Volunteer Monitoring Using Volunteer Monitoring Data in Research
Select Archives of Volunteer Monitoring Library Discussions
Publications
Training Modules
Other National Facilitation Projects
NERO
Increasing Tribal Involvement in the Water Quality Network
Additional Facilitation Projects

Guides for Growing Programs
Getting Started (2011) (pdf)
Why Monitor? (2011) (pdf)
Match Sites (2011) (pdf)
Designing Your Monitoring Strategy (2011) (pdf)
Monitoring Skills (2011) (pdf)
Effective Training (2011) (pdf)
Monitoring Equipment Suppliers (2011) (pdf)
Direct Links to Monitoring Programs' Manuals (online)
Building Credibility (2011) (pdf)
Sharing Information Through Informal Exchanges (2011) (pdf)
Volunteer Management (2011) (pdf)
Planning Your Program's Data Management System (2011) (pdf)
Outreach Tools
Locating Support and Funding

Special Topics
Current Highlight: Utah Lake Watch
Highlighted Program Archives
Job Postings
Search Slip-In
World Water Monitoring Day
Volunteer E. Coli Monitoring Project

National Water Quality Monitoring Conference
March 2011, 2012

- Direct links to 22 programs with online databases
- Factsheet learning module: what to consider before setting up a database

involved, the questions to ask, and the way to move forward with that. That has received a very positive response. With almost all of these factsheet modules we have held workshops around the factsheet topic, and every presentation we have ever done on any project is also archived on the Web site, including all of the PowerPoint presentations, so you can go back and see what we did. You can also go back and see, if you really want to, how one talk has led to the next. That is all listed there also.

Then we realized that sometimes we had trouble getting people to

read a fourteen-page factsheet. We developed a listing of all of those links under “Publications” on our Web site, so you don’t have to read all of the wonderful prose that links the factsheets and links the Web site with everything. They’re all listed there, which offers a more direct way, kind of a clearinghouse for information.

Last week before coming to this conference, one of the colleagues in our program posted a listing asking for any factsheets related to nitrogen. We got the best response and the fastest response we have ever seen. Within one week we now have thirty links to factsheets and information on nitrogen and nitrogen factsheets. I haven’t looked at any of them yet, but I know that they are going to be tremendously helpful for me as I redesign our very archaic nitrogen factsheet.

We were really thrilled with that. We also heard back from people saying, “Hey, I want information on phosphorous,” or “Hey, I want information on what communities can do to deal with tree issues.” A lot of different topics came up, so we’re going to be adding those. It is working well.

We see that there are a number of scientific rewards for volunteer monitoring. There have been huge increases in the number of locations monitored, with as many as ten volunteer monitoring sites to one agency monitoring site. Many of our agencies aspire to get out and monitor a place once a year. Many of them actually, through rotating baseline monitoring, feel really good if they go out once every five years. Many of our programs are now in their second or third decade. I was really struck by the comment that Sam Droege made earlier in this conference, that research programs can be started to address an issue at any time, but a year missed monitoring is a year gone forever. That really resonated with me and I’m going to steal that and use that in most presentations I make from now on.

Many of our state environmental agencies focus on locations that are impaired—the impaired waters listing, the TMDL programs (Too Many Damn Lawyers)—and focus on plans for repairing these impaired waters. Many of our volunteers are interested in documenting the high quality waters, the resources that are wonderful now, so that they can go to their board, they can work with their communities, they can work with the agencies and say, “This is something we may need to protect, this is where we want to focus our land trust activities on enhancing and preserving before we have to get a TMDL program.”

This is a quote that speaks so well to me and I am so glad that there



Scientific Rewards

- Huge increase in number of locations monitored (~ 10 vol mon to 1 agency site)
- Weekly rather than annual (or less) monitoring
- Source of long-term data (15, 20, 25 years...)
- Identifying the high quality waters as well as problem areas
- Finding causes of problems

"It is in the marriage of credible data and increased stewardship behavior that the true potential and vitality of citizen monitoring begins to emerge."

- Steven Hubbell,
Colorado River Watch

are people who can put these things in prose that I can't. It is the data, it is the stewardship, and those are the important things in what we are doing.

When I talk about volunteer monitors I talk about them not only being citizen scientists, I talk about them being community educators, with rewards from children to seniors.

These are some of the things we've talked about and heard over and

Volunteer Monitors are Community Educators



Photos: Eleanor Ely

Educational Rewards Youth to Seniors

- De-mystifying science
 - It's not just for professionals!
- Science literacy
 - Learning the language
 - Appreciating the process
- Hands-on activities
 - Doing enhances learning!
 - Learning from mistakes

over again, and that we've seen some fine examples of here. Volunteer monitoring de-mystifies science and communicates the understanding that it is not just for professionals. It increases science literacy, and that is probably true of all of our programs whether it is stated or not. It enables the volunteers to appreciate the process and to understand that it is a process. Then there is involvement with hands-on activities, which is just so great.

One of the best things I ever did in my program was invite the president of the university to go through a volunteer training. This was early in his tenure at URI and he was not yet controversial. He came and he didn't introduce himself as president of the university, just as Bob Carothers, and none of the volunteers recognized him. That was the smartest thing I ever did because he remembers that and it has really helped my program, and it is because of the experience of the doing as we all know. The experience of the doing is how you remember, not what you read in the book.

There are growing and very, very important rewards for our families as we increasingly see that folks are not playing outside. I was reading one of the papers this morning about how outdoor living rooms are becoming passé now because people realize they have to work to maintain their multi-thousand dollar decks and grills and outdoor furniture, and the kids want to be inside.

All of these activities we're seeing here get people outside and connect us with our natural world, which is so important. Rather than being on the sidelines and cheering your kid out on the soccer field or some other sports field, you are out together enjoying it. We see a growing number of people becoming involved in our programs for that reason, for family activities that keep them together and keep them talking. And the kids love to teach the parents and help them understand how to use the gadgets. Someone made the comment earlier, "E-mail is for old people." That is really scary to me. My daughter explained to me, using that exasperated daughterly voice, "I can't believe you don't know how to text message! All you do is this, this and this."

Rewards for Families

- Volunteer monitoring can strengthen family relationships
 - Working together for a good cause
 - Being together instead of watching from the sidelines (no emphasis on athletic skills)
 - Kids teach parents
 - Parents teach kids
- Volunteer monitoring tangibly connects people to their environment
 - Counteracts the plastic world of TV, videos, computer games



Societal Rewards

- Volunteer monitoring originates in the community and builds strong community partnerships
- Volunteer monitoring educates the community to make informed decisions
- Volunteer monitoring provides youth with civic lessons and hands-on science
- Volunteer monitoring provides a pathway to increased civic activities/responsibility
- Volunteer monitoring can reach underserved audiences

There are also a number of societal awards for all of our citizen-based activities: to build community partnerships, to help our communities make decisions, to involve hands-on science, civic activity, and to reach our underserved audience, which is very, very important.

I'm going to move ahead to one of my favorite quotes.

Challenges: Is It All rosy?

So is it all rosy? Is everything just great? Are we all holding hands and singing "Kumbaya"? Oh no, I



"I don't know when was the last time I've worked with twelve agencies and gotten something done."

- Toby Page
Lake Chocurua Association
University of New Hampshire
Cooperative Extension

don't think so. Again, from our folks at Alabama Water Watch: Our program goals, our activities, have a powerful influence on who participates, how long they stay active, and data credibility. We need to keep it real to the people involved in it.

We need a sustainable program. We need groups

Data credibility depends on a sustainable monitoring program and groups of dedicated volunteers who see the program as relevant and enjoyable in meeting their group's overall objectives of achieving clean water.

-Alabama Water Watch

Program goals, activities and cycles have a powerful influence on who participates, how long they stay active, and data credibility

-Alabama Water Watch

of volunteers who see the program as relevant, enjoyable and meaningful to meet the objectives of our program.

What we see often with agency programs, with EPA programs, with research programs, with hypothesis-based programs is the need to answer big questions, and these are questions that need to be answered: What is the condition of the resource? Is it changing over time? What and where are the causes? Are the programs and the many millions of dollars we are putting into these programs making a difference? Are our goals being met? These are kind of top-down, very important programs.

Agency/Research Questions (hypothesis-based / probabilistic)

- What is the condition of the nation's surface, ground, estuarine, and coastal waters?
- Where, how and why are water quality conditions changing over time?
- Where are problems related to water quality and what is their cause?
- Are programs to address problems working effectively?
- Are water quality goals and standards being met?

Community and Individual Concerns (targeted monitoring)

- I want to find out what's in my water.
- I think there's something wrong with my lake.
- How do I get rid of these weeds?
- Why does the stream go dry now?
- Will my grandkids be able to swim here?

You have that in contrast to what we see from many of our community-based programs, that enlightened self-interest: What's going on with the water? Why is this stream drying out? Why are we having flooding now? Is it safe to go in the water? Will my grandkids be able to swim in this stream?

So we recognize all these concerns and realize we need to find a way to mesh them together. There are inevitable conflicts in which you end up with the residents against the community leaders. Who here works on local community boards, conservation boards, zoning, or



planning boards? Bless you. It is very, very challenging. It often becomes the community leaders versus the experts, and the experts may come in with jargon-laden explanations of why this is what it is, but they don't want to commit unless they've got that ninety-five percent confidence interval to make sure that they are one-hundred percent correct. Our community leaders don't rely on one-hundred percents to make their decisions (as a matter of fact, I think many of them rely on much less to make their decisions). We need to realize that this tension exists and we need to work together to try and work around some of these things to get people involved.

I now have a number of environmental professionals who work in the R.I. Department of Environmental Management who are volunteers in

my program, which is kind of fun. They say it's the only way they get out on the water, but what it has done is enable them to see the steps involved in the process, and it has enabled them to meet the residents of the area and learn of their concerns. That has been very helpful for the program also.

So we've got this combination of top-down and bottom-up that we need to address. What many people and many programs want to do is answer this question: What's in it for me? I use this when I'm talking to monitoring organizations that are interested in forming a monitoring council to get people to leave their personal hats at the door and come to the table and meet together as a collaborative group. But as you're working together you still need to address the question, what's in it for me?

We end up with a model that Candie Wilderman talked about earlier at this conference, the Community-based Participatory Research Model, in which we work together to build consensus, the communication, the coordination, the collaboration—the three C's— and empower communities, recognizing our capacities and our limitations.

WIFM



Conclusion

I wanted to leave you with these quotes.



Photo: University of New Hampshire Cooperative Extension

(the volunteer monitors were)
"the 'hub of the wheel' that made the project a success...They provided the factual data on which decisions were made."

-Sherry Godlewski, NHDES, University of New Hampshire Cooperative Extension

They underscore the recognition that volunteers were the hub of the wheel that made the process a success and provided the data on which decisions were made, and how EPA was so thrilled with that.

So we know that our volunteer programs have a number of results: They educate people. They encour-

"...it is this type of model project that we at the EPA want to support and continue to see occur..."

-Warren Howard, EPA-NE, University of New Hampshire Cooperative Extension



Volunteer Water Quality Monitoring Programs...

- Educate the public on water quality or watershed issues, how to protect and restore resources
- Encourage citizens to adopt “watershed-friendly” behaviors and policies
- Bring university science to the community and the community to the university
- Gain valuable water quality data that is distributed to community decision makers in a usable format
- Enable communities to take action to protect and restore their waters

age our citizens to adopt watershed-friendly practices. They bring science to the community and the community to the science. They provide data in a way that people can understand, and enable us to take action to protect, restore, and maintain our waters.



Relevance to Citizen Science Toolkit/Web Site

- Since I have my laptop here I was able to look a little more deeply at that Web site (www.usawaterquality.org/volunteer) as you were going along. It is awesome. I think we’re going to rename it “Citizen Science Central” and we’re done. All of the things that we’ve talked about at the Lab about needing to know more about volunteer retention and recruitment is there. It’s too bad you don’t have the hot link to the funding module yet.

For me what was coming up during this presentation is that water quality monitoring is a pretty discrete area and it is easy to wrap a Web site around that. Citizen science is so big, so complex, with so many different disciplines, maybe we really don’t want to have a community or a Web site around that. Or should there be separate ones housed within it? I don’t know the answer to that. We can include that in our later discussions. - Rick Bonney, Director of Program Development and Evaluation, Cornell Lab of Ornithology