

**Citizen Science
Toolkit Conference**

June 20 - 23, 2007

panel discussion:
impacts of citizen science

Moderator:

Kate Haley Goldman
Institute for Learning Innovation

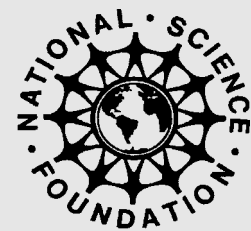
Panelists:

Ken Rosenberg
Cornell Lab of Ornithology

Christy Pattengill-Semmens
Reef Environmental Education Foundation

Georgia Murray
Appalachian Mountain Club

ZoAnn Morten
The Pacific Streamkeepers Federation



CORNELL LAB of
ORNITHOLOGY

CORNELL LAB OF ORNITHOLOGY

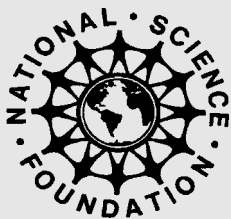
607.254.BIRD telephone
www.birds.cornell.edu

159 Sapsucker Woods Road
Ithaca, New York 14850

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 formal papers. Rather, it offers participants' oral presentations and reflects the more informal, idiosyncratic nature of deliveries 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.



This documentation is supported by the **National Science Foundation** under Grant ESI-0610363.

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 panel presentations and group discussion were part of a session titled "Impacts of Citizen Science" on day two of the conference. The session began with a presentation by Stephen Baillie, Director of Populations Research, British Trust for Ornithology titled, "From Citizen Science to Policy and Planning: Examples from the United Kingdom." The panel presentations provide a wide spectrum of examples of the impact of citizen science in a range of disciplines, projects, and settings.

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>

Panel Discussion: Impacts of Citizen Science

Cornell Lab of Ornithology

“Something resembling a panel discussion” is the degree of direction those of us up here received, so if you feel the need to chime in with comments or questions, please do. In my role as Director of Conservation Science here, I am thinking more in terms of the way-down-the-road-impact of the kinds of work that we have been talking about throughout this workshop. We obviously have a program we have been developing here at Cornell that has lots of different phases and parts to it and different people involved. We have gotten very good at collecting data. We’ve gotten very good at designing interesting projects that collect data. We’ve gotten very good now at educating people about the aspects of these projects. And we’re even getting pretty good at evaluating whether that stuff is working.

But what about taking it to the next level, the kind of things that Hague Vaughan was challenging us with earlier? We can do great science, and publish it out there in good peer-reviewed literature, but is it having any impact?

“

I think the really big questions out there that need to be addressed to deal with big conservation issues and big societal issues are probably best addressed by citizen scientists, but that gap...from the outcome of a project to influencing policy and influencing decision-making is, to me, the really big challenge.

”

So we are here to talk a little about impact, which is different from outcomes and different from products. We have at least a few examples here as part of the so-called “Cornell model” that I will share with you briefly, but I want to emphasize right at the outset that this is really the challenge ahead for all of us and for citizen science. I think the really big questions out there that need to be addressed to deal with big conservation issues and big societal issues are probably best addressed by citizen scientists, but that gap we saw in Hague’s slide from the outcome of a project to influencing policy and influencing decision-making is, to me, the really big challenge.

Ken Rosenberg,
Director of
Conservation Science,
Cornell Lab of Ornithology,

About the Panel Presentations

The panelists are going to address the topic of impacts of citizen science, but that may be written broadly, from any direction they want to take it. We hope that they pose really good questions for all of you and that we have a really good discussion afterwards. - Kate Haley Goldman, Moderator, Institute for Learning Innovation



Project Tanager:

<http://www.birds.cornell.edu/conservation/tanager>



Forest Thrushes:

<http://www.birds.cornell.edu/conservation/thrush>



I'm going to share just a few brief examples. The first is one of our earliest citizen science projects, which I've learned a couple of you actually participated in, Project Tanager. That was one of Rick Bonney's original ideas for how to do an experiment and see if we could really get people to collect rigorous data to answer real questions. Project Tanager was what I might call a high-end citizen science project in that it was a very complicated project with a complicated protocol. We posed a very specific question: How large a forest patch is necessary to sustain a breeding population of common forest birds? We picked Tanagers not because they were declining, but because they were pretty and easy to see and people could go out and see them. That was the experimental aspect of it. We have since then evolved that project, using that approach for some birds that really were in more trouble.

Project Tanager ran for a few years and it actually worked. We got not thousands, but hundreds of people out there collecting data at several thousand sites, which is a very large study of this kind. Not only did we get good data and were able to publish it in *Conservation Biology* and the *Proceedings of the National Academies of Science*, a couple of big journals, but we then tried to take it to a next step, turning those results into management guidelines for land owners. We produced this nice little booklet, *Improving Habitat for Scarlet Tanagers and other Forest Interior Birds, a Land Manager's Guide*. It translated these esoteric scientific results about bird populations and forest fragmentation into how many acres and what kind of forest patch landowners should actually provide.

In some ways that is our best example, from A to Z, thinking about this question; thinking about the impact we wanted to have and producing this result. But even in that case, so what? We had boxes of these guidelines, then we thought maybe we should call up some state foresters and forestry people and landowners and see if they actually wanted this thing. We sent it to them and we got a lot of positive feedback and a lot of people used it, but it still wasn't really the perfect model, one in which they came to us and said, "What should we do about our woodlots to protect these birds?"

We did take it to another level because we wanted to see if we could apply this to some birds that really were declining, such as the forest thrushes, and we produced a second set of guidelines for improving habitats for forest thrushes. That was actually funded by the U.S. Forest Service, so here we did have more of a connection to the managers and that is what we were really hoping for.

So these are some examples and we are proud of them, but I think this is the kind of thing we need to do a lot more of. We have one other example, which was a much more focused study of a particular species that we knew was one of the highest priority species for

conservation, and that is the Cerulean Warbler. Here, what we did is similar to what some folks have been talking about in this workshop in terms of Monarchs and worms and so forth. We basically produced an atlas. We knew the range of the Cerulean Warbler, but we didn't really know exactly where they were found, so we sent the birders out and they told us: There are thirty pairs here, there are sixty pairs there. We are actually able, on a state-by-state basis, to draw little polygons around the most important sites for Cerulean Warblers, characterize their habitats, and then get that information out to the conservation organizations in each state.



And we had success. The biggest population of Cerulean Warblers we discovered was in the state of Tennessee, and the Tennessee Wildlife Resources Agency picked up that document, went out, and used their first year's money that they got through the state wildlife grants to purchase 50,000 acres of prime Cerulean Warbler habitat. Again, and Stephen Baillie was talking about this, that is the kind of thing where the model of really having an impact in changing policy resulting in land management on the ground all started with volunteer data.

I hate to mention this, but in the United States the state can buy 50,000 acres, but nobody owns the subsurface rights. Now the mountaintop removal mining people are going in there to try to clear out that 50,000 acres, so there is yet another challenge and maybe another study we need to do.

So there are a few examples but again, as I see it, this is the big challenge of thinking this through and maybe thinking it backwards as a few people are saying: What do we really need to know out there to change policy; not just change people's minds but actually change the way land is managed, at least in the U.S.? In the U.K. half the population is bird watchers, they have one great organization and the government listens to them. We don't have that luxury here so the challenge is magnified. That is how I am thinking about the impact of citizen science at this point.

Cerulean Warbler Atlas Project:
<http://www.birds.cornell.edu/cewap>

“ _____
What do we really need to know out there to change policy; not just change people's minds but actually change the way land is managed...?
_____ ”

Christy Pattengill-Semmens,
Director of Science,
Reef Environmental
Education Foundation
(REEF)

www.reef.org

“ ...if bird watchers can do it for birds, we have thousands of people in the water every day all around the world, let’s tap into them. ”

TAKE A DIVE VACATION
THAT COUNTS!



Reef Environmental Education Foundation

The Reef Environmental Education Foundation (REEF) is a marine fish monitoring program that is similar to the bird watching scheme in a lot of ways except that, unlike the Cornell model that started with one program and has spun off all of these really neat, varying levels of different projects, REEF really runs one basic citizen science program called the Volunteer Fish Monitoring Program. It was developed in the early 1990s with input from fisheries, biologists, and some scientists from the University of Miami and the Nature Conservancy. The basic idea is that we don’t know a lot about fish distribution patterns. There is no atlas for fish distributions in the Caribbean.

The founders of REEF were Paul Humann and Ned DeLoach, marine life photographers and authors, and if you’ve ever spent any time in the water with a face mask you’ve probably used one of their guidebooks. They were doing one of their earliest guidebooks and wanted to put something under distribution and range and population size. For almost every species it was “western Atlantic,” or “western Atlantic, not known from Florida.” They were really surprised that there was so little information, so the idea was, if bird watchers can do it for birds, we have thousands of people in the water every day all around the world, let’s tap into them.

The reason you become a diver is not to lug a twenty-five-pound tank on your back, it’s because you want to find out what’s underneath the water—you saw something that you were intrigued by in the ocean, or you saw it on TV, or you stood by the shore and saw it. So there was a desire on the part of the diving community and the snorkeling community, but there was also this great need for just very basic distributional data.

That was the beginning of the idea. They turned to some colleagues in the Nature Conservancy and asked them to help design the program and it grew from there. In 1993 the first data was collected. They didn’t go beyond that. They weren’t thinking, we want this data to be used for X, Y and Z, or that in fourteen years they were going to have 106,000 surveys in their database. They never would have thought that, and that is where we are today, fourteen years later.

We get about 2,000 surveys in a month. There is one method and it is a standard throughout North and Central America. In terms of impact, I think the founders were going to be really pleased if we learned something about fish distributions, which we have. REEF now, hands down, has the most extensive database on marine fish populations in the western Atlantic, and it is quickly growing in our other regions as well.

The value of citizen science, and this has been brought up repeatedly by others, is the potential for wide geographic and temporal data

collection. That is what we have really strived to do, being able to collect data from probably 5,000 sites throughout the Caribbean. We don't have any prescribed time or place that folks go. It is every time they go in the water, whether it is on vacation or they live on the shore and go in every day, they'll do a survey.

So for us, in terms of impact, I feel we have reached our goal and people are starting to use the data. Certainly the guidebooks and the third generation of the Reef Fish Identification book is much more accurate today regarding where fish are found. We have also had some pretty exciting applications of the data that have come over time. In our experience, there are some things that we set out to do, but a lot of applications tend to emerge over time. We had this faith that if we started out with this solid program that was well designed with a good data management structure (and if we hadn't figured that out early, we would have been buried when we started getting 2,000 surveys a month), uses and applications of the data would come with time beyond what we could have ever imagined.

I have a couple of examples of that. About seven years into the program, the goliath grouper, a large fish formerly known as the jewfish, had been heavily depleted throughout its range in the Caribbean, and in 1990 it was closed to all fishing in Florida. The fishery was closed in hopes of having it not collapse. The goliath grouper population responded and that management action has served them well. We started seeing goliath grouper on a lot of dives and people started hearing that the goliath grouper was coming back. Somewhere between 1997 and '99, when we were about seven years into our project, there was a big push to reopen the fishery.

If you're familiar with how fisheries management is done, they primarily use fisheries data to tell them what is happening with the fishery. In this case there was no data because the fishery had been closed since 1990. All of a sudden they realized, wait a second, there's that REEF project down in Key Largo, they might have some data. Sure enough, we had what was really the only extensive information on goliath grouper distribution patterns since 1993 throughout Florida from thousands of sites. Our data all of a sudden became a very critical piece of information for them to use in a fisheries management decision that, in fact, while they are rebounding, it is not time to reopen the fishery. That was a great success for us.

Since then REEF data have been used in several other fisheries management plans as the key fishery independent data source. People are starting to understand that it is important to look at both the traditional fisheries-dependent data as well as fisheries-independent data. Actually, goliath grouper have come up again. We just got an e-mail asking for an updated dataset for goliath grouper. So that has been an exciting actual impact that our program has had.

“

The value of citizen science, and this has been brought up repeatedly by others, is the potential for wide geographic and temporal data collection. That is what we have really strived to do, being able to collect data from probably 5,000 sites throughout the Caribbean.

”



Have you seen
any intruders?

“ We had this faith that if we started out with this solid program that was well designed with a good data management structure...uses and applications of the data would come with time beyond what we could have ever imagined. ”



Have you seen any intruders?

Another example involves nonnative species and new species discoveries. This is something that I don't think folks thought would be of value from REEF, but because we are training divers you get this core group of fanatics who are so good. It's similar to the kind of person who can walk through the forest and name all of the birds—they are that kind of person, really good. All of a sudden we had this core group of people diving all over the place and they started saying, "That angelfish does not belong in this ocean." The casual observer would have just thought it was a little more colorful reef fish, but we realized that we were coming up with nonnative reef fish along Broward and Palm Beach counties—basically the Ft. Lauderdale-Miami stretch of coastline.

Sending surveyors out to this area, we found approximately twenty different species of Indo-Pacific and Red Sea native reef fish. We then took the data that we were collecting and had some folks at the University of Washington analyze this. The traditional thought of how nonnative species get in is ballast water, but we all knew that these species weren't coming from ballast water. They were coming from mostly well-meaning people releasing their pet fish because it got too big or too aggressive or whatever. They think, it's a coral reef and these are coral reef fish, so it's okay.

Through analysis and looking at ballast water exchange and where the last ports of call were and the Marine Life Trade data for the state of Florida, we managed to match this up and basically prove that it is coming from the aquarium trade. We started to look back, working with the state of Florida, and realized that it was actually illegal for pet fish owners to return their fish to pet stores and get credit for them. They could return them for free, but they couldn't get credit because of this weird thing where they'd be engaging in trade of nonnative species. That was another really exciting thing because it kind of caused this cascade effect. The state set up amnesty days for people to bring back their fish, which they would get praised for doing. They had to write that legislation and that was all really the start of them realizing they had this hot spot along the south Florida coast and that people were doing that.

I have two more quick examples. One is zone monitoring. Marine zones have become a big topic: marine protected areas, zoning areas for different levels of use. We have a close relationship with the National Marine Sanctuary Program. There are thirteen national sanctuaries throughout the U.S., and the Florida Keys is one of them and that is where we started. Our program started in 1993 and in 1997 they implemented a series of zones throughout the Florida Keys National Marine Sanctuary. While they did have other more detailed, targeted science projects, they looked to REEF to fill a very important role in their long-term monitoring.

They provide us a contract and we have worked out this design that

involves going into zoned no-take areas as well as reference areas that they've helped us pick out. We go out every year with our advanced assessment teams, our higher level surveyors, and collect data and report back. We've since done that type of model in some other sanctuaries along the West Coast, Gray's Reef in Georgia, and Flower Garden Banks in the Gulf of Mexico. There aren't really results I can point to from that, but they are using that in their overall analysis of marine zoning.

The last one, which is kind of interesting, is that our data turned out to be a very good source of non-extractive use patterns. People pay a lot of money to do socio-economic analyses to identify where people like to spend time, and in this case how they spend time in and use the ocean in particular. This has come up in California with its Marine Life Protection Act and zoning. They wanted to know where people spend time during non-extractive uses. Where are the places that divers, boaters and other non-extractive users care about seeing preserved in terms of this zoning? The REEF data is number one. It shows them where people go diving. There are almost seven thousand REEF surveys that have been done in California now, so they can look and see where the highest levels of surveyor use are, and that is kind of a proxy for use by all divers. That has been a new development. They're not even using the biology data, they're just looking at where people are going and how long they're going.

Appalachian Mountain Club's Mountain Watch

The Appalachian Mountain Club (AMC) is a recreational organization, but we are much more than that. We do a lot of education and conservation, and that conservation work includes both science and policy work. The research and monitoring programs that I and others at AMC are involved in are inherently related to resource protection and consequently resource management because what we are focused on is the impact to hikers and the impact to resources that hikers use: mountains, trails, rivers.

My research focuses on the air quality piece: ozone, fine particle pollution, the types of pollution that impact hikers in the environment. We work cooperatively with state and federal agencies in that work and also in the alpine plant community work that we do, so we have those relationships in place.

Our citizen science program, Mountain Watch, grew out of this monitoring work we do in our research department. It involved reaching out to our education staff and many other staff within the AMC to put together a cross-agency program that includes citizen science. It has always had an intended focus on impacting policy and resource management. I say "intended" because I feel we are still in

Georgia Murray,
Staff Scientist,
AMC's Mountain Watch,
Appalachian Mountain Club



[www.outdoors.org/
conservation/
mountainwatch](http://www.outdoors.org/conservation/mountainwatch)



“ _____
I feel that we are just beginning to look at this and figure out: How do we have impact? How do we measure impact? And how do we move the program towards having more impact?
_____ ”

our infancy compared to some of the programs at this workshop. We started this program in 2003, but we had what Sam Droege referred to as the 80% failure problem in the course of trying a few different things. We think we have finally shaken out a lot of bugs and are getting on a great path towards success, but can't yet point to impact in terms of measuring results in the way that some other projects here have described. This is great information for me to take back and hopefully improve where we go from here in measuring impact and working on impact.

I do have some examples of steps we are taking in the direction of impact. For example, climate change and alpine plant communities were identified in the White Mountain National Forest plan by the U.S. Forest Service. They put out their plan just a few years ago and those were key issues and identified as key areas of focus for monitoring. And of course, those pieces relate to our alpine plant phenology program in Mountain Watch.

“ _____
We want to bring these unengaged hikers along this continuum to become resource stewards and conservation advocates.
_____ ”

The areas where I see the program looking to in terms of assessing the impact of Mountain Watch includes trying to convert our volunteers, and this is really related to our mission as well. We want to bring these unengaged hikers along this continuum to become resource stewards and conservation advocates. Again, we do a lot of policy work. We have a conservation action network which is basically an e-mail alert system that has over 20,000 members to date. We are working to have the citizen science program help us with that effort. Hopefully, the type of involvement the citizen science program offers will bring them that much further into wanting to protect the natural areas in which they are engaged. That is one of the ways we would like to measure the impact of our program.

Of course, the other way of looking at impact would be to look at the impact on influencing policy and resource management. We have made some small incremental steps in that direction. For example, there is the photo monitoring that we have under the Visibility Volunteer piece of Mountain Watch. I took those photos and linked them with nearby EPA fine particle data and other information and presented that and additional AMC comments to the EPA on the recent Fine Particle National Ambient Air Quality Standard comment period that they have every five years or so.

So we are moving in that direction, bringing in the citizen science information and moving it into some of the things that we are already doing in policy. Again, I feel that we are just beginning to look at this and figure out: How do we have impact? How do we measure impact? And how do we move the program towards having more impact? I look forward to discussing this with others and I feel this conference is going to help us move in that direction.

The Pacific Streamkeepers Federation

I am a product of government program decision-making. Because of a government amendment, and actually the government of the United States with the Adopt a Stream program, I am where I am today. And I will reveal to all that I am not a scientist. I am a citizen of British Columbia and in 1988 my son was going to a community school and the school was going to take on a program called Salmon in a Classroom. They were going to bring salmon into the classroom and the children were going to enjoy them. Under the banner of “nonworking mother” I was asked if I would just give a hand, fifteen minutes a week. I said, “Sure.” So I started taking water quality and water temperature measurements for fifteen minutes a week, and that was in 1988.

Then it changed a little bit and got deeper into assessment and you got to touch fish and open them up and do eggs and play god, that sort of thing. After we were doing all of these enhancement things and bringing fish back into the streams, or thinking that we were, we started watching and thinking we weren’t getting back quite as many fish as we thought we were going to get back.

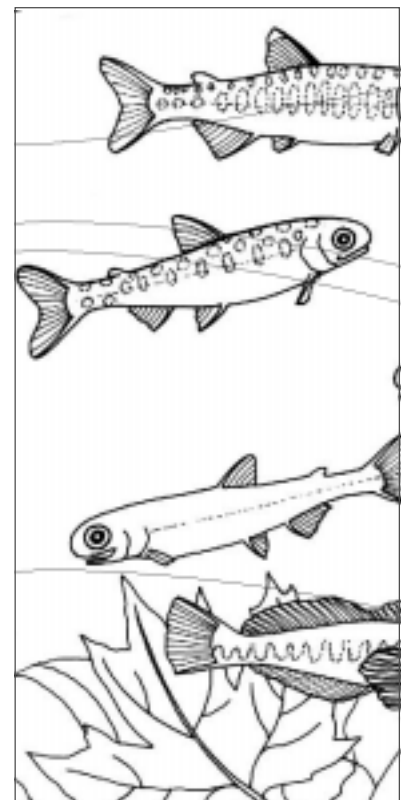
So the community started asking Fisheries and Oceans Canada, “Where are our fish? You told us we were going to do X number of fish and X number were going to come back and all of life was going to be good, and it’s not happening.”

So, how can we look and see what is happening with the fish? These fish, especially coho and chinook, need to have freshwater systems. At the same time we were growing quite rapidly in a lot of areas, and the areas that weren’t growing with urban activity were growing with forestry and mining. We have a lot of resources that we’re able to extract and make some really cool things.

We began asking questions: How come we’re not getting fish back? Where do they want to live? What needs do they have that we need to give them a hand with? So the community was asking about these things and Fisheries and Oceans got together with the Ministry of Environment and a few other people and some scientists—geologists, biologists, all of those people—and the community.

ZoAnn Morten,
Staff,
The Pacific
Streamkeepers Federation

www.pskf.ca



“ _____
When we were asked to talk about impacts, the first thing I thought about was the impact on people.
_____ ”

They put together a program through a handbook called *The Streamkeepers Program*, and the whole program is based on this handbook. In here are the” hows, whens and whys” of citizen science. We didn’t know it was called that in those days in 1991. In there they put together some standard protocols, things that we could do, and they were written in plain English. The way they determined that is they asked me to come and read this book and see if I could do it. I thought it was because I was really good at all this stuff, but that’s really not why they asked me.

They asked me to review it to make sure others could understand it, especially the math, because if you ever want to have a problem in your data, ask me to do your math for you. I read it and I made some changes in the math sections and wrote down the formula for area and things like that. That was the beginning of what we’ve done.

When we were asked to talk about impacts, the first thing I thought about was the impact on people. Citizen science kind of made me who I am today. I was a mom and a kindergarten teacher, so some of the stuff comes from that, but I am standing here today because of citizen science. Before that I was a bartender and a youth outreach person and I have a whole different line on things now (though in some ways bartending was very similar).

Then there are the people that I get to play with, and I get to meet the most phenomenal, incredible people because through citizen science and going out wandering the streams, the awe and wonder that they discover while they’re out there just opens their eyes as to what’s going on. I went out for a quick walk before coming into this session, and nature was going on outside while we were in here.

We got people to start looking at life just a little bit differently and in lots of different ways. We’ve got Doug in north Vancouver. He’s

seventy-something years old and through this he’s got a girlfriend who he met on a creek walk. They’ve been going out now for three-and-a-half years, and what an impact that has had! But as well as having this great new girlfriend, he is also, as a result of this program, now taking a computer course. He’s learning to use Flickr, he’s learning how to post his images online, he’s learning how to do a slideshow so he can share what he has. He’s got two or three grandkids now who are teachers in really small rural communities. He put them together with me and said, “Could you give them a hand? They have to do a project.”



After open heart surgery, Mike needed an exercise program. Participating in plant salvages is good for his heart and for the riparian area into which they are replanted.

I said, “Sure,” and we got things together, sent them off on their way to do these things, and now Streamkeepers is in these small native communities that otherwise wouldn’t have known about it. And it’s because of Doug. And we don’t know what else Doug is doing—Doug is doing all kinds of neat things.

But the community itself doesn’t stop and look at itself and say, “Yep, I’m having an impact, I’m doing good things.” They have a tendency to want to save the world, and it’s huge. What they want to do is huge and so they never get there. They never get to that big win. So we have to take the time and show them what the little wins are.

What I did was have these posters made up. The very top line says, “Making a Difference.” Then I asked community people: What do you do that is making a difference? Why do you come out and volunteer? And then I used their photograph. The reason I did that is because I wanted them to take ownership over this poster and take it to the mall and take it to the garden club and take it and talk about what they do. I can’t be everywhere, so it’s great if they can take it out.

We also included in the poster problems they found when they were out and about. One was all about mapping—you get into the stream and you map and you find out where all of the influences are going to be. So we identified the problems that occur when we are out and about mapping, and then the next step was to identify the solutions that we used to try to solve these problems. And finally, what was the successful result. That is the part that we forget to do. We forget to stop for a moment and celebrate our successful results. And it wasn’t about just what that one person did, it was about what they did as part of a group and a team.

“

That is the part that we forget to do. We forget to stop for a moment and celebrate our successful results.

”

We now have a series of these and I will admit I’ve become a bit addicted to poster making. It only takes about two hours to put together if you’ve got the photos, and it costs about \$40 and there is a service that will mail them to your home or to wherever you’d like them sent. We now have this online, describing how other groups can do that. But it is the individual people out there who are having an impact. They’re making a difference.

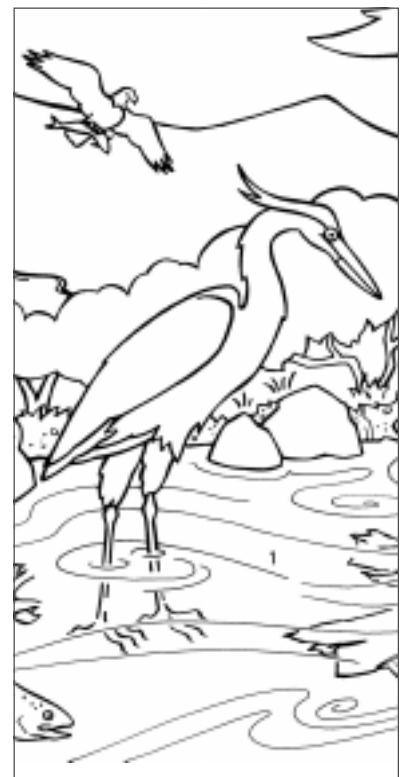
There is progress with people, program, and policy, and the other thing I’d like to talk about quickly is progress in terms of programs.

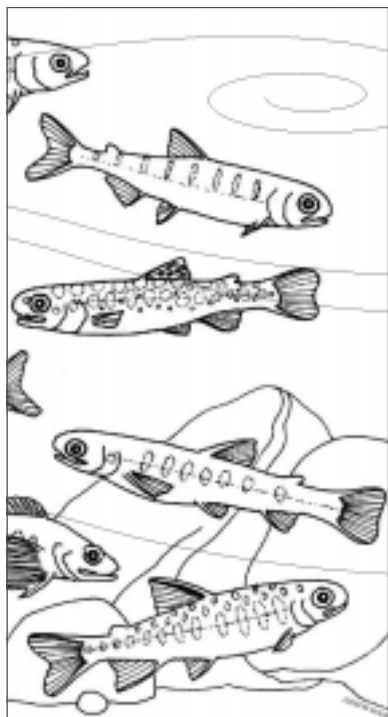
“

They have a tendency to want to save the world, and it’s huge. What they want to do is huge and so they never get there.

They never get to that big win. So we have to take the time and show them what the little wins are.

”





“ We’re supposed to be really fit, outdoor folks in Vancouver, but we have some problems in our next generation. Our provincial government looked at that and looked at citizen science as a way to get people off the couch and plug them in. ”

Just recently in British Columbia, we’ve got a couple of new programs that are under way. One is called Living Rivers. Our provincial government has just given twenty-one million dollars in order to take proactive steps and start looking deeper into some of the problems that we’re having. For the provincial government to come up with something called Living Rivers is phenomenal, and it’s because of the number of ordinary citizens saying, “Excuse me! Our water! Our water!” And so now they’ve decided to put some dollars into that.

Then they started looking around at these rivers and the organizations out there and they thought, remember those obese people out there? They actually started a program for that and it’s called Act Now. It is to get people off the couch and outside working within the community to get people active. We’re supposed to be really fit, outdoor folks in Vancouver, but we have some problems in our next generation. Our provincial government looked at that and looked at citizen science as a way to get people off the couch and plug them in.

The federal government has started a program called the FBI, which is the Fraser Basin Initiative. They are putting money into the Fraser Basin in order, I think, to figure out what is going on in there, but working with community people. I notice that NSF has helped you a lot. It has helped us too, but in our case it stands for “non-sufficient funds.” It is because of non-sufficient funds in a lot of ways that government people are now turning to citizens and saying, “What are you doing? What have you got? Can I have some of that?” So there is a lot of opportunity now that maybe wasn’t there before.

Then there is the policy end of things. The morning I arrive home after this conference, I’m going to a meeting to talk about wild salmon policy. They’ve asked me to come as a citizen and said, “Can you give us a hand? We’re trying to do conservation needs and we want to know what a habitat indicator is.” That’s scary that they’re asking me. But what they are actually wanting from me is to organize the troops to go out and collect information for them. That is what they are really looking for.

So I know what they want, and I know how they want to get there, but I do know that volunteer information is not free. There is no way that it’s free. If you don’t have a warm body walking alongside volunteers supporting them, letting them know that what they’re doing is good and that it’s of value, you can’t just wish it into being. You have to be there and you have to take part in their lives and they take part in yours, and let them know that what they are doing is making a difference.

Later on that same day that I arrive home I have a Salmon Foundation board of directors meeting. I belong to the Salmon Foundation and

we are a funding body for volunteer groups across British Columbia. Recently we were given some of that Living Rivers money so we are trying to figure out what to do with it. Giving money away is really hard, it's not as easy as you might think, but at these meetings I get to sit around the table with businessmen and it's wonderful. I've got all different clothes now besides the jeans that I wear every day. I sit with these business men and through that not only do I get to discuss money and giving it away and all these great things that we're doing, I get to bring the community to that table. And I get to bring community and what we're doing as a friendly face, not as a protester, to some of the biggest CEOs in British Columbia. I get to sit at that table, and I get to do that because of government program and policy.

Years ago I was driving down the street on the way home and all I wanted to do was go to bed. Instead, I spotted a roadside storm drain and had to stop because there was a whole bunch of stuff that was happening on the road that just wasn't very good. I determined that I needed to do something. I had to figure out what was going down that drain. So I did a simple thing, I swept six feet on either side of six drains and one other drain where there was construction going on and things going down the drain, and I put the debris into containers. Two days later I went back and saw that all of the places I had swept up were already covered with debris again.

I still had these packages of debris in the back of my truck and I happened to have a scale in my front yard because I was weighing fish that day, and I put all of this debris onto the scale and it was 221 pounds of debris that was going down there. I just couldn't believe it.

I took some photos and got some other things together and went to my district council. I told them I couldn't believe what was happening and they couldn't believe what was happening. And you know, I never had to tell them why it's bad for debris to go down the drain. I also forgot to tell them all the scientific reasons why debris is bad and all of that kind of stuff. I just let them know what was going on.

Through that, the council got their staff together and had all of our road control bylaws changed for the good in order to make sure that in times of construction or in times of any roadwork the storm drains must be protected because they are part of our stream systems. So that was one thing that happened that was really good.

I also determined through that experience that we needed to do an education program. If you want to have an impact, make sure that you are able to touch everybody at every time. We have this really simple little thing. It's just a little fish and a little container of paint. I've given away 3,000 of these. People just paint a little

“

If you want to have an impact, make sure that you are able to touch everybody at every time....We allow people to make an impact the day that we meet them.

We give them one of these [kits]. They can go home and they can make a difference in their neighborhood that day.

”



yellow fish next to their drain as a friendly reminder that anything going down that drain goes into the creek system. We allow people to make an impact the day that we meet them. We give them one of these. They can go home and they can make a difference in their neighborhood that day.

Because of that little thing I did with my own district council, and it went well, we put my talk up on our Web site. Through that, some people saw it and now next week I get to go to the UBCM meeting, which is the Union of British Columbia Municipalities. All of the mayors and council members go to these things once a year. And I get to go there and talk about storm drains with all of these people, and about the impacts and the changes that those municipalities can do that will help our stream systems.

The next day I get to go to EPMP, which is the Environment Process Modernization Plant. That deals with federal policy all across Canada. They need to do modernization plans. What they basically need, because they don't have enough people to do the job, is to figure out how to streamline things. As a result, a lot of our policies are being streamlined and through that, there are a few of us volunteers who are being asked to come in and speak about that because we see things slightly differently than some other people. We've been asked to come to the table because we have an understanding of what that might mean if you streamline at that layer. At that level, what happens when you say a two-lane clear span bridge does not cause harmful alteration destruction disruption? We can say, "No, it does. You might allow it to happen but it still causes that problem."

It is those kinds of reality checks that we are being asked to come in and make comments on as they set policy. That would be a federal policy that affects everything across Canada, so it is a great thing to be able to comment on.

And the next day I'm actually going out with volunteers to plant some trees. We had that big wind throw and had lots of trees fall down, so now there's a report that we're going to get some sunshine so we can put some different seedlings under there. That's going to be absolutely grand, I can't wait.

So on the citizen science end of things and being able to go out and monitor and collect data, one of the main reasons that we ask people to go out and monitor is just to get them into the creek, just to get them in the watershed and make them fall in love with the area. We can then make policy, but remember that not all of your volunteers are ready to make changes in policy. We only send the ones who are truly ready. There is that adaptation that volunteers go through. Don't send them until they're ready and don't push them too hard.

Group Discussion

Balancing Policy Impact and People Impact

- I just have a quick observation in terms of the spectrum between policy and people, the program, and the education work where it falls in between. As we're all well aware in the current administration, policies and legislation can be reversed and changed. Audubon has learned that the hard way as many conservation organizations have in the last few years. I think what is represented here is a wonderful balance of the power of going directly for policy and directly for legislative change, but also having the backup of the people who have been convinced with hands-on and face-to-face, who can act not only as ambassadors to the politicians and decision-makers, but as ambassadors to their communities and to model to others what they have fallen in love with. That balance is very well represented in this group.
 - Chuck Remington, Director of Field Support National Audubon Society
- It's true that as you work on one end of things, then the policy or legislation changes. We had a legislation called the Streamside Protection Regulations and there was a whole bunch of us working on it and we worked really hard and just got it enacted and it was in there and it wasn't bad. And then we got a new government and the next day it was basically, "That was bad and this is good and we're changing." They changed to a whole other policy and they didn't come to the community at all. Because we had had such a huge response asking for community input, it seemed like a bit of a slap in the face for a while. Then we had to realize, they've never come to us before so this is nothing new, the other was something new.

But it didn't work out the same and a lot of the community is not happy with this new policy. They did put a caveat in there that the community had to "meet or beat," so the different cities in BC have to meet or beat this policy. That meant that the community could now work on their own council to meet or beat this legislation, and that was nice because a community could still work at the local level. So getting to know your council members and mayors and city planners is hugely important, and getting to know them as friends, spending some time with them. But things can change on a dime. - ZoAnn Morten, The Pacific Streamkeepers Federation

Moderator:

Kate Haley Goldman,
Senior Research Associate,
Institute for Learning Innovation

What Do We Mean by "Impact"?

- I wasn't sure what would emerge from this panel in terms of impact, but it seems to me there was an awful lot there in forty minutes. It was interesting to me how fast we got to policy and how repeatedly that came up through these presentations, but there were all sorts of other things there about leisure, about conservation, about the individual level, the community level, and the organization level. I think we're hoping to talk about all of those different ranges of impacts. Before I go on about what I heard, I want to open it up instead to questions and comments. - Kate Haley Goldman, Senior Research Associate, Institute for Learning Innovation

Scientists Translating the Jargon

- Working on the Streamside Protection Regulations, scientists helped us with the language because you guys speak a different language and it's really difficult sometimes to understand what it is. Sometimes when you're making it so that I can understand what you're talking about, it actually makes it clearer for a lot of other people to understand. For scientists to help us understand their English was very helpful, and not to go beyond what we actually know about because that's the hardest part for volunteers. - ZoAnn Morten, The Pacific Streamkeepers Federation

Citizen Scientists Translating the Message

- There is a flip side to what ZoAnn said about scientists translating their language. That's the tension and synergy that you see here in a meeting on citizen science between the scientists and the nonscientists. The scientists need help in getting these messages delivered because as you said, we don't talk to our municipal leaders or whatever. So you really need both sides of that and I think that is really what sets citizen science apart. - Ken Rosenberg, Director of Conservation Science, Cornell Lab of Ornithology

Cross-training for Citizens and Scientists

- Just as we train citizens in how to do science methods, I think we could train scientists in how to communicate a little bit better. I agree not everyone is suited for communicating, but I get a little tired of: "Well, we're scientists, we're not good at communicating, we shouldn't do it. Let the environmental educator or whoever go out and do it for us." I think this whole back and forth is a really good one, and I think citizen science could perhaps help teach scientists how to communicate or include more training for that. - Melissa Pitkin, Education and Outreach Director, Point Reyes Bird Observatory

An Extroverted Scientist?

- A friend of mine who is a senior aquatic scientist in BC said that an extroverted scientist is somebody who looks at your shoes when they talk to you. - ZoAnn Morten, The Pacific Streamkeepers Federation

Citizen Scientists

Translating and Delivering the Message

- I think this was terrific and I enjoyed everybody's talk, and thank you for not doing PowerPoint and for just talking to us. It was wonderful. I think if I could find a theme at all, it is sort of the struggle to figure out how to deliver the very important message that the citizen scientists have discovered. What I feel, which was confirmed by ZoAnn's presentation, is that one of the most effective ways to deliver the message is to have the people deliver the message.

In the first talk on the Cornell Lab of Ornithology, they were talking about having these great materials and trying to rethink how to get them out there and how to get them to be effective. I was thinking things like, if the land owners could be involved not just in the study, but also in thinking through what's going to happen to the study at the end and how it's going to be used, then they themselves might be able to deliver the message to their members. It just seemed to me that was the theme, maybe because I believe this anyway, but what I heard a lot is that one way to translate science into policy is to find a way to engage the volunteers in the translation and deciding where the message should be sent to, and then getting them to send it there. - Candie Wilderman, Professor, Environmental Sciences; Chair, Environmental Studies Dept., Dickinson College; Founder and Science Director, ALLARM

Bridging the Translation Gap

- I think that is a really important concept. What I do at the park sometimes is almost serve as a bridge between the scientists, the general public, and the educators to translate for each audience. In terms of the toolkit, it would be really helpful if that could serve as a bridge because we've found it critical. We don't let our scientists just go out all alone with the public. They often need a translator. Sometimes not, but often that has been our experience. And working the other way, I often have a harder time explaining what I need to the scientists. It's almost easier to explain to the educators and they grab it and run with it. But it's how to define what's important to them in plain English that's missing. - Mary Raczko, Partnership Liaison, Boston Harbor Islands National Park

- I would echo that. A lot of what we're working on now is developing what we call "public friendly indicators." We take scientific jargon such as "oxygen depletion in the hypolimnion" and say, "Are these good trout waters or poor trout waters?" in ways that folks can

understand without knowing the jargon, but having the scientific knowledge and skills behind it. That's a very important thing, speaking in a way that people can understand and take it and use it, and I think ZoAnn gave some great examples of that. It was really interesting, the continuum of speakers here. It was fascinating and it really made a full circle and highlighted the importance of hearing all perspectives. - Linda Green, Program Director, URI Watershed Watch, University of Rhode Island Cooperative Extension

Citizens Using Citizen Science Data

- There is one thing that hasn't really come up. We've talked about citizen scientists as opposed to just being data collectors; now we can talk about citizens as advocates instead of just being data collectors. Sometimes we've talked about our projects falling short in going that extra step. For example, with eBird people go out and collect data, they don't become scientists.

But one of the things I don't think we've talked about much, unless it has happened in the breakout groups, is the fact that when the data are publicly available on the Web site, citizens can become scientists using those data. Those are data that are there for the public to use and manipulate. Now sometimes people need help learning how to do that. But I'm sitting here thinking about policy, and in the United States, you could go and say all you want if there's something in the storm drains and nothing is ever going to change as far as I can tell. They don't pay any attention as far as I can tell. That's what I meant a couple of days ago when I said that things are better in Canada. But you can have a bunch of people going through the eBird data and figuring out what it means in their community; if there is a species at risk in that community, looking and seeing what the data show. The scientists aren't going to do that, there isn't time for that. I just wanted to point that out because I don't think it has come out in any of the discussion so far. - Rick Bonney, Director of Program Development and Evaluation, Cornell Lab of Ornithology

- Actually Paul Treadwell and I were working on a flow chart to do just that, which we thought might be the beginnings of something towards building the toolkit. - Donald McCrimmon, VP of Academic Affairs, Nature Network, Cazenovia College

Citizen Science for Whom? Determining Goals and Roles

- From the toolkit point of view, if I'm starting out and using this tool, one of the first things I hope I'm faced with is the question, citizen science for whom? We talked a little bit about this in our breakout group, and in a number of sessions what has come up and

Educating the Public in Scientific Terminology

- I believe that part of the citizen science process itself should involve educating them to a higher level so it's not just what's in the trout stream but as part of participating in the project you start to learn some of the terminology. You start to think a little more like a scientist. You start to wrap your conceptions around some of the common terminology so that you're moving up and you're learning as you move through that process. To bring people in the door you have to talk to them at their level, but I think we want citizen science to be an educational process and part of that is moving them up and giving them more knowledge so that they can go out and make changes. - Paul Treadwell, Distance Learning Advisor, Cornell Cooperative Extension
- I think the point about simplifying the language was well taken, but I also think we can dumb it down too much. We really need both, so we're using terms like "oxygen depletion" as well as "bad water" or whatever. - Caroline Lewis, Director of Education, Center for Teaching and Learning, Fairchild Tropical Botanic Garden
- Perhaps "public friendly indicators" aren't the same as "policy friendly indicators." - Kate Haley Goldman, Senior Research Associate, Institute for Learning Innovation

Is Expectation of Impact a Turnoff?

- I guess I'm afraid that we could turn people off when starting a project because they're thinking, oh my gosh I've got to have these impacts, when in some cases you can have a strong, important, useful citizen science project that just answers a basic science question. But how can we help others go forward with that information? - Rick Bonney, Director of Program Development and Evaluation, Cornell Lab of Ornithology

been really helpful is Candie Wilderman's model [*see Chapter III, "Models of Community Science: Design Lessons from the Field"*] to help us think in terms of: Are these just data collectors or are these real scientists planning and designing the experiment of the project? I think that should be up to them.

For example, in our project at REEF most of them are pretty happy being "just" data collectors. There are not a lot of them who say they want to help the sanctuary plan what their zone monitoring protocol should be. From the beginning I think that whoever is designing the project needs to think of the role that the volunteers themselves want to play and then designing what that project would be, rather than dictating that they have to be data collectors or they have to be involved in higher design. - Leda Cunningham, Executive Director, Reef Environmental Education Foundation

- That's right, but if you want your project to have a broader impact, you want to get an NSF proposal for example, you come up with another way for allowing people to use those data, the people who want to use those data, and they may not be divers. They may be kids in a high school classroom somewhere who are coming up with a project and using those data to make a management recommendation as an exercise that might actually be used for something. - Rick Bonney, Director of Program Development and Evaluation, Cornell Lab of Ornithology
- I would just like to note that we have done that and we have never had an NSF grant (not that we wouldn't take one). - Christy Pattengill-Semmens, Director of Science, Reef Environmental Education Foundation
- The most common way that we're talking about things here is that it is going to be a push out to people, and that's still the common reference even though it has been mentioned many times here that we want citizen science projects to rise up from the population. We need to break the habit of talking about citizen science projects being pushed out. That is one model, and it is a valid and important model, but we need to break that habit if we genuinely want this to rise from the citizens' influence. - Paul Treadwell, Distance Learning Advisor, Cornell Cooperative Extension
- But it needs to be that combination because the Streamkeepers program actually came out from citizens saying "We want to," and government saying, "We'll give you the tools to do that." So it came from the community asking for something, but there's a lot of times that there are questions to be asked and I have no idea what those questions are or that they haven't been answered. I wouldn't even know where to start with the question, so that's up to you guys.

That's why we need the scientists, to let us know what those questions are and then engage us into wanting and striving to be in awe and wonder of your question and wanting to figure out more about it. So speak in English, tell me something I can work on, and we can work together. But you have to engage us to the point where we are going, "Wow! I can't wait to do that." And that is in my spare time, and spare time is a hard thing to find. I have heard so many great things here I keep thinking, I want to do that, I want to do that, but as I tell my volunteers: Figure out your watershed and stay in it.

- ZoAnn Morten, The Pacific Streamkeepers Federation

- It's not always the citizens looking for the science or those questions. A lot of times they just need the experience and then from the experience of doing it (and I'm sure this has happened for many of you) they come up with some amazing questions on their own. Maybe it takes the experience to get to the point where they feel comfortable in exploring those questions. We've talked about that a little in our working group, the idea of casting the net wide and then from those experiences, that is often where the questions come up.
- Timothy Vargo, Research Coordinator, Neighborhood Environmental Education Project, Urban Ecology Center
- What I'm hearing reminded me of what I thought the other day about the model, which is that there is community-driven and scientist-driven, but what we are really talking about is collaborative. That wasn't part of the model, and that is pretty much what I have been hearing everybody saying in the past few minutes as an optimal approach if you can manage it within the confines of your resources and geographic constraints. - Janis Dickinson, Director of Citizen Science, Cornell Lab of Ornithology
- Did you say that wasn't part of the model? The Community-based Participatory Research Model requires the intense mentoring of the community by the service provider, and the service providers are the scientists and they may also be people who are good in advising about programmatic issues, but the service providers are critical to the Community-based Participatory Research Model and it absolutely is a partnership. We cannot have one without the other. - Candie Wilderman, Professor, Environmental Sciences; Chair, Environmental Studies Dept., Dickinson College; Founder and Science Director, ALLARM
- I guess I interpreted that as advisors rather than equal collaborators, that was my interpretation of the language. - Janis Dickinson, Director of Citizen Science, Cornell Lab of Ornithology
- I think that's accurate. I think the idea is that they provide the services that the community asks for and that the community needs.

The Knowledge and Skills of "Ordinary" Citizens

- Someone was talking about dumbing down things for citizens. I work with Bushmen trackers in the Kalahari, and sometimes their perception and understanding of animal behavior are in many ways more sophisticated than Western zoologists. Another example is Sarah Kirn talking about fishermen who, in their own way, have a more sophisticated perception and understanding of certain aspects of the ecosystem that scientists can learn from.

I don't think citizen scientists need to be apologetic or have the idea that science is up there and they need to learn something. There are many ways and many contexts in which the so-called ordinary people actually have a very good and very subtle understanding of their own environment. I think we need to be careful of that sort of assumption that the scientist knows better. - Lewis Liebenberg, CyberTracker Conservation

Session Conclusion

- I want to thank you all for contributing your knowledge to this conversation because I think we were unsure about how it would be received by this group considering that everyone here is so knowledgeable about all of these topics. Thanks very much to the five folks who presented the varied perspectives on impact. - Jennifer Shirk, Project Leader, Citizen Science Toolkit Project, Cornell Lab of Ornithology

In reality, when the collaboration takes place it is very much a collaboration. And as ZoAnn was saying, they often do look to the service providers and say, "Give us some ideas, some good questions. In our study design, for example, what kinds of questions might be asked because we're not really sure? " The scientists would then step in and talk about their own interests. - Candie Wilderman, Professor, Environmental Sciences; Chair, Environmental Studies Dept., Dickinson College; Founder and Science Director, ALLARM

- I think what you're saying is that the language is really important because a "font of knowledge" approach does not see the knowledge of those participants as being as valuable as the knowledge of the scientists. - Janis Dickinson, Director of Citizen Science, Cornell Lab of Ornithology