White Paper on Citizen Science
NYSAEMC Conference
October 17-19, 2008
St. Lawrence University

NOTE: An edited version of this paper has been submitted for publication. Please do not cite this paper.

Citizen Science as an Organizing Principle for the Work of the EMCs/CACs

Jon Rosales[a]
Jon Montan[b]
Bob Flavin[c]

[a] St. Lawrence University, Department of Environmental Studies, Canton, NY 13617. Correspondence to: jrosales@stlawu.edu
[b] St. Lawrence County Office of Planning, Canton, NY 13617.
[c] Captain Bob & Mates Fishing Charter, Ogdensburg, NY 13669.

I. Introduction

Citizen science is an approach to scientific work that pairs the interests and labor of citizens, groups of citizens, or networks of citizen groups with professionals working in the field. Citizens often possess a keen interest, and often tremendous experience, in observing environmental conditions. While not necessarily professionally trained, citizens often observe, measure, and monitor environmental processes, and manage their own research. Environmental professionals, on the other hand, often do not have practical outlets for their work. Collaboration between citizen scientists and environmental professionals through citizen science can be an effective approach to environmental conservation, restoration, and knowledge creation.

The best-known citizen science program is the Christmas Bird Count run by the Audubon Society. Citizen science projects can also be smaller scale focusing on local or regional environmental conditions, such as monitoring amphibians, water and air quality, macroinvertebrates, weather, and even fireflies. These programs represent a network of citizens adding their input to the pool of data managed by the sponsoring institution in the creation of new knowledge. The number of people doing research and taking an active role in environmental conservation or restoration can be significantly enhanced with citizen science programs. With citizen science "you can make observations at unlimited locations that would not otherwise be practicable, while at the same time [build] public support for the environment" (Schnoor 2007: 5,923).

At the turn of the 20th Century, a time that fostered great populist thought, the great American botanist and ruralist Liberty Hyde Bailey (1996) called for the development of the "local person" to do public work, including the discovery and collating of local facts. Citizen science comes from this tradition. It unites people according to their interests, tapping into their knowledge, expertise, and willingness to work for greater understanding. Citizen science is both a scientific methodology and an organizing principle that promotes the democratization of knowledge. But most of all, citizen science situates interested citizens and professionals in their larger public domain doing useful work – to generate knowledge for the preservation of the environment, the commonwealth we all share.

Adopting the principles of citizen science can be an effective, and revitalizing, principle for the work of the Environmental Management Councils (EMCs) and Conservation Advisory Commissions (CACs). The principles of citizen science are consistent with the founding missions of the EMCs and CACs.

II. EMCs and CACs

The late 1960's and early 1970's were transformative times in the history of the United States. On April 22, 1970 a remarkable event occurred that involved 20 million participants and thousands of schools – the first Earth Day. Earth Day marked the transition from a society that was asleep to one that was waking up to the impact of environmental degradation, and it was a call to action. One of the outcomes in New York State of that historic event was legislation allowing for the creation of EMCs and CACs. EMCs were created pursuant Article 47 of New

York State Environmental Conservation Law in 1970, and CACs from Article 12-F of New York State General Municipal Law in 1971.

EMCs and CACs are advisory boards created to counsel local governments. One of the principal purposes of EMCs is to "advise on all matters affecting the preservation, conservation and ecologically suitable use of the natural resources of the county" (New York State 1970: §47-0107) and, similarly for CACs, to "conduct research into the land area of the municipality for which it was created" (New York State 1971: § 239-x(a)).

EMCs and CACs have very similar missions but operate at different levels of local government. Members of both are appointed by their governing body. In the case of EMCs, the governing body is the county. Multi-county regional EMCs are also possible. In the case of CACs, the governing body is a city, town, or village. A CAC may also be re-designated to function as Conservation Board (CB) which means that they can, "Review each application received by the local legislative body or by the building department, zoning board, planning board, board of appeals or other administrative body, which seeks approval for the use or development of any open area listed in the open space index" (New York State 1971: §239-y (3)(a)). Following receipt of an application a report shall be issued within 45 days containing recommendations pertaining to the impact on the open space index and possible appropriate alternatives. EMCs have a broad mandate to investigate, educate, report, and make recommendations pertaining to the environment, but statutorily lack the specific review responsibilities of CBs. In addition to similar missions, EMCs and CACs are also linked in counties where both an EMC and CACs exist by the fact that a designated member of each CAC shall sit on the county EMC.

EMCs and CACs each have their own statewide organization, the New York State Association of EMCs (NYSAEMC) and New York State Association of Conservation Commissions (NYSACC). Due to their close working relationship and similar missions, NYSAEMC and NYSACC have held a joint statewide "Conference on the Environment" each year for over three decades.

Currently there are approximately 24 EMCs and 199 CACs/CBs. EMCs in the 1970s were roughly twice as numerous as they are now. Attrition occurred for various reasons, but a major factor has been the cessation in 1992 of partial state reimbursement funding for EMC and CAC operating expenses. In contrast, the number of CACs appears to be relatively constant, although solid historic data is lacking.

Despite the tremendous environmental challenges that face our state, country, and world, EMCs and CACs are not realizing their full potential in part due to a lack of funding from New York State. Funding issues aside, the incorporation of citizen science initiatives could help these organizations reach their potential by more fully engaging the public and enabling environmental professionals to take their work into the public domain. Adopting citizen science as an operating principle, however, will first require a full understanding of the role of citizenship and public work in the United States.

III. Citizen Science

Citizen science comes from deeply American populist roots in the tradition of Theodore Roosevelt, Martin Luther King Jr., and Liberty Hyde Bailey. In particular, it taps into traditions and impulses related to working for the public good, to care for the commons, and building the commonwealth – governance for the common good. Citizen science fuels intellectual public life, builds the public domain through useful work, and acknowledges that all people have the ability to generate knowledge. Citizen science is often framed as a form of environmental management, but it is also a political model of the role citizens can play in their society. Citizen science can determine the kind of democracy we have. An aware and active citizenry is one where people are prepared to govern, as opposed to being governed. After all, the term democracy itself comes from the Greek *Demos* (people) and *Cracia* (power). Citizen science brings the power of the people together to learn and do public work. In this tradition, citizens are producers, actors, and creators of public goods, as opposed to consumers or customers of public goods.

Citizen science works against detachment from public life that permeates American culture. Citizens can be connected to public life through citizen science, something that counters trends in an increasingly marginalized and serviced society. John McNight (1995: 51) succinctly characterizes the overly-serviced American citizen:

> We will have reached the apogee of the modernized service society when the professionals can say to the citizen:
>
> > We are the solution to your problem.
> > We know what problem you have.
> > You can't understand the problem or the solution.
> > Only we can decide whether the solution has dealt with your problem.

Today's social and environmental problems are too often left up to professionals, the expert class, and to a culture with an attitude that one has to be credentialized, preferably with a Ph.D., to speak. This culture leads to citizens being fragmented from the responsibility for the condition of the environment, and absolved of the responsibility to generate solutions to environmental problems. This diminishes the role citizens play in determining their own choices, interests, and more to the point here, the kind of environment, our commonwealth, we want to have. Much of the bifurcation between an active, versus serviced, citizenry comes from what is considered knowledge.

Citizen science starts with the assumption that all people have the ability to learn and to generate knowledge. And, by extension, all people have the ability to generate research questions to be addressed. This starting point is crucial for citizen science. While difficult for many experts to accept, citizen science works best when participating citizens and expert professionals treat each other as equals in initiating and generating knowledge. Too often non-expert knowledge is dismissed as lay knowledge or anecdotal and not taken seriously. Knowledge is not created by experts, by trained professionals, or by scientific institutions alone. As Parris (1999: 3) observes, "One of the dangers of an increasingly professional and specialized corps of 'experts' is the mistaken belief that people who do not have academic credentials, research budgets, and fancy equipment lack the means to contribute to knowledge or discourse about environmental issues."

Citizens are often withdrawn from academic or professional studies. They are often studied, but less often do the studying themselves. While citizen science programs need to guard the quality and rigor of their activities, this does not automatically exclude citizens as active participants. Liberty Hyde Bailey also acknowledged this capacity of people for active environmental work. He reasoned that since citizens are near the sources of environmental resources and problems, they are "the natural conservator[s] of the native resources of the earth" (Bailey 1996: 26). The citizen-as-producer of environmental knowledge, then, is possible and practical.

Experts play a crucial role in this approach. As renowned theorist on civic engagement Harry Boyte writes, "experts should be on tap, not on top" (in Bailey 1996: iii). Boyte continues that specialized scientific knowledge and training are "a means to an end, not an end in itself." Rigor and quality control are the responsibility of the participating professional who sets standards according to the guidelines and protocols of their disciplines. Professionals don't necessarily have to instigate the scientific process; in fact successful citizen science programs are often initiated by citizens actively engaging in observation of environmental conditions and seek out professional advice. Bob Flavin is exemplifies the initiative citizens can take for the sake of their environment (Box 1). Professionals and their networks are crucial when it comes to advice; disseminating knowledge and information; and cross-referencing findings with other studies. This is how experts can be on tap, and useful.

Knowledge that is drawn from people's experience, in particular, is valued in citizen science. The contextual knowledge generated outside of formal scientific institutions, is both useful and needed. If knowledge is left to the dominant ways of science alone, "alternative ways of living and thinking" (Irwin 1995: 50) that are desperately needed to ameliorate environmental conditions, are stifled. Social scientists have noted this since the 1980s when, "A spate of social science work… ensued which showed that public understandings of science were more sophisticated and nuanced than they had been given credit for" (Leach & Fairhead 2002: 300). The problem is not solely the public dissemination of science, but a failure to acknowledge the "different forms of understanding and expertise" (Irwin 1995: 131). The danger is in assuming one knowledge form is appropriate for each problem. This limits the possible futures we can build.

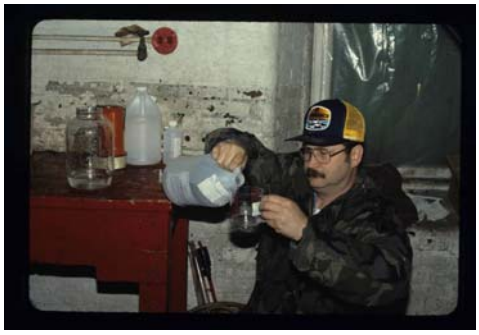
As an organizing principle, citizen science has many additional benefits for environmental work:

- More eyes, more coverage, more labor to get environmental work done.
- Enhances environmental literacy as citizens become more knowledgeable about science and the process of scientific inquiry (Trumball 2000) making them better able to assess political posturing, corporate propaganda, and distortion of scientific fact in the media.
- Mobilizes citizens for action strengthening the democratic capacity of the citizenry and connecting them to our commonwealth.
- More observers can keep polluters honest.
- Provides a direct outlet for academic research and engagement.
- Knowledge is created that can enhance conservation, develop deeper understanding of nature, and develop more effective policy.
- Citizenship involvement is needed if we are to achieve sustainability (Irwin 1995).
- It can be fun.

Citizen science has drawbacks that must be acknowledged. Scientists can be poor team players and managers of citizen science programs, and often control funding for environmental work. There are different levels of lay knowledge. If the skill level of the citizens involved is low, the data can be of poor quality. If the information is to be used in court, often data gathered by citizens is not admissible. While this shows the bias of the court system, it must be kept in mind. Not everyone will want to participate, in fact a knowledge class will emerge out of these programs of those people that want to know and generate knowledge. And, scientists and citizens don't, and often can't, articulate their knowledge in a way that is understandable to one another.

Citizen science, no doubt, is a challenge to powerful interests guarding positions of entitlement. It challenges the preeminence of science, what is considered knowledge, and who is entitled to claim that knowledge. According to Irwin (1995: 167) it challenges scientists "to engage with non-scientifically generated understandings and expertises." It forces us to acknowledge "a plurality of knowledge forms." "Citizen concerns will not fall easily within established academic categories." Science will have be constructed to fall "within everyday life" and scientific institutions will have to "flexible and open to change." No small challenge, but note, it is the professionals involved who most need to adjust. Citizen scientists have already taken it upon themselves to study, conserve, and restore their environment.

IV. Bob Flavin, a Citizen Scientist



Bob Flavin has always been a close observer of the river, the St. Lawrence River. After a stint in the Navy that included a tour of duty in Vietnam, he came back home to the river he grew up by and has not left since. An early retirement at age 58 from being a mechanic and a Risk Manager, enabled Bob to return to the river in earnest. Already being a US Coast Guard Merchant Marine Officer and a licensed fishing guide that allows him to operate virtually any vessel docked on the river at Alexandria Bay and take people out on the river fishing, Bob began a charter fishing company call Captain Bob & Mates Fishing Charter in 2004. His interest in the river runs deep and his observations of the condition of the river have propelled him to act on its behalf.

In the early1950's, US and Canadian governments started the Saint Lawrence Seaway and Power Development project to maximize the power and transportation potential of the river. With this large project came large scale disruption of the river, changing the river as he knew it. Just east of Ogdensburg where Bob lives, a shipping channel was created by removing eleven islands that ran across the river. The islands were cut, divided, and made into one large barrier. Both countries lost a large stretch of whitewater and habitat, spawning areas for many river

fish. The once rich and thriving nursery is now shallow, warm water with little or no current in which fry can grow. The "development" of the river for transportation and power continued down river in Massena and Cornwall where two large dams – the Robert Moses and Barnhart dams – were constructed along with a shipping canal on the US side. The two dams stopped the migration of fish in the river, spawning grounds were lost due to flooding, and many square miles of nursery habitat have been lost. Walleye, by the thousands, once migrated up the river from Quebec have become virtually non-existent.

As a close witness to the degradation of the river, and especially the walleye populations, Bob remembered what John F. Kennedy said in his speech in 1961 – "Ask not what your country can do for you - ask what you can do for your country" – and took it upon himself to work toward restocking river. Working with other sportsmen, a group from Ogdensburg began looking into what could be done to help the fishery. Their initial biggest challenge came from resistant government agencies – the New York State Department of Environmental Conservation (DEC) and the Canadian Ministry of Natural Resources. Bob said, "We were not getting the support from these two agencies with replenishing the walleye."

The group of sportsmen began anyway by cleaning up creek bottoms and placing rock rubble on the creek beds for spawning. They also shored up the stream banks to control erosion. The few river West of the Robert Moses and Barnhart dams began

With help from his wife Dawn and his daughter Bobbie Jean, Bob's major initiative, however, was a fish hatchery. They gathered information from many government agencies on both sides of the border on rearing walleye from eggs to fingerlings.

First they, had to learn how to design and build a hatchery, and hatch fish; then they had to get the DEC to approve it. Their hatchery work began with many experiments, setbacks, and learning from mistakes before moving on to the next challenge. Each time a burp, bubble, or egg moved in a way they thought improper they called the professionals. One day, somehow, one of the initial four jars of eggs, washed down into the catch tank. Not knowing any better, they cringed with doom, thinking the eggs were lost. They called DEC fisheries staff for help. Richard Colsante, operator of the DEC's fish hatchery on Oneida Lake, just laughed and said take a hose and suck them back in to the jar. It worked.

Another initial problem was the large flow of water into the tank; the fry were sucked into the screen and unable to swim away. "A redesign was needed and quick," Bob recalls. He improvised with some spare screen and a hot melt gun. "I do not remember a single year that we

have not had some type of a bump in the road," he says. "When this shows up we put our heads together and someone steps back and looks outside the box finding the answer."

After their initial resistance, consulting and cooperating with DEC Region 6 fisheries division greatly helped in getting the hatchery established, and eventually certified. At the time of certification, Bob's hatchery was the only state walleye hatchery. "Due to the success of our program there are other walleye co-operatives now in the state."

Once over these two hurdles, they began restocking of the river. "We were worse than expecting fathers," Bob remembers as the eggs started to develop. "We watched like little boys when the eggs hatched and the first of the walleye fry swam up out of the jar, down our eve trough, and down into the catch tank."

In 1986, when their project began, Bob spent five hours shocking fish on the Oswegatchie River, a tributary to the seaway, to get eggs for his hatchery. Today in the same area he is able to get over 50 walleye in one pass! Their walleye-restocking program has been a great success.

Bob is a citizen scientist, and a leader in North Country restoration. He acted on his interest, and love, for the river he knows so well. He received good advice along the way from professionals and scientists who were willing to help, but he largely did it on his own. Bob Flavin's work is a good example of the potential of citizen science programs. Citizens like him are eager to work for the common good and professionals can apply their expertise through environmental leaders like Bob. Along with fishing charters, Bob now provides tours of his hatchery and is teaching other eager citizens about hatching walleye.

Bob's story exemplifies the need to couple the interest and labor of citizens with the expert knowledge of professional researchers. EMCs and CACs can serve as the organizational body that links interested citizens, or citizen scientists as in Bob's case, with working professionals who can help them with their projects.

V. EMC's, CACs, and Citizen Science

Government is a site for public work. Government agencies, and their advisory boards, help catalyze, organize, train, and provide tools for public work. Consistent with populist traditions, government institutions can enable people to walk alone, to be whole persons, fully actuated and empowered. Government can expect its citizens to generate knowledge, not just be passive recipients dependent on experts for identification, diagnosis, and treatment. The role of the EMCs and CACs can line up with these populist traditions by facilitating citizen science for environmental work.

EMCs and CACs could serve as intermediaries between citizens and experts. With limited staff and resources EMCs and CACs cannot be expected to take on additional work. What citizen

science offers the EMCs and CACs is a reason to tap into its existing networks of citizens and experts, and into work that is already being done.

Citizen science calls upon everyone that is interested to collaborate and add their knowledge about environmental conditions to the collective body of knowledge that is the commonwealth. This is how a person can be connected to their country. The key is to develop action skills. The great community organizer Saul Alinsky (1971) offers some advice on how to instigate a culture of action. He develops a theory of action on how to get people involved in a cause that can be used to develop principles of citizen science for EMCs and CACs. Citizen science can draw on his inspiration by framing environmental work in ways that:

- Ground the issue in people's culture;
- Acknowledge that people's experience is legitimate and useful;
- Believe that people can develop scientific skills like any other skill;
- Create public programs that allow for diverse engagement, participation, and knowledge; and most of all,
- Ensure that people believe they can do something.

In addition to these action principles, several guiding axioms can be generated from the discussion above that may be of interest to state EMCs and CACs that want to pursue citizen science more intentionally.

1. All people have the ability to generate knowledge about the environment.

2. Citizen science programs must be flexible allowing for diverse ways of knowing and varying levels of expertise.

3. Citizen science programs must be rigorous and consistent with professional standards of practice. This responsibility falls on participating professionals to maintain methodological and ethical standards.

4. Citizen science should enable learning and skill development.

5. Experts should advise not dominate.

6. Citizen science programs should tap into the self-interest of the citizens and find common language.

True to its populist roots, citizen science is about "capacity-building for public work" and to help "communities develop their own capacities for cooperative work" (Bailey 1996: iv). It invites all interested parties to pool their abilities and resources to better the environment, our commonwealth.

Works Cited

Alinsky, Saul. 1971. Rules for Radicals: A Pragmatic Primer for Realistic Radicals. Random House: New York.

Bailey, Liberty Hyde. 1996 (originally published in 1908). The State and the Farmer. Minnesota Extension Service: St. Paul, MN.

Cohn, Jeffrey P. 2008. Citizen Science: Can Volunteers Do Real Research? Bioscience 58(3): 192-197.

Irwin, Alan. 1995. Citizen Science: A Study of People, Expertise and Sustainable Development. Routledge: London.

Leach, Melissa and James Fairhead. 2002. Manners of contestation: "citizen science" and "indigenous knowledge" in West Africa and the Caribbean. International Social Science Journal 54(3): 299-311.

McNight, John. 1995. Careless Society: Community and its Counterfeits. HarperCollins: New York.

New York State. Environmental Conservation Law §47-0107, County and Regional Environmental Management Councils. Albany, New York: GPO, 1970.

_____. General Municipal Law §239. Conservation Advisory Councils and Conservation Boards. Albany, New York: GPO, 1971.

Parris, Thomas M. 1999. Connecting with Citizen Science. Environment 41: 10, p. 3.

Schnoor, Jerald L. 2007. Citizen Science. Environmental Science & Technology 41(17): 5923-5923.

Stanford News Service. 1997. Schneider offers three questions to make a citizen-scientist. Stanford News Service (415) 723-2558.

Trumbull, Deborah. 2000. Thinking scientifically during participation in a citizen-science project. Science Education 84(2): 265-275.