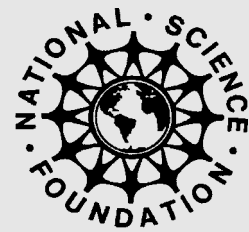


**Citizen Science
Toolkit Conference**

June 20 - 23, 2007

citizen science toolkit
and closing discussion



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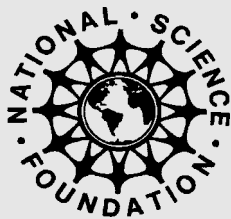
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This discussion took place at the Citizen Science Toolkit Conference at the Cornell Lab of Ornithology in Ithaca, New York on June 20-23, 2007.

In the following discussion participant comments are not necessarily exact quotes and may have been paraphrased or edited for clarity.

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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Any opinions, findings, and conclusions or recommendations expressed in this documentation are those of the authors and do not necessarily reflect the views of the National Science Foundation.

The following discussion was held during the final plenary session 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>

Citizen Science Toolkit and Closing Discussion

Citizen Science as a New Field or Discipline

- I would like to pick up on something one of the groups just said about “fields of discipline.” What I’ve been wondering during this whole conference in terms of where we go from here is, is citizen science (or whatever we decide to call it) a discipline? Is it an emerging field? If it is a discipline or an emerging field, how can it be organized? Will there be textbooks someday? Will there be a journal of citizen science someday? If so, is it time to start thinking about an association, like the Visitor Studies Association for people who are studying how visitors react to and interact with each other in museums, who got together and said, “We need to work together”?

Or is that the kind of thing that would kill something that is really kind of neat because it’s a little bit loose and woven together in a web? I would like to open the floor to that discussion and then come back to the nuts and bolts of the toolkit. - Rick Bonney, Director of Program Development and Evaluation, Cornell Lab of Ornithology

- This is not my idea, it was said in my group, but it stuck with me. It’s Science 2.0. - Rob Stevenson, Associate Professor of Biology, University of Massachusetts, Boston
- I took the position that I now hold believing that there is a field, there is a practice, there is scholarship behind this. Something like associations and journals are common to other practices and fields and I see no reason why they shouldn’t be common to this field. Certainly there are differences among projects and different approaches, but in any field you have different theoretical frameworks, so I think the field of citizen science can accommodate these differences. If we’re looking at the effectiveness of our practice, we are doing scholarship. We do have a field, no matter what we say it is called or what frameworks we operate under. - Rebecca Jordan, Assistant Professor of Citizen Science and Environmental Education, Volunteer Trail Monitoring for Invasive Plants, Rutgers University Department of Ecology, Evolution, and Natural Resources
- On the one hand I completely agree that it is an emerging field or discipline. I only caution us against using the term “discipline” because it is a very academic term, and the concept of citizen

An Existing Field Transformed by the Internet

- I’ll play devil’s advocate. One of my thoughts throughout this conference has been that what you are seeing in citizen science vis a vis science really isn’t that different than what many other fields are seeing because of the structure of the Internet—whether it’s citizen journalism or what is happening to medical care and the disintermediation of doctors, or music.

In some sense, the scientists as the high priests of science are going to lose their role and become partners in the scientific process. In many ways, what I think we are seeing is a transformation of the field much more than a new subsection of the field. And it’s all Web 2.0, it’s interaction, it’s all because of that. - David Witzel, Managing Director, Backyard Jungle, Forum One Communication

- So maybe it isn’t about a new discipline. Maybe it is that things are becoming more public—science, journalism. I remember documents about the Iraq war being loaded onto the Internet and poring through them and reading analyses of what was really happening. - Rick Bonney, Director of Program Development and Evaluation, Cornell Lab of Ornithology

About that Word "Citizen"

- If you think of the word "citizen" in terms of being a citizen of the world, worrying about whether citizen is the right term is a very American perspective. Just define it as being global citizens and dispense with that debate. - Louis Lemberg, BioBlitz 2006, CyberTracker Conservation
- It's not the Americas in general— I'm from Canada and we don't fix on that. It's a United States thing, this "citizen" business. - ZoAnn Morten, Staff, The Pacific Streamkeepers Federation
- I'd rather not get too involved in definitions and semantics and instead focus on the process. If you start worrying about what "citizenship" really means you're going to miss an important point. I'll point out something since we're here at the Lab. The bird logo used for the Lab was controversial almost from the moment it showed up and people wanted to get rid of it. It's still here because it works, and "citizen science" will work because it does work. Let's get at the process of making it happen. - Donald McCrimmon, VP of Academic Affairs, Nature Network, Cazenovia College

science extends far beyond academia. It's really critical to choose our words carefully and I'm not sure "discipline" works. There may be a place for an academic discipline of citizen science within the broader field of citizen science, but I don't think that captures the whole essence. - Kate Litle, Program Coordinator, Coastal Observation and Seabird Survey Team, University of Washington

- The analogy for me has always been GIS. GIS is a tool but it is also a field. There are people in another field who just use GIS as a tool, and there are people for whom that is their discipline and their field. - Michelle Prysby, Coordinator, Virginia Master Naturalist Program, Virginia Tech Department of Forestry
- Is it a reemerging field? Before there was science there were people who observed the world around them, thought about it, experimented, and tried to make it better in a variety of ways, and that is science. I think it's a reemerging field. - Maureen McConnell, Senior Exhibit Developer, Boston Museum of Science
- As a scientist, I want to endorse yet again the scientist's perspective that if a separate discipline called citizen science emerges, in my opinion that would be a handicap. I really like the idea, whether you call it Science 2.0 or whatever, that this is a new way of doing science, and it's the way we need to do science to answer some of the big remaining scientific questions that are out there. I think that is the message that we need to rally around. We need all the different elements involved, scientists and nonscientists, and we need everything that is going on here, but we are not doing something separate from what scientists are doing. We are doing the remaining really big science that needs to get done, and it needs the world's citizens to do that. - Ken Rosenberg, Director of Conservation Science, Cornell Lab of Ornithology
- I work with teachers. I teach teachers, and they go out and practice teaching. There is a whole discipline of study and research regarding teaching, but these teachers are not interested or trained in that. They are interested in what comes out of the research on teaching. When we talk about citizen science, at one level I can imagine researching the process of citizen science programs. That to me is academic, it is a discipline, it is scholarship. That is one aspect. But what people are doing and participating in as science may be a different aspect; perhaps more applied.

It is all part of the same thing, but I still see citizen science as a distinct discipline, an area of scholarship, an area in which a journal could exist that would publish papers by people working in different areas. Citizen science is an interdisciplinary area of

research, and these different disciplines could appear in a common journal so that I could find out about people's research at one level and about what people are doing at a different level. That would be fantastic for those who are practicing citizen science and those who are researching citizen science. There is scholarship that is built around studying scientists and the philosophy of science and there is the practice of science, and this does not pose a theoretical problem. Why can't there be a scholarship built around studying citizen science as well as the practice of citizen science? Again, an interdisciplinary citizen science journal could capture research and practice—I would endorse that. - Rebecca Jordan

- I didn't mean to imply that the scholarship aspect of this is less than valid. What I am saying is that if the science that is done is labeled as citizen science, it will be handicapped, like it or not, by some within the scientific community. - Ken Rosenberg
- I'm trying to figure out what Ken is saying. I think Rebecca is talking about a journal in which people from different disciplines publish. That happens in science. If you look at the *Journal of Animal Behavior* or the *Journal of Ecology*, you'll find trees and fish and mollusks. I guess you won't find astronomy in there, but there are probably journals that have more of the physical sciences. That is already happening.

I am wondering if what you are saying, Ken, is that we actually run the risk of marginalizing citizen science by having an association like that because then the response could be, "Oh, that's just citizen science that they're doing over there." I think people were applauding when you spoke about taking over the scientific enterprise and science being more of a public endeavor. But then there is a whole other set of discussions that we could evolve into because that happens a lot more in Europe, I think, although I am quickly out of my field here. I think in Europe the public has a lot more impact on science and I think it has both positive and negative consequences. - Rick Bonney

How Much of a Science Role Do Citizen Scientists Play?

- One of the things we discussed in our group is the fact that we've slipped into calling participants "citizen scientists," and in fact we are not training them to be scientists. They are data collectors for the most part. They are participants in a process, but they are not scientists. For the most part, we are not directing our programs to create scientists out of our participants, nor do many of these people want to become scientists. So one of the difficulties of the term is slipping into the idea or the thinking, on our part and on

A Product of a More Educated Public

- I think citizen science is due to more global education in this country. As people become more educated and more aware of issues, they become more involved. Citizen science is a part of the product of having a more educated public. - Joy Marburger, Research Coordinator, Great Lakes Research and Education Center, National Park Service

Next Steps?

- Something that I would like all of you as practitioners to be thinking about is, what do you want from this group? One part of that question is, what do you want from the Web site? That is the only thing we have right now that is tangible, and that won't come to fruit until we start including all the different models and all the Google Docs on there so that it becomes something from this group.

I'm also trying to think of where we go from here. I keep hearing, "When is the next conference?" which made me very happy. Who is going to sponsor it? Is this group going to come together and form an association? I don't know about definitions, but I'm trying to move us in that direction. - Rick Bonney, Director of Program Development and Evaluation, Cornell Lab of Ornithology

their part, that these people are in fact citizen scientists when most of them have no intention of being so, and most of us have no intention of teaching them to be so. - Chip Taylor, Professor of Ecology and Evolutionary Biology, Monarch Watch, University of Kansas

- I don't know if that's really true that most of us don't have that intention. I fundamentally agree with what you say and you know that because we've discussed it a number of times in the last couple of days. But there is "citizen science" and there is a "citizen scientist," and those are different things. Citizen science can involve people at many different levels. I don't think we call somebody a "citizen scientist" until and unless they are asking and answering their own questions.

I think that a lot of the programs that we are developing do hope to do that. You can go into the eBird database or the FeederWatch database, download the data, come up with a question, and answer and publish it in a peer-reviewed journal (if you can get it in there). That is somebody using these data, which they might have helped to collect, to really finish off that process. The problem is that it is hard to get people to do that. If anybody here really knows how to get people to do that, that is something we might have focused on integrally in the last couple of days. So I think there is a distinction there in when we call somebody a "citizen scientist." - Rick Bonney, Director of Program Development and Evaluation, Cornell Lab of Ornithology

- We had the same debate internally a while ago. We were kind of interchanging the terms "volunteers" and "citizen scientists," and we thought we should standardize it. What we came up with is that it is more of a process. Volunteers are working towards becoming citizen scientists, just as anybody works towards becoming a scientist in their education, so it is more of a process than a definition. - Timothy Vargo, Research Coordinator, Neighborhood Environmental Education Project, Urban Ecology Center

Ideas for Next Steps Going Forward

Creating an Association, Curating Shared Assets

- To advance the concepts and consolidate the vision under which many of us now operate, certainly those of us in the Cyberinfrastructure Group felt there is no question that this community is not only an association but something much larger. Right now we are really fragmented. Everybody is trying to get \$20,000 here and \$20,000 there to build something that somebody else has already kind of built somewhere else, whether it's a program, a volunteer database, or whatever.

If we try to take a bold vision about where we want to be in five years and can get together and agree on that, we can communicate that vision, not to the standard funding sources, but the new money funding sources that Josh Knauer is familiar with and has some experience with, at least peripherally. If we could just explain the concept to them and what we are trying to do, which I don't think we can do very well right now, there are some people there who will say, "Man, that's great! I happen to have made my money by doing technological work. I see that lots of solutions need a technological framework so that all of these projects can use it."

There's more to it, but I think unless we want to keep scrabbling away piece by piece, the only way we can make this concept scale up is to at least create an association. But much bigger than that, make a body that actually curates shared assets. - Paul Allen, Assistant Director of Information Science, Cornell Lab of Ornithology

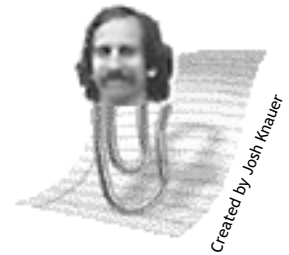
- I would like to hear whether other groups share that vision. That was the Cyberinfrastructure Group. What about Research, what about Education? That wouldn't apply so much to the Evaluation Group for obvious reasons, but certainly some evaluation tools could be standardized. - Rick Bonney, Director of Program Development and Evaluation, Cornell Lab of Ornithology
- As a point of clarification, does the association involve the professionals, or does it involve participants, or key participants? - Lori Bushway, Senior Extension Associate, Leader of Adult Outreach, Garden-based Learning Program, Horticulture Department, Cornell University
- To be determined, but my first thought was professionals in the field. Not the participants themselves because I think it is the individual projects that know how to recruit and embrace their participants, not an association. - Rick Bonney

Cross-disciplinary Communication and Common Denominators

- I am hoping that the product of this conference is going to be that people from many different disciplines studying many different things are going to start talking and sharing and basically becoming more efficient as a group. I would love to challenge all of us in this room to figure out a way to do that with the hundreds of thousands of citizen scientists, or whatever you want to call them, that are already out there. How do we get the frog people talking to the bird people talking to the rain people talking to the astronomy people?

The only analogy I could come up with late at night are people who collect antiques. They all love antiques, but some collect coins, some collect furniture, and some collect paintings, and they all

It looks like you are trying to start a citizen science project...how can I help?



A Rick Bonney "Paper Clip"

- Speaking to Rick's earlier question about what we want from this group, and to the suggestion from the Cyberinfrastructure Group regarding shared assets, we were joking around in the Education Group that part of what we would like to see on the Web site is a Rick Bonney version of that horrible little paper clip that comes up in Microsoft. Basically, it's an electronic version of "call the expert." In this case you could "call Rick" and ask, "How do I take a shortcut, how do I get from here to there rather than having to read all of this?" - Chuck Remington, Director of Field Support, National Audubon Society

Publishing Papers Based on Citizen Science Data

- We had a discussion in the Evaluation Group about papers that are published that come out of citizen science. They were produced using methods that you interpret as part of the paper. Those methods may differ from traditional research, but the two can benefit from each other, and those of us here can benefit from one another's experiences in that regard. An important distinction to make when you are publishing a paper using citizen science data is how you validated your methods, how the citizen scientists were trained, how the data was gathered, analyzed, and interpreted. - Martin Storksdieck, Senior Research Associate, Institute for Learning Innovation
- Yes. For example, Project Tanager resulted in a paper in *Conservation Biology*, and surely the methods section talked about how the volunteers were trained and sent out into the field. But then are we missing something? That paper doesn't talk at all about the impact on the participants. It doesn't talk at all about how those data might or might not have been used. - Rick Bonney, Director of Program Development and Evaluation, Cornell Lab of Ornithology

watch *Antiques Roadshow* on PBS. That's the one common thing they have. If we could find that one common denominator, or several, that bring all of the people involved, including those who are on the ground in the field, to start communicating with each other, that would put us light years ahead. - Chuck Remington, Director of Field Support, National Audubon Society

Establishing a Group Identity - The Extension System

- I think the Extension programs, to some extent, are something you might want to look at. They have their own journal in which people from all of the different disciplines publish. They meet once a year. Each state has a totally different model in terms of how they engage people from all different backgrounds. It is a way to really get people involved, and what it has done is to give name recognition for this corps of individuals. And for better or worse, there is a kind of aura about it. I think it is good that there is some kind of identity there. - Theresa Crimmins, Instructional Specialist, Sr., Arizona Master Watershed Steward Program, University of Arizona

Holding Another Meeting (and an Impressive Precedent for Doing So)

- I'm having a sense of *déjà vu*. In 1976 a group of us who were studying wading birds decided to have a conference and got some funding. We had the conference and it felt a lot like this one does now. At the end of the conference people were saying, "What next?" What we decided to do was have another meeting, not one that was funded necessarily. We said, "Suppose we held a meeting, who would show up?"

At that first conference I think there were eight people. For the first meeting, which was held at Northern Illinois University the next year—let me repeat that, Northern Illinois University in November—we had 125 people show up on their own dime.

I was thinking it may be the same kind of dynamics that are going on here. The question is, "What next?" My suggestion is (and thus the sense of *déjà vu*), maybe we could hold a meeting somewhere next year where those other eighty people and organizations who wanted to come to this conference (and probably a lot more that we don't know about) could come and join in this discussion.

Let me point out what happened as a result of that second meeting. We created a new organization. We changed the name three times, which is why I'm not too concerned about names. We started a journal. For the first three issues of the journal it was done on an offset press; it wasn't reviewed, anybody could

put anything in that they wanted. That has morphed into what is now, at last count, one of the ten top ornithological journals in the world. It took thirty years to get there, but look what happened.

My sense, just from the feel of this group, is that this could happen here. But it isn't going to happen overnight, it will take some time. That's what my suggestion is: Let's have another meeting. Blogs are good, social networks on the Web are good, but face-to-face is still, in my view, the most productive way to spend time. - Donald McCimmon, VP of Academic Affairs, Nature Network, Cazenovia College

- How many people in this room would go to a meeting a year from now in the United States on their own dime? There are a lot of hands up and as you pointed out, there are all of those other people who wanted to be here. - Rick Bonney

Aspects Warranting Attention

Influencing Policy, Studying the Process, and the Role of Scientists

- There are three things that I think are kind of orthogonal. What I find is that I want the scientific process introduced into the public discussion. I don't really care about the academic papers or people, I want it in the policy decision-making process. So I think it's important that science be delivered, and I think it's important that we have citizens involved in the scientific process in order to do that successfully. That is one thing we're talking about.

A different thing is whether we should be studying that process, and absolutely there should be a process for studying how citizens are involved in the scientific process.

The third thing is, what is the professional scientists role in that process? I think to a large extent it is a guiding role, but that is one of many roles. We also need data collection, we need darned good people disseminating, we need graphic designers, we need Web sites—they are all part of that scientific process that is going to be influencing societal decisions.

That is the big vision I found with all of this. I think we need this in order to cope with society's problems going forward. - David Witzel, Managing Director, Backyard Jungle, Forum One Communication

The Tension Between Objective Data and Motivating Involvement in Political Issues

- I think you have to be quite careful when you get concerned in

A Concept that is Gaining Currency

- I think there is a risk in marginalization, but the idea of citizen science seems to be gaining credibility. E.O. Wilson just wrote a chapter on citizen science in his book, *The Creation*. In my experience in universities, I've run into people who will have nothing to do with it but they are the minority. - Timothy Vargo, Research Coordinator, Neighborhood Environmental Education Project, Urban Ecology Center

Existing Network/Journal for Citizen Science

- There is a group that focuses strictly on getting citizens involved with researchers from many universities and federal, state, and local organizations to do citizen science and publish it in their own journal. It is called Chicago Wilderness and they publish all of their information in that for policy use, for education, for informing the citizenry. It is a huge network of people. - Joy Marburger, Research Coordinator, great Lakes Research and Education Center, National Park Service

Follow-up Survey for Matching Direct One-on-One Assistance

- Might I suggest as part of the survey that goes out post-conference that one question queries the participants in this room: What is your one most specific, pressing problem right now? I'm not talking about "I need funding," I'm talking about something specific and focused relating to your project. Those results then go back out to the group and all of us here commit to helping two peers in this room with expertise we have that might be applicable to their immediate problem. That might be more effective as opposed to the mess of a listserv. - Chuck Remington, Director of Field Support, National Audubon Society
- The post-conference survey that you will be getting from Seavoss Associates won't have questions like that on it because it will focus on evaluation of the conference, but we are planning a second survey after that to assess the willingness of people in this group to help with adding to the Web site in ways that we can't. I love that suggestion, and we'll see where we can go with it. - Rick Bonney, Director of Program Development and Evaluation, Cornell Lab of Ornithology

motivating people to get involved changing policy issues, that is, if you are concerned with monitoring the effectiveness of policy. I think the reason that our data are effective and well respected in the UK is that they are seen as being independent, they are not perceived as coming from a lobbying group. I think there are sometimes some tensions between a desire to gain objective data and a desire to motivate people to become more involved in the general process of political change or pressure for policy change. - Stephen Baillie, director of Populations Research, British Trust for Ornithology

Concrete Suggestions Beyond the Web Site

A Call for Concrete Suggestions

- The NSF grant that funded this was a conference grant. Those are capped at \$250,000, and this proposal was \$249,999. It is expensive to put on something like this, and we have spent most of that money already. We have a little bit of money left over and what we are committed to doing at this point is getting all of those Google Docs from your working groups edited and getting all of the comments up on the Web site where everybody can see them clearly; getting some models for discussion; getting some references on there, which we hope you will add to; getting the database gateway up on there; and getting all your projects on there. There will also probably will be a listserv that has RSS feeds built into it like most of them do.

That is really all the funding that we have available to us right now, which is to complete that Web site and get it going. I have no idea if people will use a listserv, or if people will talk to each other once we all leave here. I see very few models. There are stamp collectors, antique collectors, railroad people, but I've found that professionals just don't seem to talk to each other so much on listservs. What I would like to hear are more suggestions about moving this forward beyond just finishing building the Web site.

- Rick Bonney, Director of Program Development and Evaluation, Cornell Lab of Ornithology

A Call for Concrete Action

- I felt like a lone voice in the wilderness when I first came to this conference and since I have been here I feel like there has been a slightly broader acknowledgment that one thing we need to do is move forward in the next decade or so to give citizen science the status it needs and the infrastructure to support it. No one institution can do that. When you start talking about whether this is a discipline and about forming another organization and whether we want to have a conference, my answer to that personally is, if it is

a working organization that can make this actually come to fruition and produce these shared assets that will really support all of our programs, then you betcha. But if it just another concurrent session with everybody coming and talking about what they're doing, then I'm not going to come. If it's the former, I'll pay on my own dime. If it's the latter I won't come at all. - Cindy Hale, Program Director, Great Lakes Worm Watch, Boulder Lake ELC

- If there are people here who agree with that, let's hear some ideas of what that infrastructure might look like. What are some of the pieces that might be involved? - Rick Bonney
- We talked about concrete pieces in our group and it got really complicated really fast. Maybe we should just talk about suggestions concerning how we might explore what the pieces are and what it might look like. - Anon. Cyberinfrastructure Group Member
- I can appreciate that but there might be a couple of broad categories that I'm not thinking of or others haven't thought of. Are there a couple of general infrastructure needs, interests, categories? - Rick Bonney

Lesson Learned from the Volunteer Monitoring World: A Newsletter as a Key Piece of the Infrastructure

- This is really eerily déjà vu of what the volunteer monitoring community experienced when we had our first meeting in 1988 and about fifty people came. In 1990 we had 120 people. We talked about forming an organization and made some motions towards forming an organization, but ultimately didn't. One of our goals was what we called moving into the mainstream, to see our volunteer water quality monitoring accepted as a part of the water monitoring community in general. We didn't want to be marginalized and have people saying, "Oh that's what those people do out there, but their data isn't any good." I think we were successful with that goal. Now we are seeing a new generation of managers come through and we are reeducating them.

But I will tell you the one thing that kept the volunteer monitoring movement alive and moving and active is the *Volunteer Monitor Newsletter*. It really kept us going. It has been eighteen years and it is printed two to three times a year. A bunch of us are on the editorial board, it is topically oriented, and I really do believe that without that newsletter we would just break, we would not be where we are today. I think in terms of infrastructure and moving forward, that was really key to where we are now. - Linda Green, Program Director, URI Watershed Watch, University of Rhode Island Cooperative Extension

About Forming an Association

- I want to follow up on what Linda said about a national association of volunteer monitoring. There was a debate back and forth in the early years about that and I'm not so sure that was the right decision. I was kind of excited when we were talking about the possibility of an association, and I'm not sure whether this group should reject the idea because of what happened with volunteer monitoring.

We weren't motivated to start an association because at the time we were getting a lot of support from the EPA and we had everything we needed—we had conferences, we had a newsletter, all of the things you would get from an association—so there wasn't much motivation. Now that the EPA is supporting us less and less, maybe we would be better off if we did have one. I just didn't want to leave you with the idea that the lesson you take away is that you don't need an association. - Eleanor Ely, Editor, The Volunteer Monitor

Volunteer Control over Data Management and Mining: A Step on the Road to Becoming Scientists

- The other thing about data is that we made a decision. We used to have a common database for all of our fifteen or twenty different watersheds. We finally decided that in order to teach volunteers good science, it made a lot of sense for us to teach them how to manage data for themselves. What we did is set up some templates. We actually prefer them to keep the data themselves. That way they can manage it, they can graph it, they can analyze it, they can mine it, or whatever.

People have been talking about moving people from being data collectors to being scientists. They don't necessarily have to mine the data and publish in a scientific journal to move towards being a scientist, but in fact, what they can do is learn how to manage data and learn how to see the story in their data and how to ask questions based on the story that they see, and then go back and ask new questions. To me, that is being a scientist and that is moving them forward. What I am saying is that keeping the data locally has some advantages whereas if you keep it in a big database, volunteers sometimes feel they're putting the data into a big black hole. - Candie Wilderman, Professor, Environmental Sciences; Chair, Environmental Studies Department; Founder and Science Director, ALLARM

- I don't want to let this idea of a newsletter die. For me, it offers a direction to go forward. What if there were some kind of online journal that included information about the tools in our projects and offered different perspectives? If we are talking about forming an association, an online journal might be a step on the way to that. - Rebecca Jordan, Assistant Professor of Citizen Science and Environmental Education, Volunteer Trail Monitoring for Invasive Plants, Rutgers University Department of Ecology, Evolution, and Natural Resources
- The first thing that you can do is e-mail me ideas like that so that I can include them as questions in the follow-up survey to see if there are people interested in helping them move forward. - Rick Bonney

Developing (or not) a Shared Data Infrastructure

More Lessons Learned from the Volunteer Monitoring World

- I'm curious why volunteer water monitoring doesn't have more of a shared software infrastructure. Could you comment on that? Each monitoring group keeps their data in their own little system, right? - David Witzel, Managing Director, Backyard Jungle, Forum One Communications
- No, and that's very interesting, because when the National Water Quality Monitoring Council was started in 1997, cochaired by EPA and USGS, one of the reasons it was started was because we had these two data warehouses and monitoring programs that were not speaking to each other and barely acknowledged that each had data that the other considered quality (and that was after a number of years of an interagency task force on monitoring).

What we saw was a goal, not to try to get the data to agree with each other, but to harmonize with each other because there are many methods of doing things and many methods of doing things positively. We see it as performance based. That was really the goal, to try to get these two data warehouses and the agencies and organizations that feed into those working on a common portal. It has been a huge effort. Now, if you want to get water data, you can go to this common portal and get data from EPA, you can get it from USGS, and so forth. That whole thing all along has been a big backdrop to everything in terms of the monitoring program.

When we started our facilitation program we had this great dream that we'd have a database into which volunteers could enter their data. Now we are realizing there are so many aspects and questions of who, what, when, and where. It would be better for us to let people think of the questions they needed to answer and have

them building their own rather than to have one kind of monolithic thing. Does that answer your question? - Linda Green, Program Director, URI Watershed Watch, University of Rhode Island Cooperative Extension

- It's just a concern that we talked about in the Cyberinfrastructure Group, if we should think about facilitating that kind of an infrastructure. I'm just wondering what the real catches are. - David Witzel
- We're not suggesting a big database, but as Candie said, they made templates so that people could do their own thing. That is what the Cyberinfrastructure Group would hope would be available. - Paul Allen, Assistant Director of Information Science, Cornell Lab of Ornithology

Ongoing Communication

- A lot of us have been talking about a lot of similar things that I think our working groups were approaching but didn't necessarily summarize. A point of fact is that we have all had a lot of really exciting, interesting, engaging discussions. As a community-building group, we are a community now, those of us in this room, the people we represent, and others like us. I would hope that we will continue to be in communication as a community, and that we ourselves are one of the communities that we are building. This sort of echoes what Chuck Remington was saying about helping each other and continuing to communicate about things and how we can help others as well as ourselves. - Geoff LeBaron, Director, Christmas Bird Count, National Audubon Society
- I haven't gone online to look at the Google Docs produced by the working groups yet, but I have been imagining that it is almost like a review group, and that we're almost done but not quite. When you get home you can still go on there and adjust and change and modify and get your opinions in there. That is one way we will keep talking. How we will keep talking beyond that is important. - Rick Bonney

Concluding Remarks and Acknowledgments

- In a group that came together for a cross-disciplinary endeavor, I am incredibly impressed by the extent to which everybody in this room thinks outside their discipline, outside their box, and the amount of creativity and energy that we saw here in the last few days. I hope to continue to get to

Regional/Topical Groups/Data Within a National Scheme

- I want to make another comment about water quality monitoring. A program developed by Purdue University in cooperation with EPA called L-THIA is a long-term planning tool to demonstrate land use impacts on resources and hydrologic features of a region/community. Check out the following Web sites:

- www.ecn.purdue.edu/runoff/lthia_index.htm

- www.epa.gov/owow/nps/watershed_handbook

The Water Management Districts in Florida were developed in 1974 in an attempt to evaluate long-term watershed resources use. They were some of the first regional government organizations to use a watershed approach for water use planning. I've had experience with two of the five districts, St. Johns River Water Management District and the South Florida Water Management District:

- www.sjrwmd.com

- www.sfwmd.gov

I think water is a common theme for most regions now because of its importance for sustainable populations, and you need to have a common database that allows you to pull out information based on your location so that you can evaluate it in relationship to what the citizens want, or what the scientists want, or whatever.

Water quality is something that is a national effort. Some of the other topics here are more localized, so you almost have to have a regional or local group like the societies do—they divide up into regional societies that focus on the topics of their regions. - Joy Marburger, Research Coordinator, Great Lakes Research and Education Center, National Park Service

Thank You to Participants

- I want to thank you all once again for coming. I never, ever dreamt that there would be this much interest. I knew that we had an obligation to the National Science Foundation to put on a conference and I just thought it would be a whole lot of fun. Some of you I know, some of you I've known for a long time, some of you I've just met. The ones that I didn't know all started out as these little essays, and it's really hard to review those and decide, is this person going to really help or is this person going to be the one jerk that Chuck Remington noted you get at every conference? We didn't get any of them this time. In fact, it was so much the opposite, with every single person engaging in a major way. Thank you so much. - Rick Bonney, Director of Program Development and Evaluation, Cornell Lab of Ornithology

know you better. Most of all, I want to thank Rick Bonney and Jennifer Shirk for the outstanding job they did putting together this conference. - Janis Dickinson, Director of Citizen Science, Cornell Lab of Ornithology

- I will only take a moment because to be honest, after taking notes to try some summary comments at the end, I find that it has all been said. This is just the very beginning of the conversation and you all had an opportunity to add input here to the process of moving it forward. Not everybody takes advantage of that in a conference, and I am one of those people behind the scenes who will keep pursuing you after this conference and looking for your input. Please share it. We want your input, that is why we brought you here.

We brought you here to hold us accountable as we go forward with this endeavor, and whether or not it is a discipline or a field, I don't think it really matters. As has been said by Chuck and others around the room, we are a community and we will meet again. I don't know when or where, but building that sense of community has been part of this conference. I think the most powerful aspect has been getting to know all of you in this room, so thank you very much. - Jennifer Shirk, Project Leader, Citizen Science Toolkit Project, Cornell Lab of Ornithology