2007

Organizing Rural Communities for Effective Citizen Science Programs

Anna Dean Holden
The University of Montana

ORGANIZING RURAL COMMUNITIES FOR EFFECTIVE CITIZEN

SCIENCE PROGRAMS

By

Anna Dean Holden

Bachelor of Science, Resource Conservation, University of Montana, Missoula, MT,
2005

Professional Paper

presented in partial fulfillment of the requirements
for the degree of

Master of Science
Environmental Studies

University of Montana
Missoula, MT

Spring 2007

Approved by:

Dr. David A. Strobel, Dean
Graduate School

Len Broberg, Chair
Environmental Studies

Laurie Yung
College of Forestry and Conservation

Neva Hassanein
Environmental Studies

Adam Switalski
Faculty Affiliate, Wildlands CPR

Holden, Anna, M.S., May 2007   Environmental Studies

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Chairperson: Len Broberg

  Citizen science, or the use of volunteers for scientific projects, is becoming a popular way for agencies and organizations to collect data. The benefits of citizen science include saving the agency or organization resources, educating the community about conservation issues, and promoting land stewardship. Currently, many citizen monitoring organizations are based in urban areas, whereas their projects are located near more rural towns. Research shows that demographics such as area of residence can be a factor in the public's attitude toward any scientific or land management project (Williams et al, 2002; Kellert, 1978, 1985; Vaske et al, 2001). This fact was supported by a citizen science project, led by the author, on the Clearwater National Forest. Currently, no citizen science organizing manuals address the issue of rural/urban difference in volunteer recruitment. Additionally, the question of what qualities citizen science must have to be used by government agencies must be determined so that non-governmental organizations can produce useful data.   I interviewed 11 successful urban-based citizen science conservation organizations in order to establish the characteristics of successful volunteer recruitment and retention. Additionally, I interviewed five state or federal agencies that used citizen science data in order to establish the characteristics of effective citizen science programs. Using Glesne (1999) as a guide, interviews were numbered and coded. Results showed that successful recruitment methods differ between rural and urban areas, with word of mouth and local newspapers as most effective. Citizens must believe in the program, have a social atmosphere associated with the program, and have a personal relationship with the project organizer in order to volunteer again. There is a difference in rural and urban communities, having to do with different values, priorities, and environmental awareness. Effective citizen science programs share three main characteristics: a proper training program, scientific accuracy, and a quality control program.

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CHAPTER 1: INTRODUCTION

The Issue

As more and more urban-based non-governmental organizations conduct citizen science projects located near rural communities, they encounter two major interrelated challenges: organizing rural communities around their citizen science projects (organizing), and making sure the data collected is of quality to be used in land-management decisions by governmental agencies (effectiveness). Indeed, not only are these challenges interrelated, but they also highlight the conflict between agency or organization protocol and rural community needs, wants, and interests.

There are three main sections to this paper. The first is based on my experience in recruiting and retaining volunteers in rural communities and striving to make my monitoring data effective enough to be used by agency personnel. The second and third sections address the two major challenges, recruitment and effectiveness, through an examination of largely non-governmental staff perceptions of rural volunteering and management agency staff perceptions of citizen science data quality.

In order to address the challenge urban-based organizations face of organizing rural communities around citizen science projects, I interviewed 11 urban-based organizations about successful recruitment and retention methods in rural communities. Additionally, I asked about their views on the differences between urban and rural communities and how these differences might affect their programs.

To face the challenge of obtaining professional-quality data from citizen scientists, I interviewed five governmental agencies that have used data collected by citizen science organizations. They were asked to identify the characteristics of the

citizen science program that made it of quality high enough to be used in their decision-making.

Interview results highlight the overarching conflicts found when urban organizations attempt to organize rural communities—that the rigorous protocols associated with citizen science programs (which they need to be effective) often conflict with the interests of the community. Additionally, it may be that the perceptions urban organizations have of rural communities, which tend to be somewhat stereotypical, are the very things keeping them from being successful in those communities.

Citizen Science

Community organizing has become a popular tool for creating social change. Advocacy groups have recently begun to realize that mobilizing local communities around issues is the best way to create lasting change. The people who experience the problem must take part in finding the solutions, since they will be most affected by any action taken (Lewis 2001). Many books and organizing manuals have been written to walk an organizer, step by step, through the process of including citizens in activities to create new laws or improve neighborhoods (Connor, 1990; Bobo, 2001; Alinsky, 1971). These manuals are usually written for people who work outside of state or federal agencies, and who realize they must include the public in order to create change.

To date, very few manuals (Pilz et al. 2006; Herron et al., 2004) have been written for scientists or biological managers for the recruitment and implementation of citizen participation, or citizen science, projects. Citizen science is simply the participation of non-scientists in data collection for scientific investigations (Trumbull et. al. 2000). Of

the citizen science manuals written, none address the challenge of working in rural communities. One major purpose of this paper is to address those challenges and give recommendations to organizations hoping to create a citizen monitoring program with a rural citizen base.

Community is often defined as a group of people who share the same values and live in the same geographical location (Webster, 1961). However, even small rural communities are dynamic and diverse. For example, one geographic community can support a multitude of different cultural, racial, religious, or socioeconomic communities. For the purposes of this paper, I use community to refer first to people in the geographical location of a citizen science project (communities adjacent to the project area), then to focus on those citizens who volunteer for the participatory project and relay the information they learned back to the geographical community (the community of citizen scientists).

Citizen Science Projects Near Rural Communities

More and more, scientific field research is being conducted near rural communities even as the scientists themselves are based out of urban areas. This phenomenon may be due to the urban base of most research institutes and universities, yet the nature of conservation field research often takes it to more remote places. In the western United States, there are several urban-based organizations involved in citizen science research projects located in rural areas. For example, the Wilderness Institute, based in urban Missoula, Montana, conducts noxious weed surveys in wilderness areas near the small towns of Anaconda, Wisdom, Wise River, and Phillipsburg, Montana.

Also, the Great Burn Study Group out of Missoula, Montana, uses volunteers to monitor several aspects of the Great Burn Proposed Wilderness, located North/South between the small towns of Superior, Montana, and Orofino, Idaho.

While both projects were successful in the number of volunteers retained, the number of citizen scientists from rural communities was low. In the first year of the Wilderness Institute's weed monitoring program, the project had 91.4% of its volunteers from Missoula, while only 8.3% were from rural Montana towns (Yung, personal communication, January 14, 2007). The Great Burn Study group reported that out of 106 volunteers in 2006, only 15 were from rural towns, or just 14% (B. Dupree, personal communication, January 15, 2007). In the 2006 field season, my project with Wildlands CPR (see Chapter 2) reported only 10 of over 60 volunteers coming from rural areas, nine of which were high school students on a school-sponsored field trip.

For many organizations, including those interviewed, it is important to get the support of the local communities for their projects. Building community support, community capacity, and increasing knowledge and skills toward a particular issue are goals for many organizations (Wilderness Institute, Monterey Bay Sanctuary Monitoring Network, PCEI). Therefore, when organizations take-on projects in remote areas, it is important the local rural communities are involved.

Differing Values in Rural verses Urban Areas

Scientific literature has begun to uncover differences between areas with different demographics. Sutton (2003) cites several studies that show how attitudes and values regarding predator and land management can be affected by demographics: Vaske et al.

(2001) showed that length of residency, gender, and education level influence attitudes regarding land management. In his study, new residents, females, and those with higher education levels tended to support a more biocentric view of the landscape, preferring preservation to multiple-use.

Values about scientific management issues—whether they be predator or land management decisions—can vary depending on demographics. A review by Williams, Ericsson, and Heberlein (2002) showed that ten of twelve studies found a significant negative correlation between rural residents and attitudes toward wolves. Additionally, higher socioeconomic status, higher education, and urban residence were found to be characteristics of people who place high value on wildlife (Kellert, 1978, 1985; Vaske et al., 2001; Williams et al., 2002). .

Benefits of Citizen Science to Agencies and Organizations

Benefits from using citizens in any planning project include obtaining a better understanding of the project's audience, gaining creative solutions to problems, and obtaining data that could only be known by people who observe the area year-round (Connor 1990). Also, scientific agencies and organizations often do not have the resources necessary to conduct both baseline data and continuous monitoring of ecological projects, since ecological monitoring requires a lot of time, money, and personnel (Au et.al. 2000, Pattengill-Semmens and Semmens 2003). The use of citizen scientists can reduce costs on projects, education, public support, and expertise. For example, the Verde River Project in Arizona generated 3,840 hours of volunteer labor to

monitor the impacts of non-native fish on native fish, and saved $30,720 in salary costs and $12,000 in travel and per diem expenses (Leslie, et.al. 2004).

Although cost-savings are obvious, some benefits of citizen science may be overlooked by the research community, such as strengthening participation from the civic community. Currently, scientific research is the business of scientists and specialized experts. In an attempt to remain objective, experts distance themselves from their research participants. Scholars reap rewards by contributing to a knowledge base that is critiqued by their peers and published in journals; these papers are known to be the utmost in scientific quality. However, such an approach to research doesn't encourage citizen participation. In fact, such a system conflicts with democracy because it doesn't value the participation of citizens in decisions that affect their lives (Ansley et al. 1997). This can leave non-scientists feeling disempowered, frustrated, or even angry when management or resource decisions are made without their input, especially land and wildlife management decisions. Scientific projects that use citizen scientists can help realize democracy in the lives of non-scientists and bring a quality of understanding to the information.

Besides practicing democracy, implementing projects with citizen scientists presents the opportunity to educate citizens about conservation issues, correct misconceptions, and gain public support for the agency or organization. Since citizens come from a wide variety of backgrounds and areas of expertise, projects can provide the agency staff with the opportunity to learn from knowledgeable citizens. Citizens can also challenge agency personnel by asking a wide range of questions about conservation issues or offer valuable advice. Additionally, the agency or organization can gain

information to assist in formulating management and research objectives (Leslie, et.al. 2004).

Other benefits to agencies and organizations include developing necessary communication skills to suit a wide variety of personality types. Supervisors must be able to provide a wide range of communication techniques in order to maintain a safe and enjoyable volunteering experience. In these circumstances, good communication skills include avoiding scientific terminology or jargon, which will help scientists more adequately relate their studies to the public (Leslie et.al. 2004).

Benefits to Communities and the Importance of Community Involvement

Not only does citizen science benefit organizations or the scientific community, it also benefits local communities. Local citizens gain opportunities to learn more about land or water management projects in their area. As citizen scientists hit the field with conservation leaders, they will have the opportunity to gain an understanding of the project and issues surrounding it. This gives participants the ability to be an educational source for other citizens in their community. Additionally, agencies and organizations have the opportunity to dispel rumors or misconceptions about their management, policies, or practices (Leslie, et.al. 2004).

Through work in the field and time with conservation professionals, citizens will better understand restoration projects and why they are important. Hopefully, this information will be passed on to the larger community so that additional projects will be embraced. Conversely, what citizens learn might want them to change the project to more closely meet the needs of the community. Either way, investing time in citizen

science projects promotes land stewardship and community cooperation (Court et al.2005).

As stated earlier, citizen science projects have the capacity to be a democratic process. Eric Higgs (2003), in his book about ecological restoration (a category which many citizen science projects fall under) states, "To ignore the political significance of restoration is to underestimate its power and potential by giving too much importance to restoration as a technical practice." (p256). What he means is that for a conservation project to be successful, it must rely on hands-on participation from the community instead of work solely by professionals and machines. By embracing community-engaged practice, we can begin to build relationships between people and place, which is critical for a successful restoration project.

On page 222, Higgs asserts that "restoration is successful only to the extent that the life of the human community is changed to reflect the health of the restored ecosystem." He points out that cultural change is necessary and eminent in successful restoration. For example, the Deer Lodge Valley of Montana is the site of the largest EPA superfund clean-up in US history. Mine tailings from the Butte-Anaconda mine in Butte, Montana, have traveled down the Clark Fork River and lay below the surface of the water embedded in sediment. The river clean-up will affect 13 large cattle ranches, all of which use the Clark Fork River for watering their cattle. Cattle are known to be disrupters of riparian health (Belsky et al, 1999), and if the Deer Lodge ranchers do not support the Clark Fork clean up and the riparian restoration to follow, they can destroy the restoration work with one year of careless cattle watering.

The environmental movement has gained many critics in the past 30 years. In some areas, there is significant distrust between non-scientists and the scientific community, and between communities and state and federal land-management agencies. If a restoration project is to take place in an area where this lack of trust exists, then the project could easily fail in the long run from a lack of citizen stewardship.

Personal Case Study: Citizen Science-based Road Decommissioning Monitoring on the Clearwater National Forest

From October of 2005 until October of 2006, I was the volunteer coordinator for a road decommissioning monitoring project on the Clearwater National Forest (CNF) that relied on citizen science involvement (the Clearwater project). The organization I worked for, Wildlands CPR, is based in Missoula, Montana, whereas the field work for the project took place between urban Missoula and Moscow, Idaho, near the rural north central Idaho towns of Kooskia, Kamiah, Orofino, and Troy, Idaho.

While the benefits of using citizen scientists were evident for Wildlands CPR and the citizens involved, mobilizing citizens from the rural areas proved more difficult than in urban areas. We had the majority of consistent volunteer participation from Missoula and Moscow, whereas our primary goal for recruitment was to involve the citizens of Kooskia, Kamiah, and Orofino, since those towns were directly affected by the project.

Additionally, Wildlands CPR had hopes of the CNF using the citizen monitored data in order to make future land management decisions on the forest, specifically those about road decommissioning and wildlands management. However, even with careful project planning, Wildlands CPR was unsure as to whether their results would be seen as

valid and useful in the scientific community since the data was collected by non-professionals.

Utility of Citizen Science Data

Scientific organizations, whether urban or rurally based, strive to conduct research that will be valid and useful for other members of the scientific community. Additionally, many non-governmental organizations try to produce data that will influence management decisions. The aforementioned benefits of citizen science make it attractive to agencies and organizations; however, when data collection and analysis is not carried out by trained professionals, there is always a question of the quality of results. That is, is research conducted with the help of citizen scientists as reliable as data collected by professionals alone? Yoccoz et al. (2003) suggests that vigilant training and sample design should make it possible for citizen science-based monitoring projects to produce results as reliable as those produced by professionals. However, the reliability question still remains. Therefore, it would be useful for organizations to understand basic qualities that citizen science efforts should have in order to gain influence and trust from government agencies (Danielsen et al., 2004).

Current Organizing Materials

In order to address the specific values within a community, current volunteer organizing manuals (Alinsky 1971, Connor 1974, Bobo et al. 2001) talk about building coalitions within the project community. This includes taking a survey of the values of the community and holding stakeholder meetings. However, such manuals are designed

for direct social change. Citizen science projects create social change indirectly because they do not focus directly on changing an area of government or social injustice. Instead, they seek to create change through participation, education, and hands-on scientific field work. To date, there are no recruitment manuals designed specifically for citizen scientist recruitment in rural areas that take into account the different attitudes rural people may have toward science and scientific projects. These manuals also do not address the indirect, longer term approach to value change contemplated by such projects.

Recently, the USDA has created a guide for managing citizen science projects entitled: *Broadening Participation in Biological Monitoring: Handbook for Scientists and Managers* (Pilz et. al, 2006). This guide breaks the management of citizen science projects into three major categories: planning, implementation, and follow through.

The planning stage includes creating goals for the project though stakeholder meetings and involvement. "If there is not a common understanding of purpose, stakeholders will follow divergent paths" (p14). Collaboration, a major sub-theme in planning, refers to types of participatory monitoring and the advantages and disadvantages to using citizen science. Interestingly, even though the book is about using participants, the guide sites several more disadvantages than advantages to citizen science. Disadvantages include the large time commitment collaboration involves, diverging values or hidden agendas from citizens, stakeholders unwilling to collaborate, and irreconcilable interests and values.

Relevant to this study, the USDA's planning stage also addresses context, recruitment, and selection of participants. Context here describes the overall environment of the monitoring project, including events and circumstances (p26). Having

a clear understanding of the context is important for all stakeholders, and a collaborative description of the context is the key to moving forward with the project. Context is to be understood in a number of different ways, five which are relevant here.

The first is by collaboration, or by weighing the perspectives of all stakeholders to inform decision making. The second is politically. "No natural resource management issues exist outside a political context" (p26). Tactics and decisions are often influenced by relationships between more powerful and less powerful stakeholders. For example, less powerful stakeholders may feel that there are barriers or limits to what decisions they can make or the influence they can have. "Unless powerful stakeholders (for instance, government agencies) approach participatory projects with integrity and long-term commitment of policy, personnel, and resources, other stakeholders can easily become disillusioned and mistrustful" (p27). Understanding political context is critical for building trust among participant stakeholders.

Third is the community context, which the USDA guide describes as support and mobilization of the community in response to lack of jobs or land use controversy. When managers are open-minded to community-based initiatives, successful collaboration can occur (p29).

Fourth is the economic context, which can be particularly important to participants as agencies are funded largely through taxpayer money. Economic interests can dictate what projects participants are interested in and where they will fit into the project best. However, when participants volunteer because they favor a certain outcome, safeguards must be taken to insure nonbiased data collection and interpretation (p29).

Finally, is the cultural context. Often, individuals and even whole communities can differ in their epistemologies, which results in different opinions about the project and may require different recruitment, education, and communication techniques from the agency.

The USDA guide also stresses that a wide range of good communication skills are necessary to recruit and manage citizen scientists. Clear and non-threatening communication is the only way to build trust between stakeholders (p41). Different communication styles must be understood by agencies in order to address the differing perspectives of participants. These perspectives include differing worldviews and paradigms, or ideas about how the world works. They can also include differing ideas of how humans should behave and what is important in life (p41). Any assumptions held by citizens can lead to preconceived notions of other people, agencies, and activities. Assumptions can also lead to preconceived notions on how to best understand the world; science, religion, observation, etc. "When our worldviews, assumptions, perspectives, and preconceived notions differ significantly from those of other individuals with whom we are trying to collaborate, clear communication often requires additional effort" (p42). The USDA recommends performing structured communication exercises to explore and understand differing perspectives.

The guide also talks about the recruitment of participants. Best outcomes occur when all volunteers are treated fairly in the participation process, regardless of their personal contexts. This doesn't mean that volunteers can't be used differently, just that their treatment as volunteers is equal. Recruitment strategies from the USDA include using newspaper announcements, calling by phone, or creating a formal scoping and

advertising process. However, as I will describe in Chapter 2, these strategies may not be as effective in rural areas as in urban areas, or in two areas with different contexts--a problem that the USDA, even with all their talk about context, does not address.

Project Purpose

Citizen science is used frequently as a tool by agencies and organizations, largely due to the benefits listed above.   The purpose of this paper is to examine the factors that promote or interfere with recruitment and retention of rural volunteers by primarily urban organizations. Additionally, this paper attempts to address ways to set up a citizen science project that will be valid and useful to land-management agencies and organizations. Therefore, the studies performed in this paper are completed to inform the final chapter, which will be a guide, based on my experience and the experience of other urban-based organizations, of how to build an effective, rurally located citizen science program.

A note to the reader: although the technical term for volunteers in scientific projects is "citizen scientist," there are few organizations who give their volunteers this title. This paper uses "citizen scientist" and "volunteer" interchangeably to recognize the vernacular nature of the language.

CHAPTER 2: CASE STUDY: ROAD DECOMMISSIONING MONITORING ON THE CLEARWATER NATIONAL FOREST

History

The Clearwater National Forest (CNF) is located in north central Idaho and runs East to West between Lolo, Montana, and Moscow, Idaho. In the early 1900's, logging companies found the forest to be quite profitable for timber, thus heavy logging began. Scars from that heavy extractive period are still evident today—road densities in the CNF are upwards of 40 miles per square mile. While logging still takes place today, logging on CNF lands is managed with the modern policy of no net gain of roads—for any road built, the same length of road must be removed.

The CNF, due to its steep nature, is also known for 100 year rain-on-snow events which cause extensive flooding and landslides. One such storm happened in the winter of 1995-1996; this storm caused over 900 landslides, over half of which were the result of road failure. This information lead the CNF to acquire emergency funds from Congress in 1997 and in 1998, they teamed up with the Nez Perce Tribe (NPT) to begin an extensive road decommissioning program. To date, they have decommissioned over 500 miles of roads from the forest.

Road decommissioning is one form of ecological restoration. Eric Higgs (2003) states that restoration should be a conversation, or reciprocal exchange, "between restorationists and ecosystems, and among science, aesthetics (cultural values) and participation" (p 286). This sort of exchange can only take place with careful monitoring of the restoration work, and monitoring requires resources. Recently, diminishing

budgets in the Forest Service have prevented them from doing anything but basic monitoring, mostly on the technical aspects of their decommissioning work. Monitoring on decommissioned roads is scarce; there is very little data on the effects of road decommissioning.

In 2004, Wildlands CPR and the University of Montana's Environmental Studies Program (EVST) partnered with the CNF and the NPT to develop a set of monitoring protocols to be used by citizen scientists to monitor the effects of decommissioned roads. Specific project objectives included: 1) to assist the Forest Service and Tribal personnel in obtaining vital monitoring data regarding their road removal program in several areas of the forest, and 2) to engage and educate members of the public about the existence of road decommissioning projects and their benefits and impacts (Court et al.2005).

The use of citizen scientists in this project was critical because of the benefits listed in Chapter 1 and because the local people were those directly affected by the negative impacts roads had on flooding and landslides: many of the area's residents watched their homes slide off hillsides during the flood. Additionally, these communities use many of the US Forest Service roads that have been decommissioned or are slated to be decommissioned as funding becomes available. By having citizens conduct the monitoring, Wildlands CPR is seeking to build an understanding of road decommissioning in the local communities and begin the conversation between the ecosystem and the citizens. The goal is to counter misperceptions about the decommissioning process and foster an understanding of road decommissioning as a watershed restoration tool.

In the first year of the project, monitoring protocols were developed to monitor for wildlife and vegetative recovery, stream health, and erosion. Wildlife protocols include using remotely triggered cameras and track plates; these are checked each week during the field season. Once per season, a vegetation sample is conducted on the decommissioned roads; we use a simple point cover survey and density data plots. A Wolman pebble count is also conducted in the streams below the decommissioned roads, along with a macro-invertebrate sample and water temperature measurements. Finally, erosion pins are set and checked once per season. In the first monitoring season, we compared decommissioned roads to a roadless area, an overgrown road, and the open roads adjacent to each of these.

After the protocols and study design were set in place, the first citizen scientists hit the field. The first citizen science monitoring season was deemed successful; many people from Missoula volunteered. The number of volunteers from Idaho communities, however, was small because the time and energy of creating a protocol limited personnel resources for recruiting in rural Idaho communities. In the second year of the project, I was hired to target the rural communities of Kooskia, Kamiah, Orofino, and others for the majority of the season's volunteer base.

Early Season Rural Volunteer Recruitment Efforts

In November of 2005 I began to try and make contacts in north central Idaho. My goal was to find a citizen in each of the small communities who could recruit and mobilize others in the area. Ideally, this person would be well respected in the community and have influence in guiding community activities.

My first attempts were just to contact the women from the CNF and NPT who I would be working with. Both of these attempts were unsuccessful. Unlike contacts in Missoula, who usually responded with email in 24 hours, I tried email after email and phone call after phone call with no avail. I finally was responded to, but not until two weeks after my initial try.

Because the panhandle communities are small and rural, I looked for any organizing group to focus my recruitment efforts. I emailed and called the Chambers of Commerce from Kamiah, Kooskia, and Orofino; only Orofino replied. I had found that they were having a town Christmas celebration in mid-November, and I asked if I could help.

Through my undergraduate studies in the Wilderness and Civilization program, I learned about non-profit advocate organizations who, like me, were struggling to understand a different community's values and be understood by that community. I also learned that this usually took at least a year of the organization interacting with the community, as well as a calculated effort on the part of the organization, to understand the community first. For example, when Women's Voices For the Earth (WVE) was advocating for Smurfit Stone Container (a pulp and paper mill in Missoula) to stop bleaching their products, they spent a year patronizing the same bars and restaurants as mill workers, talking to them each night and building trust. Once they felt they had developed enough trust, they were able to pitch the idea of removing the bleaching process and, more importantly, able to gain support from the mill workers. With this support, they were successful in eliminating bleaching from the mill's processes.

Like WVE, I felt that I was coming from a place of different values than the small Idaho communities. Missoula is known as the liberal hub of Montana; Moscow (which about two hours northwest of Kooskia, Kamiah, and Orofino) is the liberal hub of Idaho, but those values may not extend into the small communities. Wildlands CPR advocates for the removal of roads in wild areas, as well as the elimination or reduction of off-road vehicles. While in north central Idaho, one fact that became very apparent was that off-road vehicles were a major form of recreation. Suddenly, I was the strange hippie from Missoula advocating that the community support the removal and monitoring of the very roads they spent their weekends on. I suspected from the beginning that convincing the communities to do this was going to be daunting for two reasons: 1) they like to use off-road vehicles, and 2) they weren't included in the decision to remove the roads or to begin a monitoring project. Therefore, their inclusion was technically an afterthought and thus the project did not include their values, beliefs, or input in any way besides monitoring work.

I joined the Orofino Christmas celebration with this in mind, and with the mind-set that I was there to show the people that we shared common ground. The afternoon activities drew few community members, but during a small Christmas art event I did talk to a nice woman who was new to the community. She took me to a sandwich shop for dinner, and insisted that my project was interesting and would draw many volunteers, even though she herself was not interested in volunteering.

I spent the night in the home of my CNF contact, and we talked about where and how I should focus my efforts. I want to make it clear that this was more than a formal meeting—I was offered dinner and wine, dessert and breakfast. We decided that the best

place for me to work in Orofino was in the high schools. The school system was too poor to afford a field trip (to reduce costs they have a four-day school week), but education is free.

In January, I met with the Orofino high school government teacher. The biology teacher followed a strict lesson plan and was unable to allow a guest speaker on (heaven forbid!) something practical. The government teacher and I decided on two separate lessons, given one month apart. That same weekend, I also spoke with the principal from Kamiah high school, an enthusiastic man who invited me to teach a week-long unit to the upper-level ecology class in May.

In February, my eyes were opened to some of the values that permeate these communities when I taught at Orofino high school for day. My lesson was about the difference in public and private land, plus an overview of our project and how they could participate. During this time, President Bush had given the state of Idaho control of wolf management in Idaho—a job usually up to the federal government. The state of Idaho wanted to kill off 75% of their wolves in the local area (Lolo hunting district), claiming that wolves were the reason for the declining elk populations. Although these intentions were based on faulty science, the students in the classroom largely supported the initiative[1], and further probing suggested that they felt this way because their parents did.

These learning experiences drove me to create a brochure about our project that was as comprehensive as possible, and would appeal to both the urban and rural Idaho

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[1] Between 1910 and 1934, intense wildfires opened up prime elk habitat in the Clearwater region, and elk populations reached the tens of thousands. But fire suppression, road building, increased hunter pressure, and a bad winter in 1997 reduced elk to 5,000 in that year. Wolves, introduced in the area in 1995, were only a small part of the decline (Zaffos, 2006; Gilman, 2006). Additionally, it was found that livestock calves in the area maintained a 95% survival rate after the introduction of wolves, and only 31% of the death was caused by wolf predation (Oakleaf et al, 2003).

crowd. The brochure showed wildlife pictures taken from our cameras, plus pictures of volunteers on the ground. It also explained the history of landslides in the CNF, why roads cause problems, why monitoring is important, and how people can get involved. This brochure was handed out at Missoula events, in the high school classrooms, at Forest Service regional offices, hotels, and gas stations. While the brochure was being generated and distributed, I waited and retried contacting the Rotary and Kiwanis clubs from north central Idaho, to no avail. I also tried the regional Ducks Unlimited group, but was denied.

In March, I did a presentation with my Forest Service contact at a Trout Unlimited (TU) meeting in Genessee, Idaho (just south of Moscow). My experience with TU in other states (Utah and Montana) was that it was a group of conservation-minded people (mostly men) who loved to fish and recreate in wild places. However, that assumption was proven false for this, the Three Rivers, Chapter of TU.

My Forest Service contact went first with a presentation of partnerships between the CNF and other organizations, including Wildlands CPR. When she mentioned the road decommissioning program and our monitoring of it, she was stopped by several people in the group who wanted to know more about why the CNF had used their tax dollars to remove roads. Clearly, either the connection between the landslides and the roads was not understood or access was more important than human and ecosystem safety. Additionally, it was obvious that a connection between the effects of roads and landslides on streams, and subsequently fishing those streams, was not made.

The CNF wasn't even able to finish their presentation, as time was limited and she had taken nearly an hour to try and calm down the riled-up crowd. When my turn

came to talk about volunteering on these decommissioned roads, I felt that my words

landed on deaf ears. It seemed apparent that no one was interested in monitoring

obliterated roads, since they felt that they shouldn't have been removed in the first place.

Luckily, I was wrong. The next week, one man who had attended the TU

meeting, who was a member of the Clearwater Flycasters, thought that his group would

like to hear a similar presentation from me at their next meeting. This man was from

Troy, just outside of Moscow. I agreed to speak at his next meeting.

Additionally, I found another organization out of Moscow called Friends of the

Clearwater. They were very interested in what we were doing and asked that I go to

Moscow and speak with them at their monthly group potluck. I agreed, and was soon

eating chili in a member's home and telling them about my project. The directors were

very eager to help, and promised me work from their intern, who could do weekly

monitoring at our site near Moscow (otherwise, I could have only afforded monthly

monitoring, since the site is four hours from Missoula).

That weekend I also attended the Clearwater Flycasters meeting and generated

more interest, especially in macroinvertebrate samples. Additionally, I met with the

Palouse-Clearwater Environmental Institute (PCEI), who agreed to post my volunteer

trips on their list serve of over 900 volunteers. Recruitment from the Moscow area

seemed to be going well.

On the 22nd of May, I began my four day teaching unit in the Kamiah high school

ecology class. The first lesson was background on land ownership and an overview of

our project and how the class would be involved. The second day's lesson focused on the

wildlife aspects of our project and included a track book worksheet, which the students

really seemed to like. On the third day, we went outside and practiced doing vegetation

surveys as we would be doing in the field the following day. The students were well

prepared when they went out into the field, and really jumped into the field work. The

students seemed interested as long as they were doing this for class, but there was little

interest generated for field work over the summer save for one or two students (out of

nine).

Later in May, I traveled to Moscow and met our FOC intern and a volunteer from

Clearwater Flycasters, who proved to be a reliable volunteer throughout the season. The

rain was coming down in sheets that day, and our list of almost six volunteers dwindled

to two. We still had a productive day in the field, however, and established two lasting

volunteers.

Monitoring Season Observations

During the monitoring season, I relied on brochures and email alerts to recruit

volunteers, both proving somewhat fruitless. I must admit that putting so much emphasis

on recruitment in Idaho caused me to concentrate on Missoula less than I should have,

and therefore I didn't get as many volunteers as I potentially could have. I'll let the

numbers speak for themselves: from Missoula, we had 136.5 hours of volunteering, from

Moscow, we had 114, but from the rural towns of Kamiah, Kooskia, and Orofino, we

only had 58.5, all of which came from the school group in May.

Volunteer recruitment was more successful in Missoula, but only when the

university students were in session. Concurrently, the only volunteers involved from the

rural North central Idaho communities occurred when high school was in session. I was

unable to get any volunteers from that region, largely due to the fact that there are few organized adult groups in those areas, and of the established groups, none had interest in scientific or ecological projects. I speculate whether their lack of interest was due to the fact that their organization was focused on "community service" instead of "ecological community service," if their values differed greatly from the goals of the project, if their time priorities didn't allow for this type of service, if they didn't receive proper notice of the project, or if their lifestyles precluded them from participating. Thus, the purpose of this project became clear: How does an organization successfully recruit volunteers from rural communities?

CHAPTER 3: METHODS

<u>**Methods**</u>

To try to address the challenges urban organizations have with organization rural communities for citizen science project and making sure that the data collected is of quality to be used by professionals, I performed qualitative interviews. For each, I developed an open-ended interview guide and conducted interviews over the phone. For the first, I focused on the challenges urban organizations face, specifically related to volunteer recruitment and retention in rural communities. The experience and perceptions of these organizations can illuminate what might work for other urban-based organizations for successfully recruiting volunteers for citizen monitoring projects, especially in rural areas where projects are largely based.

I found 11 organizations which either had a strong citizen science or restoration focus. (For instance, the Bob Marshal Wilderness Foundation works on restoration projects and performs little, if any, data collection. However, they still recruit volunteers from rural communities for similar work). I found these organizations largely through internet searches, links from other organizations, word of mouth, and from personal experience. I developed an interview guide in November of 2006 and passed it through the Institutional Review Board that month. This allowed for the organization to be identified for all but the final three interview questions.

The interview questions focused on the organization's project, the utilization of volunteers, the methods used to recruit and retain volunteers, and how recruitment and retention were different in rural verses urban areas. Additionally, I asked three

confidential questions about differences between rural and urban communities and rural and urban volunteers. The interview guide can be found in Appendix A.

The eleven interviews took place between February 12th and 22nd. Each interview was conducted by phone and digitally recorded onto a computer using WavePad software. All files were saved as CD quality Wav files. Due to lack of funding, the interviews were not directly transcribed, but detailed notes were taken during the interviews and again afterwards to ensure an accurate written account of each interview. I referred to recordings frequently during data analysis to ensure the accuracy of the participants' wording. The written accounts of the interviews were printed out on hard copy, numbered, and then coded using suggestions from Glesne (1999).

Through a second set of interviews, I also attempted to address the challenge that urban organizations have in producing effective data that can be used by land-management agencies. For this portion of the project, I developed an interview guide with questions about the project from which citizen science data was used and the characteristics that made the data useful (Appendix C). I identified five organizations that either have had their data used at the local, state, or federal level in management decisions, or used citizen science data collected by an outside organization. This information was provided through the EPA's website on citizen monitoring programs at http://yosemite.epa.gov/water/volmon.nsf/Home?readform, and through web searches on Google. I looked at each organization's web page and contacted each of them for interviews. Questions inquired about the organization's project, use of volunteer data, and perceived characteristics that make volunteer data usable (see Methods section).

For both analyses, I re-read and listened to the interviews repeatedly as one would a story, then began writing down commonalities between the interviews, many of which became themes among the interviews. Themes were then coded using Glesne (1999) and put into its own analytical and quotational files, with the comments supporting that theme cut and pasted as hyperlinks into that file. From there, I was able to piece together the story told by the organizations.

Additionally, I looked for divergent themes from the data spreadsheet. These are themes that only one participant mentioned and those which contradicted the main themes. These themes will also be discussed in the results.

Since interviews were not transcribed, I have used my written accounts from listening to the interviews to paraphrase the participant's words in the results. For sake of accuracy, I have also included direct quotes.

<u>**Benefits and Limitations**</u>

A benefit of this study is that a guide will be made from the ideas and perceptions of urban organizers and directed toward use by other urban organizers, allowing the experience, accomplishments, and failures of one organization to be shared or avoided by the other. Additionally, this final guide will be created to act as a supplement to other organizing manuals and will afford the users the benefit of saving resources by eliminating or reducing the failed organizational and effectiveness methods tried by other organizations.

A limitation of this study is that while the organizations interviewed recruited in both urban and rural communities, they were not very good at recruiting from rural areas.

Thus, they are not the experts in this field. Rather, they provide advice on the best way

for organizers to proceed. Moreover, those interviewed were primarily urban-based

themselves and may not have much experience with or knowledge of rural residents.

Their urban bias may lead them to see rural people in a somewhat stereotyped way.

Additionally, this study had a limited sample size and groups from all over the country

were interviewed, which masks regional differences.

CHAPTER 4:

SUCCESSFUL VOLUNTEER RECRUITMENT: A QUALITATIVE ANALYSIS OF SUCCESSFUL CITIZEN MONITORING ORGANIZATIONS AND THEIR RECRUITMENT AND RETENTION METHODS

<u>The Interview Participants</u>

Eleven representatives from citizen monitoring organizations were interviewed. Here, I will name the organization and the person I interviewed and give a brief description of their organization and their citizen monitoring projects. Unless otherwise stated, all information comes from my interviews with the organization. The results of the interview—questions dealing with their recruitment methods and views of rural verses urban volunteers—will be discussed in the "Results" section of this chapter.

The eleven people interviewed were: Laurie Ashley, of the Wilderness Institute; Bridget Hoover, the Monterey Bay Sanctuary Citizen Monitoring Network; Debi Chiro-Macdonald, the Coastal Watershed Council; Paul Travis, the Bob Marshal Foundation; Elizabeth Herron, the Rhode Island Water Watch; Ken Cooke, the Kentucky Water Watch; Kristin Sewak, with Natural Biodiversity; Dan Miller, the Bear River Watershed Council; Veronica Egan, with Great Old Broads for Wilderness Interactive National Grassroots Evaluation Resource; Courtney Rush, with Palouse-Clearwater Environmental Institute; and Matthew Martinez, with Volunteers for Outdoor Colorado.

The Wilderness Institute

The Wilderness Institute is based in Missoula, Montana. They are involved with one major citizen science project, which is monitoring noxious weed infestations and recreation impacts in Montana's wilderness areas. The project began in 2005 as a partnership between the Wilderness Institute and the Bitterroot National Forest (Bitterroot) and the Lolo National Forest. Like many national forests, the Bitterroot is on the move to keep noxious weed invasions in their wilderness areas under tight control. Because of budget cutbacks, most US Forest Service (USFS) offices are low on resources and funding; this is true for the Bitterroot. By pairing with the Wilderness Institute, the Bitterroot could meet its need of surveying noxious weed infestations while saving resources.

Together, the two organizations identified which noxious weed species needed to be identified and mapped and in which areas. The Wilderness Institute, working with local forest ecologists and botanists, worked out which parameters would be best measured for each infestation using GPS. The Wilderness Institute trained two field leaders—I was one of them--to perform the majority of the weed monitoring; however, one major objective of the project was to include volunteers, so the field leaders also took five groups of five to 10 citizen scientists into the field during the monitoring season (June—August).

The Wilderness Institute included volunteers from the outset of the program, not as an addition. Their volunteers come mainly from urban areas—91.4% were from Missoula, Montana; the rest from the rural towns of Arlee, Choteau, Darby, Hamilton,

and Great Falls. For the 2006 season, they had 65 volunteers, about 10 of which were retained from the previous season.

Monterey Bay Sanctuary Citizen Monitoring Network

The Monterey Bay Sanctuary created the Citizen Monitoring Network (Network) because of its goal of having comprehensive monitoring of the health of the Sanctuary and its watersheds. The goal of the Network is to have volunteer based, long-term water quality monitoring of the Sanctuary and its watersheds. On their website www.montereybay.noaa.gov/monitoringnetwork, the Network lists one of their main goals: "To establish communications between citizen monitors and government agencies so that the information that is collected is useful" (2001).

Their website states that their major watershed monitoring activities include: basic watershed monitoring, which is conducted by about 20 trained monitoring groups in the Monterey Bay area; Snapshot Day, a day of water quality monitoring concurrent with Earth Day where local citizen monitors can provide a "snapshot" of the water quality of the Sanctuary's watersheds; First Flush, a late fall monitoring day to monitor urban runoff during the first major storm event of the season; and Urban Watch, a collaborative group between cities in the bay which monitors urban runoff and mobilizes for First Flush.

The Network recruits volunteers throughout the sanctuary, which stretches from the San Francisco coast 300 miles south. However, because the area is so large, the Network focuses on the South end of Monterey bay, while partner organizations focus in

other areas. These south bay towns include Monterey, Carmel, Watsonville, Pacific Grove, and Morrow Bay.

Bridget Hoover of the Network said that their volunteers are fairly evenly spread throughout the major cities, with fewer coming from the rural areas such as Watsonville. Last year, they had 190 volunteers for Snapshot Day, 75 for First Flush, and about 40 for their Urban Watch program. They have about 30 to 50 volunteers coming back each year.

Coastal Watershed Council

The Coastal Watershed Council, or CWC, is one of the Sanctuary's aforementioned partner organizations. Established in September of 1995 in a response to the declining health of the watersheds in the Monterey Bay region, their mission is to restore the watersheds while teaching local citizens about water quality issues and fostering stewardship between citizens and the watershed. According to CWC's website, www.coastal-watershed.org, the CWC is "committed to the preservation, protection and management of coastal watersheds through establishment of community-based watershed stewardship programs, education and community outreach." They do this by focusing their programs in three areas: 1) Stewardship, through the Clean Streams Program; 2) Education and Outreach, by providing information to schools, community groups, and citizens; and 3) Watershed Advocacy, by working with agencies on water quality and monitoring issues.

The CWC was formed with a volunteer component, and actively recruits volunteers from Santa Cruz county—towns like Aptos, Capitola, San Mateo--and even up

to Walnut Creek and San Francisco. The number of volunteers they have from each community depends on the year and the program, however, they had 126 volunteers last year alone. Most of those volunteers, 80 of them, participated in Snapshot Day. Additionally, most of the volunteers came from the more urban areas of Capitola and Santa Cruz.

Bob Marshal Foundation

The Bob Marshal Wilderness Foundation (BMWF) acts as the volunteer coordinator for the Bob Marshal Wilderness area (the Bob). The BMWF works with the USFS to put together volunteer projects to benefit the Bob. A growing part of their volunteer projects are in ecological restoration, and volunteer activities include trail work, campsite restoration, and facility maintenance. Trails take up the bulk of volunteer time, requiring 85% of their attention.

The BMWF started all of their projects with volunteers in mind. They structure all their USFS collaborative meeting with this in mind, so that all projects are volunteer-centered.

The BMWF recruits volunteers on a national level, mostly from large, urban towns. However, they also have a local recruitment focus, which targets the communities surrounding the Bob. They get most of their volunteers from Missoula, Helena, Great Falls, Kalispell, and Whitefish. The majority of their volunteers are urban-based, but they believe that to be because there are simply more people in urban areas to draw from.

Even with their local focus, most of their volunteers come from out of state— urbanites seeking a wilderness experience vacation. Again, most of their in-state

volunteers are from urban areas also. Last year, they had 370 volunteers working on 43

different projects. Included in that number are youth groups, at-risk youth, and school

programs. Retention is difficult since most of their volunteers travel long distances to

help, but within the local volunteer base, the BMWF retains somewhere from 5-10% of

its help.

Rhode Island Water Watch

The Rhode Island Water Watch, or the Watch, is a state wide water quality

monitoring program that engages people in the active monitoring of lakes, rivers, and

other water bodies. Citizens monitor for a basic suite of water chemistry parameters and

help the Watch establish priority lists of locations where water quality is low and requires

attention.

The Watch was started with the volunteer component in mind, and actively

recruits volunteers throughout the state of Rhode Island. Most volunteers come from the

Northern and Southern ends of the state. Each year, the Watch has about 350 citizens

monitoring the state's water resources.

Kentucky Water Watch

The Kentucky Water Watch (KWW) was formed to help citizens protect the

waterways of Kentucky. The KWW recruits and trains volunteers to monitor water

quality in streams, rivers, lakes, wetlands, groundwater systems, and wells. Founded in

1985, the KWW was modeled after a watershed watch program in North Carolina and

Europe, a citizen science program where volunteers went out and assisted in data collection and analysis.

The KWW covers 120 counties in Kentucky, which makes them a state wide citizen monitoring organization. They divide those counties into eight regions, and a volunteer steering committee runs each of those. Each region is subdivided into areas one county in size, and each area has 10 to 15 teams, racking up 300 to 400 volunteers per region. In total, the KWW has about 2500 active volunteers, statewide, each year, who go out to assist in data collection and organizing. Additionally, they retain 80% of their volunteers each year, with the average citizen volunteering for three consecutive years; however, some citizens have been monitoring since the program's beginning.

Natural Biodiversity

According to their website, Natural Biodiversity (NB) is an organization whose mission is "To conserve the native diversity of plants and animals within the ecosystem of south-central and southwestern Pennsylvania by nurturing harmonious interactions between the natural populations and communities" (www.naturalbiodiversity.org). The goals of the organization are to both reduce the presence of non-native plant species and increase the abundance of natural plant and animal diversity. Additionally, NB strives to educate the public about the damage caused by noxious species and the benefits of biodiversity, and enlist volunteers to help solve non-native species problems.

There are several citizen monitoring opportunities with NB. The first is the Weed Watcher program, which calls upon citizens to identify invasive plant problems near their homes. The second is the Weed Whackers program, which recruits volunteers to go out

and help to mechanically control noxious weed infestations. Natural Biodiversity has a Stream Bank Stewards program, in which volunteers help plant trees and other native species in riparian areas. Finally, the Natural Wildlife Federation Habitat Stewards program has its volunteers plant native plant species specifically for wildlife habitat.

From the beginning, NB had an advisory committee, the members of which functioned as professional volunteers. NB also had Americor volunteers. After two to three years of organizing, they began recruiting citizen scientists. Their recruitment is aimed in the communities adjacent to the two watersheds they work in—one 1800 square mile watershed and the other 3400 square miles. They do not limit their recruitment to these areas, but it is their main focus.

Most of NB's citizen scientists come from the urban town they are based in; Johnstown, Pennsylvania. Last season, they had more than 150 volunteers come out during the year, but their volunteer member base is over 200. Each year, NB surveys their volunteers, and over 90% say they'd volunteer again the next year. Kristin believes the actual retention rate to be 75% to 80%.

Bear River Watershed Council

Based in the rural town of Richmond, Utah (just outside of urban Logan, Utah), the Bear River Watershed Council (BRWC) is the home of the Motorized Use Data Project, or project MUD. This project utilizes citizen scientists to document ORV routes on the Wasatch-Cache National Forest in the Logan Ranger District. To do this, citizen scientists first walk along authorized ORV trails to document the status quo and set up a

baseline. Then, the volunteers look for unauthorized ORV trails, follow them to their finish, and record the status of these trails.

The project was initially established with volunteers, but due to the complicated logistics associated with the project, it failed in its first year. The BRWC refined the program, and last year had 26 volunteers.

Most of the BRWC's volunteers come from Logan, with a few from Salt Lake City and Ogden. Logan is located in the center of Cache Valley, and is surrounded by a multitude of smaller, more rural towns. However, even with several rural towns in proximity, the only volunteers the BRWC has from the rural areas are from Richmond and serve as BRWC board members.

Great Old Broads for Wilderness

Great Old Broads for Wilderness (Broads), and their data base, GoGINGER (Great Old Broads for Wilderness Interactive National Grassroots Evaluation Resource), support two ongoing citizen science monitoring programs. The first is an off-road vehicle, or travel corridor monitoring, project, called Broads for Healthy Land. This program is designed to train citizens to record the impacts of motorized travel on public lands. The second program, Riparian Areas Streamside Assessment, was designed by universities and provides Broads with protocols to train citizens to quickly assess the health of stream segment and its riparian area.

The programs of Broad were created for citizen involvement, and the organization recruits volunteers for projects in Utah, Colorado, Arizona, and California. Some of their main recruitment towns include Durango and Cortez, Colorado, and Kanab, Logan, and

Moab, Utah. Last year, most of Broad's volunteers came from the rural town of Moab, Utah. They estimate that they had between 60 and 80 volunteers last year.

Palouse-Clearwater Environmental Institute

The Palouse-Clearwater Environmental Institute (PCEI), located in north central Idaho in Moscow, has two main areas of focus: environmental education and watersheds. For their environmental education focus, they use citizen scientists to help in the office, doing research on environmental education, helping local teachers incorporate environmental education into their curriculum, or going into classrooms and teaching kids about an environmental education participant. Watershed volunteers help research for grants or plant trees at restoration sites.

In the beginning, PCEI was all volunteers. During that time, they didn't anticipate the numbers of volunteers they would have today. Currently, they plan every project with volunteers in mind. Their volunteers are recruited from the urban communities of Moscow, Idaho, and Pullman, Washington. Because their restoration sites are near smaller communities, PCEI also recruits here. These towns include Grangeville, Elk River, and Colfax, Idaho. Currently, PCEI advertises having 1445 citizen scientists.

Volunteers for Outdoor Colorado

Volunteers for Outdoor Colorado (VOC) hosts an array of citizen monitoring and stewardship programs. The most common way for a citizen to get involved with VOC is though direct stewardship, where citizen scientists are put on a project team and given a

specific role, whether that is manager, tool manager, project support, or technical advisor. These projects have been selected by a land manager or agency that uses citizen volunteers from VOC.

According to their website, the mission of VOC is "to motivate and enable citizens to be active stewards of Colorado's public lands, thereby creating enthusiastic and beneficial stewardship of Colorado's natural and cultural resources" (www.voc.org). Hence, their programs included volunteers from the beginning. They recruit volunteers statewide, but get most of their citizen scientists from the Denver metro area. Currently, they have 6000 volunteers from the state.

Results

Stewardship, Education, and Saving Resources

The second question of the interview asked the participants why they chose to use volunteers in their project. The main reasons these organizations choose to use volunteers in their projects (mentioned by over half of the participants) are to foster stewardship between people and the environment, to educate the public about conservation issues and/or their organization, and to save resources. However, participants also mentioned that it's necessary to include citizens in scientific projects and that it's fun to do so.

There are several definitions of stewardship. In general, it can be defined as responsible caretaking of the environment by humans, with the "premise that we do not own resources, but are managers and are responsible to future generations for their condition" (www.jcpsky.net/Departments/EnvironmentalEd/balckacre/glossary.html).

To do this, citizens must understand their environment and become engaged in environmental work.

For many organizations in this study, stewardship was one of their goals. As Laurie Ashley of the Wilderness Institute stated, "It's valuable for us to be connecting citizens with wild areas, connecting them with the Forest Service and the management that goes on." Kristin Sewak of NB said that they believe that unless the community is engaged, the project will not be effective. Moreover, PCEI believes that their influence on the community is large enough that the more they engage people, the more the community will act in positive ways towards environmental issues.

Stewardship towards the environment feeds on education. Most of the participants mentioned providing volunteers with education about their project and organization, but that, for the most part, education goes toward the larger goal of educating citizens and communities about environmental issues. The CWC said that utilizing citizen scientists educates the community, teaching them valuable skills. The KWW makes it their goal "to generate a group of people who understand the technical issues in resource management and involve them in advocacy efforts" (Ken Cooke). Other organizations said that the inclusion of volunteers in a project is a great way to engage and educate the public about public lands issues, Leave-No-Trace, or backcountry skills.

Saving resources is one of the main reasons listed in the literature for using volunteers. The Wilderness Institute started its weed monitoring program to fill the need of the Bitterroot to manage noxious weeds in wilderness areas—a job the USFS didn't have the resources to do. The CWC said that they use volunteers because there is no way

that they, as a non-profit organization, could support the staff needed to get out and monitor all the sites at the right times. Dan Miller of the BRWC said flatly that they use volunteers because "We have no money to pay people." Similarly, Paul Travis of the BMWF and Veronica Egan of Broads said, respectively, "The reason is because you don't have to pay volunteers," and "There's not enough money for hiring."

Volunteers Required

Ten of the 11 participants said that their project required volunteers. The other, Broads, said that sometimes it's more efficient for them to use a couple paid inventory people to collect two weeks worth of data; the same amount, she said, may take volunteers all season. However, all those interviewed said that, even if not required, their programs were created with the intent of recruiting and using volunteers.

Choosing Communities for Volunteer Recruitment

Two main themes arose from participants when asked why they recruited volunteers from a particular place. Most participants said that they recruited from the communities they did because the communities were either affected by or involved with the project, either by proximity or land use. Additionally, just under half said that the city or community expressed interest to them, enough so that they were motivated to start their program. Also, other organizations chose communities to develop local capacity and help foster a people-land connection.

The Wilderness Institute said that they try to identify communities closest to the areas where they're working because they believe it's important to create an immediate

connection between people and their home (see stewardship in previous section). They

mentioned that they had a volunteer from Florida who came out as a volunteer on his

vacation—he had a great time getting to know the landscape, but for the Wilderness

Institute, it's more important to connect citizens with the wildlands near their home.

Similarly, the BMWF said that in the communities that surround the Bob, "They

are adjacent to something that they know and hold dear to heart." Egan of Broads also

said that "The actual issues being monitored are located adjacent to those communities,

and the people that we're recruiting have an active interest in what goes on on those lands

because they recreate and their daily lives are conducted on those lands." PCEI had a

similar sentiment:

> If we choose the communities in which we have restoration events, then they will
> probably feel more protection and more pride towards their specific communities.
> It's the 'in my back yard' effect. If they realize that they're doing their own
> restoration for their own community, then they'll take possession of that and
> hopefully in the future continue a clean up or some sort of restorative work while
> they're there.

Nearly half of the participants said that cities or community groups came to them,

asking for some sort of citizen-based monitoring program, usually because they were

concerned about a particular resource. Natural Biodiversity said that their programs were

spurred by the community from the beginning—citizens were requesting noxious plant

control. There were hiking groups forming trail systems who wanted to see the noxious

weeds removed.

The Rhode Island Water Watch also started their programs from community

interest. Elizabeth Herron said that the community came to them, said they were

interested, and asked if the Watch would work with them to monitor. Additionally, for

the Network and CWC's Urban Watch Program, the city must have the desire (and the money) for the program to run.

The Wilderness Institute chose the communities they did in order to make the immediate connection between people and their homes. This points to a current disconnect between the places that we live and the lives we carry out. By engaging citizens in scientific projects near their homes, perhaps this land/people disconnection can be remedied.

Matthew Martinez mentioned choosing communities in order to build a local capacity to deal with land-management issues. This gets to the edges of the conflict between agency wants and community interests. As a volunteer organization contracted by land-management agencies, VOC now becomes the advocate for agency demands; namely, developing local capacity so that agencies do not have to spend so many resources in rural communities, including paying for urban volunteer travel into these areas.

Seeking Citizen Scientists: Recruitment Methods

There are several avenues in our society in which to advertise our needs. In fact, the average number of different recruitment methods used by my interview participants was five. The most popular methods for recruitment were newspapers, word of mouth, enlisting the help of local community groups, and being present at events or tabling at events. Other methods mentioned by more than one participant included flyers, email, public service announcements, radio, university class announcements, online volunteer match services, websites, and membership newsletters.

There were two avenues mentioned by one participant that seem directly applicable to successful recruitment and obtaining high quality data. The first was having an agency make an announcement to their contact lists. The second, and more creative recruitment method, was a replacement requirement from the KWW. This means that, from the beginning, volunteers sign a contract stating that if they choose to stop volunteering, they must find another volunteer with equal or better skills. Ken Cooke said that this "indentured servitude" rule is somewhat balked at by others, but by making volunteers accountable, they are able to retain the number of volunteers they need for their projects.

Successful Volunteer Recruitment Methods

Although most organizations reached for nearly five methods of recruitment, only three seemed to stand out as successful. Over half of the participants were successful with word of mouth , although newspapers and email were also useful. The other aforementioned methods of recruitment seemed to be hit or miss depending on the organization. The BMWF, for instance, finds their website to be their number one successful recruitment method, possible since they are drawing people nationally and their wilderness trips act as a vacation for some recreationists.

Importantly, two participants said undoubtedly that the most unsuccessful method of recruitment were flyers—a waste of time, effort, and paper for the organization. However, the Wilderness Institute would beg to differ, stating that "Flyers seem to work really well; that was our top way [to recruit]," said Laurie Ashley. They also mentioned that they relied on email as a runner up, with word of mouth in third place.

Successful Recruitment Methods in Rural Areas

Participants cited two major successful recruitment methods for rural areas: word of mouth and local newspapers. Nearly half the organizations alleged that rural people might work on a less technological scale than urbanites and require more face-to-face contact and personal connection. Kristin Sewak, of the Rhode Island Water Watch, said, "Word of mouth is big in rural areas . . . and some of the less technical means, the flyers, all of the traditional means of recruitment, are very successful in rural areas—radio, public service announcements, those kinds of things."

Similarly, Paul Travis of the BMWF said that for rural groups, "Getting out there and doing outreach—slideshows, talking to local groups and user groups, doing that kind of thing—works well in rural communities." Making connections with the people who own the land the project is on, or land adjacent to the project area, is important for training and education of the individual and the community. "Definitely in rural areas, it's neighbor to neighbor. So you get people on a particular stream segment and they know the neighbors, and they talk them into it" (Ken Cooke, KWW).

Elizabeth Herron of NB adds that "Most effective, and this is true in rural areas in particular, is word of mouth—neighbors speaking with neighbors and having those local watershed groups kind-of recruiting the folks in their own organizations. So it's the personal touch in particular in the rural areas that works."

The second major theme in the successful recruitment of volunteers in rural areas is using local newspapers. "My own feeling is that the newspapers really go through to people in rural areas" (Paul Travis, BMWF). Elizabeth Herron adds, "The newspapers tend to be, especially when working with local newspapers, tend to be better in rural

areas than urban areas. The statewide newspaper, we get lots of phone calls and initial interest, but very little follow through from any groups."

Some organizations thought that newspapers worked in rural areas because in rural areas technology is not as accessible. "In rural areas where people don't have internet access, they might be more into reading the newspaper" (Kristin Sewak, the Watch). Courtney Rush of PCEI agrees. She said that they did more recruitment in the rural town of Elk River through their local newspaper, the Huckleberry Herald. She said, "I do feel that we were able to generate more volunteers through rural setting because of that one newspaper, because it's such a small town that everyone reads that one newspaper."

Besides word of mouth and local newspapers, only two other methods were mentioned. Email seemed to work for the Broads. Contacting local groups—or establishing local contacts—seemed to work well for the Network and VOC. Perhaps having a local group contact can help spur word of mouth communication in rural communities. For example, if that contact has clout within the community and is also supportive of the project, then she may be able to gain additional support for the project by talking to other community members.

The CWC and the BRWC mentioned that they were unsuccessful at recruiting volunteers from rural communities, and noted that no methods worked for them.

Successful Volunteer Retention Methods

Over half of the organizations provided incentives for their volunteers. Of these, six provided food—either meals in the field or a banquet dinner at the end of the

season—and a few provided T-shirts or had drawings for donated items. However, these sorts of incentives are not what keep volunteers coming back year after year, according to the participants interviewed.

By far, the most successful retention method mentioned was volunteer belief in the program. Seven of the 11 participants mentioned this. Laurie Ashley said:

> They are affecting management and stewardship of our wilderness areas. We have surveyed them and they feel like they're making a contribution to wild lands . . . . They learn a lot just being out there with people who know a lot about the natural history of the area . . . . I think that the experience itself is what keeps people around, more than some message that we're trying to give them.

Bridget Hoover agrees. "The bottom line is that they really need to believe in the program and feel that their voice is heard." Elizabeth Herron adds, "Our data is used by our Department of Environmental Management, so our people feel like they're contributing to something."

This belief in the project is what seems to keep people coming back year after year. Sometimes, project managers believe that it is their duty to instill this belief, especially if volunteers do not seem to have a previous connection to the resource or project area. "The key thing on [retention] is just acknowledgement that their work is valuable. And that's sort-of a self-feeding thing. . . . If you collect data on your creek, . . that data is valuable to you and you'll stick with it" (Ken Cooke, KWW).

Veronica Egan of Broads said that people stay involved because they are interested in the results of the project. People want to have their voices heard, she says, which takes citizen involvement. Veronica's project involves mobilizing mostly rural citizens around illegal ORV use and standing up in public meetings against ORV user

groups to voice their concerns about motorized travel in wild places. She implies that, although non-motored recreationists care about the future of their wild places, they are hard to recruit and retain. "We know very well that the motorized users are highly organized, and very effective in communicating their desires to the agencies. Whereas recruiting and organizing [recreationists] is like herding cats—we're highly unorganizable, so it's harder for us to get together and get functioning."

Two other successful retention methods came forth from the interviews: developing a personal relationship with the volunteers and creating a social atmosphere for them are of equal importance to the participants interviewed.

The personal touch from the organization to the volunteer seems to be an important dynamic in retaining volunteers. Debi Chiro-Macdonald states:

> I've been working for CWC now for four and a half years, and prior to that I volunteered for two, and what I'm finding since I've taken over all of the volunteer recruitment and all the volunteer contact, etcetera, side of the organization is that personal contact—and lots of contact—is what helps me to retain my volunteers. Lots of emails to check in with them, lots of kudos when I'm out with them, and phone calls to check in with them, rather than just emails. They seem to like the personal touch a little bit more.

Kristin Sewak has noticed the same thing. "We just make sure that we let them know that their work is appreciated and that it's being utilized. . . .We're very diligent about making sure that they're appreciated and that they feel their work is making a difference. Those two things are big retention methods." Courtney Rush of PCEI agrees. "I can tell you that the best way to retain volunteers is to make a personal relationship with them. So at PCEI we really train our staff on how to reach out to volunteers, know their name, make them feel special, and tell them how useful they are, and that we couldn't do it without them. That alone will make someone want to come back."

As important as the relationship between the organization and the volunteer is the atmosphere in which volunteers have to make social relationships. A social atmosphere will keep volunteers coming back because they have something other than the work as a motivating factor. Matthew Martinez of VOC said, "It's interesting; we have a club within a club. We want to get people engaged in stewardship, and it almost becomes advantageous to create a social aspect so there is incentive for volunteers to come back and keep relationships going. It's important to create this atmosphere."

Other organizations expressed the need for a social atmosphere. Broads, PCEI, and the Network also mentioned that volunteers seem to enjoy the work more if they enjoy who they're working with and can form a social group. This helps keep them engaged. Broads even mentioned that they organize non-working trips like barbeques and non-working hikes to keep people engaged.

Lessons Learned From Volunteer Recruitment

All organizations mentioned a multitude of lessons they had learned from recruiting and managing volunteers. The most frequently mentioned were that it's important to have local contacts in rural communities, and that preparation is the key to a successful volunteer organizing program. Also mentioned was that being personable, or having the personal touch, when dealing with volunteers is important, and that volunteer recruitment is just plain hard.

Having local contacts, as mentioned briefly in the *Successful Recruitment Methods in Rural Areas* section, was an important lesson learned by many organizations. "Having local sponsors has been the best way of keeping people involved long-term,"

said Elizabeth Herron. Laurie Ashley also mentioned that this year they are going to try to have more local contacts in rural areas because of the stigma attached to their Missoula location, and to the word "wilderness" in their title. Having a volunteer organizer who is already part of a rural community helps to reduce that stigma and reduces the feeling that rural communities may get of being pushed in on, or feeling condescended to by urbanites.

"You really need to find something out in that rural community where those community members are going to tap into" (Debi Chiro-Macdonald). Matthew Martinez of VOC said, "I think the best thing in dealing with [rural areas] is to work with organizations and individuals who live in that community, because they can be the voice of what needs to take place. They also have a good idea of what kind of resources they can tap into to get the project running."

Besides having local contacts, being prepared was also an important lesson learned by many of the organizations interviewed. Bridget Hoover said it clearly, "You absolutely cannot waste their time—you have to be organized and have it together . . . the equipment and everything they need must be ready and in good working condition." Debi Chiro-Macdonald adds, "Be on top of it. If someone writes to you interested in your organization, write them right back or call them and give them heaps of information if they want that. Play up to what they are wanting and what their needs seem to be."

Other organizations shared this same sentiment. "Whoever is in charge of a local project must be on top of assigning tasks and following up," Veronica Egan charged. PCEI said that it is important to have all the paperwork ready, so that when someone

comes to the office interested, you can have them fill out the correct paperwork immediately.

Besides being establishing local contacts and being prepared, organizations learned that being personable is important, and that volunteer recruitment is by no means easy. "Especially in the rural communities, just being a friendly presence and giving phone calls to the person in charge of [a group]" (Courtney Rush).

Elizabeth Herron said, "It's a full time job, really. One of the things that state agencies will say is 'We'll just use volunteers' without understanding how much is involved in the recruitment and once you get them interested, work with them to keep them actively involved." This is an important testimonial for agencies and others interested in starting a citizen science program. Yes, volunteers may save you resources, but there is still a large management aspect to recruiting and retaining volunteers that cannot be overlooked.

Also, volunteer recruitment can be frustrating. "It's hard!" said Dan Miller of the BRWC. "I mean, we have so much going on and so little time between everybody. . . . I've been trying to find just one person to deal with volunteers. . . .We don't have that . . . and so it's really tough to keep on top of everything."

What Organizations Want to do Differently

Nearly all of the participants said that they would like to change their recruitment methods in the future. Two organizations said they wouldn't change their plans, yet even as they told me that, talked about things they were already changing. Three main themes came forward as steps for organizations to take in changing their recruitment strategies,

all of which had to do with being more visible in communities: do more networking, get the word out about their projects earlier, and have more personal contact with citizens and communities during recruitment.

Four organizations said that they would like to do more networking. To the CWC, this means "Trying to bump up more events, trying to polish off our website a bit better, and just being a little more visible in those respects." PCEI thinks of networking as having a larger volunteer base. They hope to get into University of Idaho student groups, classrooms, and Greek houses, and to send personal invitations to volunteers. Matthew Martinez said that VOC is trying to look statewide to figure out what the needs are on different state lands. Once they get that data, they'll start "Going around and getting user groups together and discussing the needs of the areas and seeing how we can tackle those problems."

Three organizations mentioned that they'd like to get the word out about their projects earlier. Fundamentally, this means being better prepared for the volunteer recruitment season. Bridget Hoover said that the earlier project dates are out, the better. "Even when we know a year in advance of events, it always ends up being last minute. So the more time the word is out and on people's calendars, the better." Since being prepared for volunteers requires time and commitment, some organizations said they will be, or would like to be, hiring a full time employee, or full time volunteer, to handle all volunteer outreach. This person would be in charge of getting project dates advertised and recruiting volunteers to fill projects. Like Paul Travis says, "It will hurt our projects if we can't fill them."

Also mentioned that was organizations want to have more personal contact, a method was so successful both in recruitment (word of mouth) and retention (personal relationship). The Wilderness Institute and PCEI are both striving for more personal contacts in the future. Laurie Ashley said, "Making contacts involved in the issue in rural areas is really beneficial to building a relationship with people." Courtney Rush agrees, "For now, the most important thing is for people to see our faces. It's one thing to see a flyer downtown, but it's another thing to actually invite someone face to face to volunteer." In other words, establishing a personal connection with potential citizen scientists is an important method for getting them on board with the project.

Why the Differences between Rural and Urban Volunteer Recruitment/Retention?

So far, participants have noticed that there is a difference in the recruitment and retention of volunteers from rural areas. Urban organizations have said that to successfully recruit and retain volunteers from rural areas, an organization must advertise in local newspapers and use word of mouth, and that in order to retain these volunteers the organization must instill in them a belief in the project, create a social atmosphere, and develop a personal relationship. Additionally, the participants acknowledged that recruitment in rural areas especially takes preparation, local contacts, and again, being personable. Why is this so?

The final three questions on the survey were more difficult to answer because they inquire about differences in people who are separated only by the geographical local of their home. Therefore, full confidentiality has been granted for the participant, their organization, and the geographical locations of their projects.

Are There Perceived Differences Between Rural and Urban Communities?

Most participants believed there were differences between the rural and urban communities that they work with. Three main themes emerged, and two divergent. Many participants suggested that rural communities may have different values, different priorities, and may be less environmentally aware. That rural communities may have less environmental education was also mentioned, and will be discussed as it directly relates to the other three.

To value something is to estimate its worth; to esteem; or regard highly. Webster's Dictionary (1961) states that a value is "based upon intrinsic worth or upon special, personal considerations." Some interview participants noted that there seemed to be a difference between what urban and rural people place value on. One participant mentioned that it's harder for them to recruit citizen scientists from rural farm communities because these communities do not seem to see the value in scientific projects, especially when those projects collect samples for the very herbicides they spray on their crops. In other words, this urban participant believed that the farmers may value a healthy crop (income) more than a healthy watershed (natural resource).

Another participant expressed frustration when trying to work with certain motorized user groups, located in rural communities, to find common ground. The user groups suggested education as the best way to keep illegal off-road vehicle use at bay, but were unwilling to hand out educational brochures at the mouth of popular ORV sites. The participant came to the conclusion that those people value freedom of recreation, no matter what the planetary impacts, over the health of the environment.

Values can be directly tied to priorities, which are a ranking system that sets precedence to certain needs and wants. Three participants mentioned that rural communities seem to have different priorities than urban communities. One participant said, "In some instances, in rural communities, outdoor stewardship isn't the priority. The economy and getting by is more important." Another participant suggested that rural communities seem to be more tight-knit, meaning that they seem to prioritize the immediate needs of the community more than the needs of the environment. Another participant noticed that they just couldn't seem to engage rural people. When asked why, the participant said, "I think a lot of it is education and different priorities."

Some of the participants believed that rural people have less environmental awareness than urban people. That is, they might not *prioritize or value* the environment in the same way as urban people. One participant said, "They're . . . farmers. They don't want to collect samples for herbicides." As the organization, this sentiment would seem as a lack of environmental-mindedness; however, what appears to this organization as lack of environmental awareness may just be different priorities. Along these lines, a participant said, "Really, the urban communities seem more environmentally open-minded. They don't have their livelihood in a farm using pesticides." What the participant is saying is that they perceive rural people to be less environmentally open-minded because their livelihoods have traditionally included doing non-environmentally-friendly things, like using pesticides and herbicides.

Contrary to most participants' suggestions, a couple of participants argued that rural communities have better land connection and more expertise in the field. One participant said, "It's harder for us to recruit in the urban corridor, because the rural

people have a better connection [with the land] and understand their impact. . . . Urban people don't have that connection and don't see the point [in the work]." The participant is expressing their view that rural communities are more environmentally-minded because they live closer to the land and have a better understanding of what their impacts are on the environment. For example, an agricultural community may better understand where its food comes from than an urban community—ask most urban children where there food comes from and you'll undoubtedly receive "the grocery store" as an answer.

Another participant suggested that although urban people seemed to have more free time to go out and do work, "Rural communities will have more of an attachment to a project and the work that you're doing. [Volunteering is] a recreational thing for a metro person, but for a rural person it's because they're attached to the area." This perception relates to the notion that people move to and stay in rural areas because they become emotionally attached to the land, which in itself is a strong argument for a land ethic with ties to environmental values and priorities.

Are There Perceived Differences in Rural and Urban Volunteers?

Most participants said they perceived no difference between the rural and urban volunteers who they worked with. Half of these participants said that all citizens volunteer for the same reasons. One participant said, "Those who come out to volunteer are excited, don't know what they're doing, and by the end of the day feel accomplished. . . . Maybe the conclusion is that if they're interested, then they have an environmental mindset."

If participants perceive no difference in rural volunteers, then what do they think keeps rural people from coming out to volunteer? This question ties back to the perceived different values and priorities talked about in the previous section. One participant mentioned that stigma around environmental issues and groups is a big deal in rural communities. "There might be a little more reticence about people being identified with the monitoring group. They're more nervous about identifying with the monitoring group because of what their neighbors think. We have to keep a low profile because of our [organization's] name." Perhaps this fear of being associated with environmental issues is a problem because it goes against the values and priorities of the community. Another example of this stigma is from one participant who said that when an environmental organization formed in one of their rural project area towns, it took the group a month to come up with a name that residents wouldn't perceive as environmental.

Just under half of the participants believed there was a difference between the rural and urban volunteers, although no one specified what that difference might me. Participants had different opinions as to what the rural/urban volunteer difference was. Differences mentioned were that rural volunteers stick with the program longer, that urban people have more free time to volunteer, that rural people have more experience, and that rural people are, again, less educated about the environment. The participant who noted that rural volunteers stay with the program longer said:

> Generally, our rural volunteers stick with the program longer. We even have a few folks starting their 20th monitoring season. Urban people don't stick with the program as long. We think the rural people are worried about protecting their high quality streams. Urban people wonder what the point is if the water is dirty. Rural people may live right on the water body and have a connection to it, where as urban people don't.

This statement relates to the idea described above that rural communities have a stronger connection to the land.

Some participants suggested that rural work such as farming and ranching can take up more time than the standard urban, nine to five job. This may be due to the fact that farming and ranching jobs are never finished—there is no office to walk out of; instead, there is always an animal, fence, or crop to tend to. This may be one reason that urban organizations suppose that rural people tend to volunteer less than urban people. One participant argued that "A lot of times, but not all, people in a metro area will have more free time to go out and do the work we do."

Nearly all citizen science monitoring positions require outdoor work and some knowledge of the natural world. One participant argued that rural people have more experience in the outdoors. This participant suggested that volunteers from rural areas worked ten times harder than those from urban areas. "Maybe they worked on a farm and had to do it everyday, and it wasn't a problem for them. Not to say that urban people weren't good to work with—they had lots of enthusiasm, but were physically not as experienced."

Finally, one participant suggested the difference in rural and urban volunteers to be a lack of environmental education. This participant explained a situation where fencing was being put up to keep out illegal ORV use, and a volunteer from a local ORV club had volunteered to help. Throughout the day, the volunteer kept asking why the fence was needed, wondered aloud if he was doing the right thing, but went along with it since the Forest Service was supporting the project. This volunteer may not have

understood the need for the project due to lack of education on the subject. However, the volunteer could have also been clear about the project purpose and just had different opinions.

How do Urban Organizers' Views of Rural Communities and Volunteers Affect Projects?

Organizations felt that they needed appeal to different values when promoting their projects in rural areas.   They also believe they must change their recruitment strategies to reflect these differences.

One participant said that because of the differences in values between rural and urban communities, he has a hard time even bringing rural people to the table. In order to do this successfully, he must find a way to make his project appeal to rural communities. Another mentioned that there is stigma attached to their organization's name and project which they believe keep rural people from participating. In order to overcome this, they are convinced that they must figure out a way to make the project appeal to the rural community's values.

Changing recruitment strategies was also a way that organizations see rural/urban differences affecting their projects. "I think that we must have different strategies in different areas. We can't have a one-size-fits-all strategy across the board. . . .[instead, you must] have a feel for the community you're working in." Additionally, changing recruitment strategies is perceived as a better way for urban organizers to gain a community presence. It forces the organization to think about "how to attack to make people know we're there."

CHAPTER 5: BUILDING EFFECTIVE CITIZEN MONITORING PROGRAMS

The Interview Participants

The Bitterroot National Forest

The Bitterroot National Forest, or Bitterroot, like many national forests, is on the move to keep noxious weed invasions in their wilderness areas under tight control. In general, the US Forest Service (USFS) is low on resources and funding; the same is true for the Bitterroot. In 2005, in order to get a survey of the noxious weed invasion in their forest, the Bitterroot teamed up with the Wilderness Institute, a non-profit organization out of Missoula, Montana. As described in Chapter 3, both organizations worked together to identify their target weed species and areas and measurement parameters. They hired two field leaders, including myself, to conduct the monitoring while also leading groups of citizen scientists into the field to get involved.

Citizen scientists were trained in the field, but had field leaders as experts to help with plant identification skills. Monitoring took place in the Welcome Creek and Anaconda Pintler wilderness areas. Monitors mostly stuck to trails, except in burned areas where winds had strewn the seeds of exotics. At each infestation, monitors took a GPS point which included information about the species, size of infestation, relative density, and proximity to water (Holden, personal observation).

At the end of the field season, the field leaders created maps using ARC Map. They copied all data onto disks, which were given to each of the ranger districts covered through monitoring. Each ranger district in the Bitterroot now has information showing

where weeds are, what species are present, and how widespread the infestation is. With this information, they can prioritize areas for attention (Holden, personal observation).

Virginia Department of Water Quality

The Virginia Department of Water Quality (Virginia DWQ) has a citizen monitoring network called the Commonwealth. According to their website www.DWQ.state.va.us/cmonitor, this network is a group of organizations that conduct monitoring for the Virginia DWQ. Groups work mostly with water quality monitoring on lakes and rivers.

During our interview on October 11th, James Beckley of the Virginia DWQ stated that they work with about 85 citizen monitoring groups, some of which are part of larger organizations such as the Alliance for Chesapeake Bay, the Virginia Save Our Streams program, and Friends of the Shenandoah River. Each two years, the Virginia DWQ conducts a water assessment report for the EPA. This report uses data from both the DWQ and citizen groups.

One major goal of the DWQ is that for the 5000 miles of river monitored, 3000 of those would be monitored by volunteers by the year 2010. Last year, they received volunteer data from 1500 sites along these same waters (Beckley, personnal communication, Oct. 11, 2006).

The Virginia DWQ has a strong quality assurance program that it uses to assess all of its volunteer monitoring programs. Independent monitoring programs can have their data used by the DWQ if they meet certain standards, which are weighted on a three-tier system. A level three program would use the same methods and have the same

quality assurance program as the DWQ—data from this source would be as if DWQ scientists collected it. A level two program would still have a quality assurance program, but may use different methods; this level of data may be used to identify priority areas and waters of concern. Level one programs have no quality assurance program and their methods are not similar to the DWQ; however, this data can still be used for red flagging areas of concern. Level one and two organizations can move to level three if they comply with the rules for a level three project or if the DWQ performs a validation survey for their methods (Beckley, personal communication, Oct. 11, 2006).

Oklahoma Conservation Commission

The Oklahoma Conservation Commission serves as the technical authority for the state's non-point source pollution management program. As their website, www.okcc.state.ok.us/ED/ED_bluethumb.htm, states, they believe that nonpoint source pollution can best be addressed through education, and so have initiated an education group called Blue Thumb which acts to connect citizens to the land by protecting streams, rivers, wetlands, and groundwater.

The Blue Thumb program has over 300 active volunteers working in 80 streams across the state. According to their website, they take a three-step approach to learning about stream monitoring: chemical, biological, and physical monitoring. All of Blue Thumb's volunteers must complete a 24 hour volunteer training before they are ready to work in the field. A few times a year, the organization completes a quality assurance meeting with all monitoring groups in order to make sure data is being collected and analyzed correctly.

In our interview on October 19th, Jean Lemmon commented that in the beginning, data collected by Blue Thumb wasn't notable. In the last few years, however, their data has gained recognition as the state's premier water quality monitoring program. Currently, state agencies use Blue Thumb data along with state-collected data because Blue Thumb data hasn't been compromised scientifically.

Monterey Bay Sanctuary Citizen Monitoring Network

The Monterey Bay Sanctuary Monitoring Network was described in detail in Chapter 4.

Wisconsin Department of Natural Resources

The Wisconsin Department of Natural Resources (DNR) water quality department focuses on two areas: streams and lakes. It has a few different citizen monitoring programs associated with it. The Water Action Volunteers, or WAV, is a state-wide organization coordinated by the DNR and the University of Wisconsin Cooperative Extension. According to Fred Fetter (November 17th, 2006), this program trains and utilizes volunteers to monitor the state's 55,000—88,000 miles of streams. Although coordinated through the DNR, the program's data is not used by the state. The data is considered of insufficient quality because the procedures that are used are too different from those the DNR uses. The data is used by other entities, such as city and county agencies and non-governmental organizations.

The DNR does have a more successful lake monitoring program, however, titled the Wisconsin Citizen Lake Monitoring Network. This program has been successful at

monitoring the state's lakes using citizen scientists to produce credible data that is used by the DNR (Fetter, personal communication, Nov. 17th, 2006).

To fix the disparity in citizen collected data of lakes and streams, the DNR generated a citizen-based water quality monitoring pilot program this past summer. To address the problem that WAV had with insufficient procedures, the project set out to use the same procedures, training, and equipment that are used by DNR field staff. Citizen monitors must go through seven hours of training and pass a certification. After certification, all citizen monitors must set a list of goals, including primary and secondary dates of monitoring during the season. Citizen monitors are expected to make 90% of all primary dates set, and 95% of secondary dates. Nearly all monitors reached these goals. Additionally, over 50% of teams were supervised once during the season as a quality control measure (Fetter, personal communication, Nov. 17, 2006).

These strict goals and procedures were put into place to set a higher standard than the DNR follows. WAV's data is not sufficient to meet DNR's standards, therefore, the pilot project aimed to set standards higher than those of the DNR. That way, they would be, in effect, petitioning the DNR for data recognition and use (Fetter, personal communication, Nov. 17th, 2006).

Results

After coding the interviews, three main themes emerged as characteristics of effective citizen monitoring programs: training, scientific accuracy, and quality control. One implied characteristic has emerged, that of catering the program to the needs of a specific agency. Three divergent themes have emerged also, that of personnel selection,

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selection of a project for citizen scientists, and tension between citizen scientists and agencies.

Major Themes

Training

A major concern of agencies is that citizen monitors are not as well trained as professionals. Coincidentally, everyone interviewed either stated that good training was necessary, but a specific training program for citizen science organizations was preferred. Trainings varied in length and scope, but generally were between four and 24 hours, with both classroom and field training. Bridget Hoover, from the Sanctuary, said that "We don't do a lot of classroom training because hands-on training is more applicable. We introduce and demonstrate, but they don't get it until they go out in the field, and it's more fun."

While training is important, some agencies noted that they don't have the resources to provide all the training themselves. Wisconsin DNR has one person who trains others to train volunteers for WAV projects. Thus, "we have trained a large base of people who can provide the training, a sort of 'train the trainer,' and do follow up training to stay current." The University of Wisconsin Cooperative Extension, the DNR partner on the project, also provides volunteer training.

For some agencies, certification of training was important so that trained citizen monitor data is set apart from "Joe Six Pack's data" (Fetter). The pilot project run by Frank Fetter out of Wisconsin DNR has a seven hour training, where, among other tests,

"I watch them to make sure they're doing procedures right." After verifying they could do the correctly the monitors obtained a certification.

Training also entails providing citizen monitors help from professionals. Since part of the justification for using citizen collected data is to save resources, a balance must be struck between the amount of professional support citizens need and the amount of resources the agency has. Most projects had a professional staff person either in the field with citizens each time, or provided citizens with easy access to professionals during the monitoring season. Jean Lemmon of Blue Thumb says, "When you have citizens regularly monitoring . . . they know when it's right and when it's wrong, and when it's wrong they know who to call."

Scientific Accuracy

Scientific accuracy was a theme that was implied by all interviews, but stated only a few times. As expected, scientific accuracy is important to agencies when making decisions. Generally, agencies seemed to be looking for data that had been collected by proven-effective procedures. The procedures required were usually the same as the agency scientists used. If citizen groups can train themselves in these procedures and target scientific accuracy, their data has a higher chance of being used by agencies. As Jean Lemmon said of Blue Thumb, "We don't compare ourselves to a lab, but we're close. Starting in 1992 and 1993 we had to compete with people saying volunteer data is rubbish, but people and agencies around the state are saying 'that's Blue Thumb data.' Our collections are used by the state as equal to some of their others because our data hasn't been compromised."

Along with the idea of scientific accuracy is scientific integrity. Lemmon stated that scientific integrity also includes humility and an acknowledgment of an organization's limits. Integrity can be defined as an unbroken wholeness or totality that leaves nothing wanting. This is the type of data that state and federal agencies are looking for. Scientific integrity is not the only criteria for good data, however. Agencies are also looking for the right type of data. For example, the Wisconsin DNR is dealing with a situation in their pilot program where citizens are collecting data that is of sufficient quality for the DNR to use, but comes from the wrong stretch of river. The one procedure that the DNR doesn't have control over in the pilot program is where the citizens monitor. The agency believes that if told where to go, citizens won't monitor because they are only interested in their favorite stream or lake. The problem is that the DNR has stated that they don't have the capacity to deal with data from just anywhere; they can only process data from areas that are included in their yearly review.

Quality Assurance

All agencies either stated or implied that a quality control program was essential to an effective citizen monitoring plan. Even if citizens are trained well to follow scientifically credible procedures, someone needs to be checking their work in the field as well as the equipment they're using.

Lemmon stated, "The most important thing we do is a quality assurance meeting with people a few times each year. It's so important—we've found mistakes and bad tests and so many things . . . . When data doesn't match up we sit down and figure out why." Most agencies mentioned similar types of quality assurance. She continued by

saying, "Every quarter we test all our thermometers in ice water to make sure they're reading appropriately. It's a simple thing and yet our temperatures are correct, and I can say that with confidence."

While the quality assurance procedures do not have to be given by the agency themselves, it does seem important that the plan is agency approved. Remember that the Virginia DWQ ranks citizen monitoring organizations by the type of procedures and quality assurance plan they have in place. Level three, the most reliable level, has both procedures and a quality assurance plan that is the same as the DWQ's. Bridget Hoover mentioned that she works closely with the state water control board and follows protocols that are state wide for volunteer data. She also follows a state-wide quality assurance plan so that city and state agencies know they're following proper procedures and policies. In other words, the data collected by citizens with an agency approved quality assurance program is of known quality so agencies know they can use it.

It is important to note that this is the theme most frequently mentioned in all interviews, either stated or implied. Again, most agencies want citizen monitoring organizations to follow agency-approved quality assurance plans, even if the agency itself doesn't have the time or resources to administer it. Since all agencies interviewed had different resource allocations, this was different for each agency. Gilbert Gale of the Bitterroot National Forest, who had very little resources for administering quality assurance for weed monitors, noted his frustration that "There are subtle and not too subtle breaks and thresholds on what it takes to get the job done, and you'll never know! How would I have known if I hadn't gone out there with them? It takes a lot of time to go out and quality check the work. If I'm going to do that, I might as well do it myself."

Apparently, Gale believes that it should be up to the citizen monitoring organization to train monitors to do their own quality assurance administration.

Implied Theme

Conversation between Agency and Citizen Monitoring Organization

One theme that was not directly stated but implied throughout the interviews was that whatever training, procedures, and quality assurance plans the citizen monitoring programs adopts should reflect, if not copy, those of the agency.

If an organization's goal is to collect data that is significant, helpful, and effective in environmental decision-making, they must cater their projects to those agencies directly making the decisions. Before plans and procedures are conceived, a conversation must begin between the organization collecting data and the agency using the data.

Most agencies stated that training, quality assurance, and scientific integrity were important. However, it is critical to note that these are not general rules—they are specific and applied and defined by each individual agency. For example, training for stream sampling is different from training for weed mapping; they will also both require different procedures and different levels of technical expertise and quality assurance. Additionally, scientific integrity is relative to the agency defining it. Therefore, each organization must work with the agency in order to understand the agency's definitions for each of these terms.

Divergent Themes

Citizen Monitoring Project Selection and Personnel Selection

Gale stood out from the other interviews by talking a lot about two divergent

issues: citizen monitoring project selection and personnel selection. The first topic has to

do with the technical expertise required for high quality data collection. The second topic

is focused on the selection of volunteers who will be leading the monitoring.

It is important to note that, of all the agencies interviewed, Gale's project was

arguable the most technically difficult. It required excellent plant identification skills,

and experience with GPS technology making GIS maps. Therefore, it wasn't an ideal

citizen monitoring project.

> There are certain types of projects where volunteers dove-tail very neatly into a
> project and you can accomplish what you want effectively. Others don't fit well,
> where you need more professional quality . . . . Trail work, for example, is a
> great volunteer project. It's just grunt labor and you don't need a lot of skills.
> They are fairly simple tasks and don't require much training.

Gale's experience with the Wilderness Institute was a positive one, largely due to the

training provided to the field leaders, but also, in Gale's mind, because of the leaders'

interest in the subject matter and their understanding of the problem. When working with

another group of volunteers (unaffiliated with the Wilderness Institute) Gale said:

> When it comes to this type of work, the kind of people you put on the ground are
> critical. They must have high quality of field experience and training, a certain
> level of consistency, and understand what's at stake and what the problem is. I
> had a team from [a university]; only one was a plant invasives major, the other
> two were in business and photography. The two non-science majors didn't get
> what was at stake. They walked by small infestations where none of them caught

it. The quality of the work was poor; I wasted money on those folks. People must take this seriously; it's not just a walk in the woods.

Tension between Agencies and Citizen Scientists

Because of the benefits associated with the utilization of citizen monitors, one might not expect there to be tension between the citizens and the agencies. However, Frank Fetter of the Wisconsin DNR had a different story.

Recall from above that the data collected by WAV is not used by the DNR because it is not considered to be of high enough quality. There are other agencies that do use WAV data, including city and county agencies. However, because the DNR won't accept data from WAV, citizen monitors are angry. Citizens, who in many cases see themselves as unpaid state stream technicians, don't understand why the DNR won't accept their data.

The pilot project started by Fetter is trying to address this problem. The water division administrator for the state is a political appointee who came from the stream non-profit sector and has heard the cries of the volunteers. As it stands now, the pilot program was successful in training and certifying citizen monitors with the same, if not higher, standards as DNR technicians. The procedures citizen monitors follow are the same as in the DNR except for one: the DNR cannot tell the citizens where to monitor, and this creates tension (Fetter, personal communication, November 17th, 2006).

According to Fetter, many citizens become involved in stream or lake monitoring because they want to protect a certain stream reach or lake that is important to them. However, because of the massive area that Wisconsin streams cover, each year the DNR must prioritize and randomize stream reaches for data collection—they are simply not

prepared to handle information from just anywhere. For example, a citizen's water area

of interest might already have sufficient data collection or, conversely, just simply cannot

be processed due to the limited capacity of the DNR. This results in the DNR not using

good citizen collected data and causes conflict between citizens and the DNR. However,

if the DNR randomizes a spot where citizens are monitoring according to the new pilot

program protocols, the DNR will use that data.

The DNR has expressed concerns that the citizens will, in effect, "hijack" their

work planning. These are legitimate fears, says Fetter. There are certain citizen groups

whose members hold clout in the water monitoring arena, and there is the possibility that

they could force the state to monitor in areas where the citizens, as non-experts, deem

important.   This could have serious implications in the scientific, ecological, and overall

integrity of the stream monitoring data collected by the DNR.

Fetter believes that there will continue to be tension between citizens and the

DNR, but he's confident that they'll work things out to the satisfaction, if not the delight,

of everyone.

CHAPTER 6:

A COMPARISON OF ORGANIZATIONAL AND EFFECTIVENESS FINDINGS

WITH THE CLEARWATER CASE STUDY AND CURRENT LITERATURE

<u>**Comparison of Project Findings and the Clearwater Case Study**</u>

Recruitment and Retention of Volunteers in Rural Areas

This study suggests that most volunteers are used in projects because the

organization wants to promote stewardship, education, and to save resources. The

Clearwater project also began in this way. Road decommissioning monitoring was meant

to serve all of these purposes. One of the goals of the Clearwater project was "to *engage*

and *educate* members of the public about the existence of road decommissioning projects

and their benefits and impacts (Court et al.2005, emphasis mine). Additionally, the

Clearwater project sought to become a long-term monitoring effort by the affected

communities themselves.

Like most of the project, the Clearwater project required volunteers in order to get

all the work done. Some of the work—like weekly checking of track plates and

cameras—was able to be done by one monitor; however, protocols such as the vegetation

survey, macroinvertebrate sample, and pebble count require at least one volunteer in

addition to the field leader. In addition, the Clearwater project was created specifically

for citizen scientists.

Similar to this study, the Clearwater project chose the rural towns of North central

Idaho because they were in close proximity to the project area. In other words, the

communities were directly affected or involved with the resource being monitored, and hence, the results of the project.

Most organizations in the study used newspapers, word of mouth, local groups, and events and tabling for recruiting volunteers, although newspapers and word of mouth were the most successful in rural areas, and email was successful in urban areas. For the Clearwater project, I tapped in to local groups which helped establish our main rural town contacts. However, I also found it difficult to find groups in the rural towns and had to look for more regional groups.

I also attempted to use word of mouth by being involved in the town's Christmas celebration and through my Forest Service and Tribal contacts in the area. Word of mouth seemed to work through the high school system by getting Orofino High School on board. I was given the number of the Kamiah High School principal at a teacher's event that I attended, and was able to set up appointments through that contact.

One method that the Clearwater project failed to utilize was the local newspapers. After seeing the results of this study, it seems as though a small advertising blurb to both educate the community about the project and appeal to their interests would have been beneficial to the recruitment aspects of the project. Instead, I had attempted to use email, which proved to be highly variable in its effectiveness, and indeed was shown by this study to be a useless method of recruitment in rural areas. I also attempted to use brochures to advertise the project, which also seemed to be fruitless. After seeing the results of the study, I wonder if brochures and flyers fall into the same category of ineffectiveness.

Like most organizations, we provided incentives for our volunteers, but not with food. Instead, we provided donated T-shirts, water bottles, and discount coupons from REI. Although the volunteers seemed to appreciate this gesture at the end of a long monitoring day, I see that it clearly isn't the reason why citizen's volunteer. Instead of spending time finding donated items, perhaps the Clearwater project should focus on instilling potential volunteers with belief in the project through educational outreach.

In the beginning of the Clearwater project, I knew that establishing local contacts would be the way in to these rural communities, and I was able to find a few key contacts. However, the lessons the participants learned teach me that there can't be too much time spent on this endeavor—it was the number one lesson learned by the participants. I felt that I succeeded in being prepared for the volunteers, another lesson learned by the participants. Although I tried to be as personable as possible, I now realize that instead of solely having an email list of volunteers, it would be beneficial to also have a phone list so that volunteers can be contacted in a more personable manner. And as two of our participants so eloquently put it, volunteer recruitment is a full time job and it's hard!

I agree with the participants in that if I were to do something differently with the Clearwater project it would be more networking and working to establish more local contacts—this could only be done through personal contact, as more technical means of contact aren't effective in rural areas. Through this personal contact, I would not only try to get the word out earlier, but also get the word out more frequently in the form of reminder calls and emails to volunteers, as well as educational outreach.

The participants in the interviews also perceived what I had noticed during my attempts at volunteer recruitment and retention in the Clearwater—that there seem to be differences between rural and urban communities, and that these differences have something to do with their values. The participants identified values as one of the main differences, as well as priorities, a parallel difference. Both priorities and values lead to the third difference identified by the participants, that rural people are less environmentally minded. Perhaps it is the values and priorities of the rural communities that lead them to be less environmentally minded.

When I was out in the field with Clearwater volunteers, I did notice a difference in my rural and urban volunteers, but the differences I noticed only reflected the values and priorities of their communities. In other words, I didn't notice any difference in the work ethic or the quality of work by rural volunteers, just in the conversations about wordly events and conservation issues.

I also find appealing the participant's observations on how the differences in rural and urban communities affect their project—it seems to be in line with the differences they mentioned. For example, the participants observed that rural communities have different values and priorities than urban people. Therefore, project advertising and recruitment strategies must be molded to appeal to these values and priorities in order to be successful.

Characteristics of Effective Programs

The interview participants said that effective citizen science programs have four main characteristics: proper training of volunteers, scientific accuracy of data collected,

an assured quality control program, and a continued conversation between the organization and the agency.

According to the Volunteer Water Quality Monitoring website, "Effective training of volunteer . . . monitors is critical for volunteer competency and satisfaction, and therefore essential for program success" (Herron et al., 2004). My study found that agencies like to see citizen scientists trained as well as professionals in the field, and some noted that they require volunteers to pass a certification process. Most effective programs had a four to 24 hour training for volunteers before they began taking "real" data. The Clearwater project, in contrast, trained volunteers in the field while taking "real" data to be used in data analysis. Keep in mind that volunteers always had access to trained field leaders. It was the hope the Clearwater project that citizen scientists would volunteer frequently enough to learn the methods so that they would be skilled enough to collect data in future monitoring seasons. However, while there was no formal training for the Clearwater project, it is important to note that the protocols were written with citizen scientists in mind, which made them easy enough to master in one or two field sessions.

That brings us to the next characteristic of effective citizen monitoring programs, that of scientific accuracy. Most agencies were looking for data that was collected using proven-effective procedures, ideally those used by the agencies themselves. However, there were no universal protocols for road decommissioning monitoring when the Clearwater project began, so protocols were created during the first year of the project using peer reviewed methods. These protocols were created with citizen scientists in mind: they required little scientific expertise, were easily repeatable in the field, and did

not require the supervision of trained professionals. Wildlands CPR met with university academics, tribal employees, CNF employees, and local consultants to ensure the accuracy of the protocols.

Along with scientific accuracy is the idea of scientific integrity, or humility and the acknowledgement of the projects limits. Some of the protocols of the Clearwater project, such as the vegetation samples, were ambiguous in direction and admittedly subjective. Therefore, it was hard to acknowledge when the citizen scientists were over-stepping their abilities or biasing the data because they were having to make both qualitative and quantitative decisions.

The biggest factor in effective citizen science programs was having a quality assurance program, so that data and equipment can be checked, even if volunteers are using scientifically accurate methods. The Volunteer Water Quality Monitoring website states, "Data of unknown quality are essentially useless, and useless data can potentially corrupt the decision-making process. Therefore incorporating a Quality System you're your monitoring program is necessary for generating useful data"

The participants of this study noted that it is essential that the quality assurance plan be either approved by the agency or the same plan that the agency follows for quality control. The Clearwater program did not follow the CNF's quality assurance plan; in fact, Wildlands CPR was not sure the CNF even had a quality assurance plan for road decommissioning monitoring. Therefore, the Clearwater program didn't include a quality assurance program. This fact alone may be the biggest reason why the data has, thus far, stayed in the hands of Wildlands CPR and not been fully embraced by the CNF or the tribe.

The final characteristic of successful citizen science programs is to have a continual conversation between the organization and the agency. This conversation must begin early in the project planning process and continue throughout the project. This means that any training, protocols, and quality assurance plan that the agency has should be duplicated or closely mimicked by the organization for the project. Again, these are not general rules but specifically applied to the agency the organization is working with. The Clearwater project, therefore, should have followed the same training, protocols, and quality assurance as the CNF. Additionally, since each agency defines things like scientific integrity and quality assurance differently, Wildlands CPR should establish an understanding of what these terms mean to the CNF and then build the project from there.

As mentioned above, during the inception of the project, Wildlands CPR sat down as partners with the CNF and NPT to develop a vision for the citizen science program. Their protocols did not follow CNF protocols because the CNF wasn't monitoring the same parameters and therefore didn't have any protocols. Therefore, together they established the monitoring protocols. Additionally, some of the protocols the CNF used were considered too difficult for citizens to use. In this case, the agency was mostly interested in getting people into the field to see their own monitoring efforts—if additional data was collected (the goal of the Clearwater project), great, but getting additional data from Wildlands CPR was not a major prerogative of the CNF (Adam Switalski, personal communication, February 27, 2007).

<u>**Comparison of Project Findings with Literature**</u>

Study Results with Citizen Science Literature

Benefits of Citizen Science to Organizations and Citizens

This study found that citizen scientists were used because they saved the organization resources, and promoted stewardship and education. One of the main benefits to the organization that other researchers have mentioned is that using volunteers will save resources (Au et.al. 2000, Pattengill-Semmens and Semmens 2003; Leslie, et.al. 2004). While the participants in our study failed to mention the exact amount of money saved by volunteers, we can infer their savings was large since almost all listed that they require volunteers because they don't have the money for paid personnel. Saving resources by using volunteers also allows for citizen scientists to have influence in management and research objectives (Leslie, et.al. 2004). For example, when citizens involved in the Rhode Island Water Watch came to the organization seeking help, the citizens had already identified polluted water ways that were in need of action— therefore, the Watch formed its research objectives around input from volunteers.

Promoting stewardship and instilling a belief in the project with volunteers allows them to be active, educated participants in a scientific project, thereby supporting the democratic process that is largely absent in most scientific research (Ansley et al. 1997). This study found what Court el al (2005) directed, that citizen science projects promote land stewardship.

Earlier in this paper, I acknowledge what author Eric Higgs had to say about community participation in scientific projects, that "restoration is successful only to the extent that the life of the human community is changed to reflect the health of the

restored ecosystem. (p.222)" By educating the community, which organizations in this study claimed to have done, and having volunteers become instilled with a belief in the program, the community has changed in accordance with the restoration project and has a commitment to the project's success.

Citizen Science Near Rural Communities

All of the organizations interviewed were based out of either urban or suburban towns yet were conducting some, if not all, of their projects near rural towns. While most organizations had a hard time giving me the breakdown of the numbers of volunteers coming from urban verses rural areas, most said that they had more from urban areas because it was easier to recruit in those areas.

Research has shown that demographics, including area of residence, affect people's attitudes and values toward scientific research (Vaske et al. 2001; Williams, et al 2002; Kellert, 1978, 1985). This study shows that urban organizers perceive a difference in the rural and urban communities that they worked in, and that they allege these differences to be differing values, priorities, and a lower level of environmental awareness. However, because the aforementioned studies were not citizen science based, there was no separation of the volunteers from their communities. Participants in this study believed that rural citizens who volunteer for a scientific project are largely there for the same reason as urban volunteers—because they believe in the project, have developed social relationships with others in the project, or have developed a personal relationship with the project leaders.

Study Results and Current Organizing Manuals

The USDA publication, *Broadening Participation in Biological Monitoring: Handbook for Scientists and Managers* (Pilz et. al, 2006), states that it is important to understand the context of the communities where volunteers will be recruited from. It states that the organization sponsoring the project should gain an understanding of the norms and values of the community and take these in to consideration before recruitment begins. My urban participants also found this to be essential to the success of a citizen monitoring program. Participants noticed that there seem to be different values and priorities in rural communities, and that this requires them to make their project and their recruitment strategies appeal to these differences.

Other important contexts that the USDA document cites are political and economic. The political context has to do with the relationships between more and less powerful stakeholders. The economic context has to do with the fact that agency projects tend to use large amounts of taxpayer money, and how taxpayer money is spent is an important issue to the public. Both of these contexts fit into the different values and priorities the urban organizations perceived of rural communities.

The USDA manual also said that a broad range of communication skills were necessary for the organization in charge. This was a theme noted by my participants. Over half of them noted that because of the differences they perceive in rural and urban communities, they have to adjust their program advertising and recruitment to appeal to different values and priorities.

The USDA manual addresses few methods for volunteer recruitment, including newspaper and phone. However, they do not say which methods are most successful, and

the do not mention the differences in recruiting in rural verses urban towns—two areas where our participants noticed differences. Again, my participants found that while newspapers, word of mouth and email were successful for all volunteers, word of mouth and newspapers worked best in rural areas. Additionally, the USDA manual doesn't include suggestions for retaining volunteers, which my participants identified as instilling a belief in the program, creating a social atmosphere, and developing a personal relationship with them. In fact, these personal aspects of volunteer recruitment and retention, which were so important to my participants, were largely absent from the USDA report.

CHAPTER 7: CONCLUSION AND RECOMMENDATIONS

<u>Summary and Analysis</u>

According to the interview results, of the organizations interviewed, most use volunteers because it promotes stewardship, environmental education, and saves resources. Most of the projects surveyed require volunteers, and all were created for volunteers. The communities that the organizations recruited citizen scientists from were chosen because they were affected or involved in the project area or because the city or community itself expressed interest.

Most organizations used newspapers, word of mouth, events, and local groups as recruitment methods, and word of mouth, newspapers, and email were most effective. Moreover, most effective recruitment methods in rural areas were word of mouth and local newspapers. Most organizations provided incentives for their volunteers, usually food, but found that the most successful volunteer retention methods did not include nutrition; instead, belief in the program, a social atmosphere, and a personal relationship between the organization and the volunteers was what kept them coming back year after year.

Organizations learned that establishing local contacts and being prepared for the volunteer recruitment and monitoring season were critical lessons learned, as were being personable and ready to work hard in the process. Most organizations said that they would work to do more networking, establish more personal contact, and get word out about their projects earlier, in the future.

Most organizations believed that there is a difference between rural and urban communities, and that those differences are due to differing values, priorities, and that rural people are less environmentally-minded. Most organizations said they did not perceive a difference between rural and urban volunteers, and that most citizens volunteer for the same reasons. None of those who noticed a difference between rural and urban volunteers were clear what the differences were. These aforementioned differences affect the participants' projects by requiring that they advertise their project to appeal to the different values, priorities, and education levels of the communities they work in, and that their recruitment methods reflect those differences.

In regards to current organizing manuals for citizen science recruitment and retention, this study has found that they are inadequate to address the complexities of working in rural areas where values, priorities, and environmental education levels are different than those of urban people and organizations.

The study suggests that there are four major characteristics of effective citizen monitoring programs: sufficient training, scientific accuracy, quality control, and continued conversation between the organization and the agency.

Conclusion

Participants noticed a fundamental difference in the numbers of volunteers from urban and rural areas, pointing to different values and priorities as the cause. Although its benefits make citizen science an attractive option, organizations and land managers seeking to include citizens in a scientific project should understand that demographics

such as place of residence—urban versus rural--can be a factor in the public's attitude toward any scientific or land management project.

However, perhaps it is these very perceptions—that rural communities value and prioritize the environment less, or are less environmentally educated—that are creating the conflict in recruitment and retention. Additionally, this study suggests that organizers must incorporate rigorous training, accuracy, and quality control measures—as approved by the agency—in order to be effective. There is a fundamental conflict in recruiting those who are not fully included in all aspects of a project, including the structural foundation. In fact, one could argue that potential volunteer recruits may be suspicious of protocols or plans they did not help design and therefore may not understand.

In our world today, perceptions are reality. We judge books by their cover, cars by their manufacturer, and people by the clothes they wear. While perceptions are only skin deep, they seed in us ideas of how things are. For example, my perceptions would tell me that a book with a pink cover is a "chick novel," a car made by Ford is a lemon, and a girl wearing a mini skirt in Montana in February is not smart enough for college. Therefore, if we perceive rural people to value or prioritize the environment differently than us, or to be less aware of environmental issues, then they do and they are. However, if we instead perceive rural people to be just like urban people—as a dynamic group of individuals who value and prioritize different things according to their own lives—then they are.

In order to be effective, citizen science programs must follow closely agency recommendations for their structural foundation. However, beginning the planning process in this way leaves out citizen involvement from the beginning and requires the

organization to ask communities to volunteer for a project that they may not be interested in. This conflict between the fundamental structure of how effective scientific monitoring is conducted and the desire for rural citizen involvement needs to be addressed in order for true success in organizing rural communities.

Recommendations: A Guide to Organizing Citizen Scientists from Rural Areas and Ensuring Program Effectiveness

In addition to the citizen science programmatic guides listed above, these nine steps are useful for increased organizing and effectiveness for citizen science programs in rural areas. It is important to note that these recommendations support citizen science programs as they are currently set up—with the agency as the authority for training, protocols, scientific accuracy, and quality assurance. It also makes the assumption that an urban organization has identified a project that would affect rural communities, and would like to target those communities for volunteer recruitment. However, by following the recommendations, the interests and needs of the rural community can be addressed.

1. Identify the agency you'd like to provide data for. In the beginning, you should ask the agency how they view citizen science data, if and how much they value it, and what criteria for using citizen collected data are important to them. Next, you must together define:

- The problem and your hypothesis or ideas to address the problem
- Your goals and objectives for the program
- Steps for implementation

2. Identify the interests of the target communities. This should be accomplished before the planning stage (steps 1-5) is complete, by introducing the project to the community in a collaborative setting to identify the interests of the community in regards to the project. If collaboration is reached early on, the project may still be flexible enough to include the community's interests while keeping the foundational goals of the project intact.

3. Keeping in mind the information gathered, develop a volunteer training plan tailored to the both the agency's needs and the needs of your citizen scientists. Ideally, this plan would be the same plan the agency would use to train their personnel. Remember, most organizations noted that many of their citizen monitors (Fetter specified 30%) had no prior monitoring experience. Keep this in mind when developing a training program.

Additionally, if the project you are working on requires a high level of technical expertise, consider advertising for citizen monitors in places where you might find people with experience. For example, for weed mapping, advertise in the botany department of a local university or with a local botany group.

4. Develop protocols that pay attention to both scientific integrity (as defined by the agency you're working with) and level of citizen expertise. You can do this two ways. The first is by using the same protocols as the agency has in place and providing more training to citizen monitors. The second is by creating a protocol that is free of scientific jargon and highly technical procedures so that any citizen scientists can follow it. Note that this option must still produce the scientific integrity and rigor the agency is after.

5. Create a quality assurance program that is similar to, if not the same as, a program put in place by the agency. Assure that this program is strictly followed.

6. If not accomplished in step two, identify communities that are located within the project area or are otherwise affected by the outcome of the project. Identify the interests of these communities, so that you will be able to tailor your project advertising and recruitment methods to appeal to these values.

7. When recruiting volunteers, the most successful methods are newspapers, word of mouth, enlisting local community groups, and tabling at events. Do not waste time with flyers unless you enlist local groups to help paste them in rural communities. Keep in mind, however, that the most successful recruitment methods for rural areas are word of mouth and local newspapers. This involves having a presence in rural communities, building a personal relationship with its citizens, and establishing local contacts. When beginning the volunteer aspects of the project, be aware that recruitment and retention of volunteers is a difficult, full time job.

8. You may want to consider providing incentives for your volunteers. However, the best incentive is for volunteer retention is a belief in the program. Instead of putting money aside for banquets and T-shirts, spend more time creating fun, educational events to get citizens interested and on board with your project. Also, make sure to provide a social atmosphere for your volunteers. In other words, if you notice several volunteers having a good time in the field together, make sure they have the opportunity to be together more often—keep them monitoring together or have other social events where volunteers can get together outside of work. Finally, make an effort to develop a personal relationship with all of your volunteers. If volunteers establish a connection to project leaders, they will be more likely to come back the next year.

9. When recruiting, especially from rural areas, focus on networking with local community groups and contacts. Perform your networking with less-technical means in rural areas—by phone, door to door, and through community groups and events. Also, be sure to get the word out about your project early so that volunteers have plenty of time to plan and nothing is left to the last minute.

Citizen involvement is important for the collaboration of organizations, agencies, and communities around scientific, land management, resource, or environmental projects. Most important is the involvement of the local community most affected by the project. Volunteer recruitment and retention is a challenging endeavor, but the support of the community, their continued involvement, and their excitement towards a project is well worth the effort. The resources of an agency or an organization are finite, but the resources of a supportive community are forever renewable.

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Volunteer Background/Recruitment

1. Will you tell me a little bit about the volunteer projects that you have?

2. Why did you use volunteers for this project/these projects?

3. In your opinion, does this project require volunteers? If so, why?

4. Did you start the project with a volunteer component in mind, or add the component later?

5. From which towns or communities did you recruit volunteers?

6. Why did you choose these communities for volunteer recruitment?

7. How many volunteers came from each of these communities?

8. How many volunteers worked on each project during the last year?

9. How did you recruit your volunteers? What methods did you use?

10. What worked? What didn't?

11. Were some methods more successful in rural areas? Urban areas?

12. Did you provide incentives for volunteers? If so, what? Did these seem to work?

13. What methods did you use to retain volunteers and keep them coming back? How many volunteers returned to work on the project for a second year?

14. What lessons have you learned about recruiting volunteers? What lessons have you learned about recruiting volunteers specifically from rural communities?

15. What do you plan on doing differently in the future?

Confidential Questions: For the following questions, your name, organization, project and project area will be kept strictly confidential.

16. What differences have you noticed between the rural and urban communities you work with?

17. What differences have you noticed between the rural and urban volunteers you work with?

18. How do these differences affect your project?

2. Why were volunteers used?		1	2	3	4	5	6	7	8	9	10	11	Total
Comm benefit	16.1										1		1
stewardship	16.2	1	1	1				1		1	1		6
education	16.3		1	1	1		1			1	1		6
fun	16.4										1		1
match for grants	16.5										1		1
necessary	16.6	1		1									2
save resrouces	16.7	1		1	1				1	1		1	6
comm interest	16.8					1							1
increase scoping	16.9						1						1

3. Does the project require volunteers?

		1	2	3	4	5	6	7	8	9	10	11	Total
requires	1.1	1	1	1	1	1	1	1	1		1	1	10

4. Was it created for volunteers

		1	2	3	4	5	6	7	8	9	10	11	Total
yes	1.2	1	1	1	1	1	1	1	1	1	1	1	11

6. Why did you choose these communities?

		1	2	3	4	5	6	7	8	9	10	11	Total
affected/involved	2.1	1	1	1	1	1	1	1		1	1		9
comm/city interest	2.2		1	1		1		1	1				5
people-land connection	2.3	1											1
dvlp. Local capacity	2.4											1	1

9. Recruitment methods

		1	2	3	4	5	6	7	8	9	10	11	Total
flyers	3.1	1		1				1			1		4
email	3.2	1	1	1					1		1		5
word of mouth	3.3	1		1	1		1	1		1	1		7
sponsors	3.4												
local groups	3.5				1	1		1	1	1	1		6
newspapers	3.6	1	1	1	1		1	1	1	1	1		9
events/tabling	3.7	1	1	1				1	1		1		6
PSA's	3.8		1	1						1			3
radio	3.9	1	1	1				1					4
U classes	3.11			1							1		2
online services	3.12										1	1	2
website	3.13	1		1	1							1	4
newsletter	3.14				1	1			1			1	4
replacement requirement	3.15						1						1
agency announcement	3.16								1				1

10. Successful methods

		1	2	3	4	5	6	7	8	9	10	11	Total
newsletter	4.1				1								1
newspaper	4.2		1			1		1			1		4
community groups	4.3					1					1		2
word of mouth	4.4	1		1			1	1		1	1		6

Method	Code	1	2	3	4	5	6	7	8	9	10	11	Total
email	4.5	1		1						1			3
website	4.6			1	1								2
online services	4.7			1									1
radio/tv	4.8					1							1
flyers	4.9	1											1
follow up	4.11									1			1

10. Unsuccessful methods

Method	Code	1	2	3	4	5	6	7	8	9	10	11	Total
flyers	5.1			1							1		2

11. Methods successful in rural areas

Method	Code	1	2	3	4	5	6	7	8	9	10	11	Total
no difference	8.1												
word of mouth	8.2		1			1	1	1					4
local groups	8.3		1									1	2
newspaper	8.4				1	1		1			1		4
none	8.5			1						1			2
email	8.6									1			1

11. Methods successful in urban areas

Method	Code	1	2	3	4	5	6	7	8	9	10	11	Total
website	9.1				1								1

12. Incentives

Incentive	Code	1	2	3	4	5	6	7	8	9	10	11	Total
yes	6.1	1				1		1	1	1	1	1	7
no	6.2		1	1			1	1					4
food	6.3	1				1		1	1	1	1		6
Americore	6.4									1			1
transportation	6.5	1							1				2
donated items	6.6	1									1		2
t-shirts	6.7	1						1					2

13. Retention methods

Method	Code	1	2	3	4	5	6	7	8	9	10	11	Total
belief in program	7.1	1	1			1	1	1	1	1			7
social atmosphere	7.2		1						1	1	1		4
personal relationship	7.3			1				1	1		1		4
education	7.4	1				1							2
experience	7.5	1			1								2

14. Lessons learned

Lesson	Code	1	2	3	4	5	6	7	8	9	10	11	Total
hands on	10.2		1										1
quality training	10.3		1										1
perserverence	10.4									1			1
follow up	10.5									1			1
preparation	10.6		1	1					1	1			4
hold vols accountable	10.7									1			1
be personable	10.8					1				1			2
local contacts!	10.9	1		1		1		1				1	5
it's hard!	10.11					1		1					2
clarity	10.13								1				1

15. Do it differently?

Answer	Code	1	2	3	4	5	6	7	8	9	10	11	Total
no	11.1					1			1				2

Response	Code												Total
yes	11.2	1	1	1	1		1	1			1	1	8
get word out early	11.3		1	1	1								3
more personal contact	11.4	1									1		2
more networking	11.5	1		1							1	1	4
more web							1						1

16. Differences between rural and urban comms?

Response	Code												Total
no	12.1	1											1
yes	12.2		1	1	1	1	1	1	1	1	1	1	10
rural: disadvantaged	12.3		1										1
rural: less education	12.4		1					1					2
rural: different priorities	12.5		1				1				1		3
rural: different values	12.6		1			1		1			1		4
rural: less enviro-minded	12.7					1	1		1		1	1	5
rural: harder to reach	12.8			1									1
rural: better land connection	12.9					1					1		2
rural: more expertise	12.11				1								1
rural: wz stigma problem	12.13									1			1
urban: interest and $	12.12				1								1
rural: close knit	12.14							1					1

17. Differences between rural and urban vols?

Response	Code												Total
no	13.1	1	1	1			1	1					5
yes	13.2				1	1			1				3
out for same reason	13.3		1					1					2
rural: stay longer	13.4					1							1
urban: have more free time	13.5										1		1
rural: more experience	13.6				1						1		2
education	13.7							1					1

18. How do differences effect your project?

Response	Code												Total
appeal to different values	17.1							1	1	1			3
recruitment	17.2			1				1	1				3
more time in rural areas b/c of interest	17.3					1							1
dynamics	17.4										1		1
efficiency and quality	17.5				1								1
frustrating	17.6							1					1

1. What project did you use?

2. What project of yours did you use the data for?

3. What were the key characteristics that made the data useful?

4. What could have made the data more useful?

5. If you had a hand in creating a non-agency citizen science project, what guiding principles would you use?

6. Do you think citizen science projects are important? Increasingly important?

7. What aspects of citizen science projects make them difficult to use?