

## Effective Science Communication

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**THE PRESENTATION AND INTERPRETATION OF SCIENTIFIC DATA REQUIRES MORE OF INVESTIGATORS** than a journal article and a presentation at a research conference. Though the primary audiences for the National Park Service's Inventory and Monitoring (NPS I&M) Program are park planners and resource managers, we must help *everyone* to understand the importance of the program and of the resources in their charge, if the I&M program is to build a long-term relationship with the parks we serve.

NPS management policies state that park natural resource information will be made broadly available to park employees, the scientific community, and the public (NPS 2006, 38), and that parks should, in balanced and appropriate ways, thoroughly integrate resource issues and initiatives into their interpretive and educational programs (NPS 2006, 93). The natural resources I&M guideline (NPS 1992) calls for inventory and monitoring efforts to be designed to provide information for park managers *and the public* (emphasis added). The Natural Resource Challenge (NPS 1999) repeats a mantra of communication to a variety of audiences. At its most concise, the challenge points out that NPS employees and scientists "have the responsibility to widely share our knowledge about park resources in order to enhance the public's ability to learn from, and to enjoy, its national parks." Finally, the NPS director's science advisor has created a set of strategic goals that includes linking science with education programs and activities, so that we promote both, while contributing to the visitor experience (Machlis 2009).

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Beyond agency policy and guidelines, there is a fundamental reason for communicating with a variety of audiences. Gruchow (1995) wrote that “we will love the earth more competently, more effectively, by being able to name and know something about the life it sustains.” He meant that simply being able to identify plants and animals, and understand what affects them, is a way of building connections with places. From personal connection comes a sense of responsibility. This is the kind of public investment we need in the national parks.

### **How should we communicate?**

Fancy, Gross, and Carter (2009) felt that I&M networks should invest at least one-third of their resources in data management, analysis, and *reporting* (emphasis added). But they acknowledged that key challenges for many networks would be the development of integrated information products, and the ability to translate the large amount of complex, scientific data to decision makers, policy makers, and the general public. These challenges are compounded by tight budgets and busy staff.

Communicating to a broader public requires different formats and venues than technical reports and conference presentations. It also requires the dedicated time and energy of science communicators, interpreters, and teachers who can breathe life into the data, and who are skilled at translating the language of science into terms that are understandable, compelling, and relevant to a variety of audiences. We present here examples of written and electronic communications being used by I&M networks to do just that, and three venues in which a combination of these approaches is used.

### **Written communication**

Science communication best practices are well-accepted guidelines that are widely practiced by I&M networks nation-wide. They include the following: use of plain language, defining acronyms, stating the purpose of monitoring, acknowledging limits to data or conclusions, highlighting status and trends, using engaging images, involving partners and collaborators.

Three communication products from the National Capital Region I&M Network (NCRN) illustrate these practices. The network’s newsletter, NCRN Natural Resources Quarterly, presents brief articles on the status and trends of natural resources. The purpose of monitoring is stated, and the limitations to data or conclusions are acknowledged. A short key to park acronyms is always included for the benefit of non-NCRN employees or new NPS staff. The Quarterly’s comprehensive distribution strategy includes posting issues online, and emailing an issue overview and newsletter link to regional subscribers. Hard copies are also mailed to each park.

The network produced *A Photographer’s Path*, a regional photography book that features a collection of gorgeous images from network parks. The book uses only short, plain language captions and a minimalist design, to keep the focus on the images. Natural resources in the urbanized National Capital Region are sometimes overlooked, but this book promotes both their value and beauty, in part by showing how both natural and cultural resources blend into a seamless whole. The book has been distributed to regional parks and offices, including that of the regional director, and has become a compelling calling card for the NCRN.

A series of natural resource-focused brochures highlights the extensive collaboration utilized in their production. Development of this series involved staff from the NCRN, park interpretive and natural resources staff, and the Urban Ecology Research Learning Alliance. An urban fossils brochure also involved a Geologists-in-Parks employee, and utilized information from NCRN’s paleontological inventory report. Brochures use plain language to discuss resource status and trends, and acknowledge limits of available data.

These communication products take their strength from adherence to basic science communication best practices. In doing so, they become important long-term references that can deliver

messages to any reader, support and inform resource management, foster cooperative relationships, and promote resource appreciation and stewardship.

### **Electronic communication**

Today's electronic communication comes in many forms. The NPS Pacific Island I&M Network (PACN) is using three web-based platforms for electronic communication: a standard NPS website, a coral reef and climate change educational web-project, and the Pacific Island Parks blog.

The PACN website is hosted and maintained by the NPS. The Network adds content to the website, including monitoring results, inventory reports, newsletters, and links to relevant NPS information. The website caters to a specific, knowledgeable audience of mostly natural resources managers. It serves a useful function for relaying information, but its reach is limited.

The coral reef and climate change educational website was developed with outside partners using NPS funds. The goal of this website is to offer current and detailed information on coral reefs and climate change within the Pacific islands, in an interactive and scholastically-relevant manner. The website has been reviewed and partially created by teachers and students, and is intended to be used in eighth through twelfth grade classrooms in Hawaii, Guam, and American Samoa. Games, materials, and activities following state and territorial teaching standards are employed throughout the website. Real-life examples for the materials come from the Pacific islands national parks, and reflect local cultural and environmental issues. Real data from the I&M program are incorporated into the educational program.

The Pacific Island Parks blog (<http://pacificislandparks.com>) was created by a park interpreter for use by all eleven national park sites in the region. It is used to relay regional NPS news in a modern and accessible fashion. An individual from each park, and one person from the I&M network, can post breaking news, scientific findings, events, or minor but compelling stories in this rapid and socially connected forum. The blog incorporates other functions, such as Twitter and YouTube, to host and relay its messages. It has attracted many loyal followers, and provides a broad-reaching interpretive platform previously inaccessible to national park personnel. In less than two years, the blog has been viewed over 160,000 times.

These three electronic communication platforms just scratch the surface of the possibilities that natural resource managers and stewards have at their fingertips. It is important to stay focused on your topic and audience, but have some fun and experiment with the right media for your needs.

### **Virtual research learning center model**

Research learning centers (RLCs) were created as part of the NPS Natural Resource Challenge (NPS 1999). There are about 20 RLCs nationwide, and they overlap geographically with I&M networks and Cooperative Ecosystem Studies Units, creating opportunities to initiate or strengthen regional and national partnerships. The mission of each RLC is to facilitate research efforts, support science education opportunities, transfer science information, and facilitate science-informed decision-making. Also critical to the mission is that they be supported by partnerships.

Partnerships among parks, programs, and non-profit, university, and corporate partners allowed the development and implementation of the model that is now being used by seven different RLCs. The virtual model addresses two key needs: how to manage the volume of information that is available about resources, and how to communicate with audiences that have different levels of resource knowledge.

The Greater Yellowstone Science Learning Center (GYSLC) is a virtual research learning center, based in the parks of the Greater Yellowstone I&M Network ([www.greateryellowstone-science.org](http://www.greateryellowstone-science.org)). The GYSLC has worked with the learning center of the American Southwest

(LCAS; [www.southwestlearning.org](http://www.southwestlearning.org)) and other partners to develop websites that address the needs identified above. The use of web-based communication outlets allows networks to work with partners, who also create and manage content, and to better maintain and update resource information in the face of new science.

GYSLC and LCAS developed a suite of synthesis products and reports that bring together disparate university, non-profit, and government research papers, manuscripts, books, and book chapters, following I&M reporting requirements. They then made them accessible to managers, researchers, students, the media, and the public through the virtual RLC websites. Public access to this content allows for extended collaboration among stakeholders. For example, the sites were used to facilitate a series of workshops focused on regional resource management issues. This type of facilitation leads to professional collaboration, but also to tangible resources like conference proceedings and a science agenda for the greater Yellowstone area.

Maintenance and development of the sites is web-based. Each website has the same underlying architecture, but centers have autonomy over web content and appearance, and have the flexibility to develop and add features. Those features can then be easily shared or updated, leveraging the efforts of each individual site to benefit the others, in a true partnership.

### **Engaging park staff**

The San Francisco Bay Area Network (SFAN) recently completed a survey-based natural resource communication strategy that revealed many ways to improve how science and natural resources information is shared among park staff and partner organizations (O'Herron 2009). The survey assessed existing communication methods, what obstacles people encounter when trying to get information, what kind of information they need, and the formats they most prefer. The overwhelming majority of people surveyed wanted information at different levels of technical depth, all housed in one place. Many thought available information was too technical and/or too long to be useful. A large number said they prefer interactive information sources like multimedia, brown bag presentations, and symposia.

SFAN has been making great strides in trying to meet the needs identified in its communication strategy, through partnerships with natural resources and interpretation staff, the I&M program, the Pacific Coast Science and Learning Center, and park-affiliated non-profit organizations. Accomplishments include the following:

1. A new virtual learning center ([www.sfnp.org](http://www.sfnp.org)) brings together useful links, multimedia products, fact sheets, field season updates, briefings, reports, references, research projects, and management documents that had been in disparate locations. In addition to being a clearing house for existing information, new content is continuously being added.
2. Monthly I&M e-mail updates have been reformatted to be more appealing. They cover a broader range of natural resources topics from both the parks and their partners, and they are now more widely distributed.
3. Two-page resource briefings are reviewed by interpretive staff and subject matter experts to increase their appeal and relevancy to a broader audience.
4. The audience and range of speakers for the annual Science and Natural Resources Symposium has been expanded. In 2011, rather than just a day of science presentations, there was also a panel session where interpreters took a science topic presented earlier in the day and demonstrated how they would talk to the public about it. There were also presentations by educators about how they use the parks to teach science to kids.
5. Science topics are being included in more staff trainings and brown bag sessions.
6. Interns have added numerous multimedia pieces and photographs. The local PBS affiliate has provided free, relevant, professional-quality multimedia content.

7. Having a science communication specialist who can be a conduit for information, who can translate science to non-scientists, and who can dedicate time to work on materials and websites, has been absolutely essential.

### **Citizen science**

The Upper Columbia Basin Inventory and Monitoring Network (UCBN) is working with citizen scientists to monitor camas lily (*Camassia quamash*; *qem'es* in Nimiipuu, Nez Perce) at the Weippe Prairie site of Nez Perce National Historical Park in Idaho. Teachers and students from three local high schools have assisted in data collection for five years, providing valuable information on the current status of this native wetland prairie plant species.

The main objective of this program is to record information about camas plants, and other variables that may affect camas growth and reproduction. Learning components of the program are tied to state science standards, and students work alongside ecologists, natural resource managers, and interpretive rangers to learn about this important natural and cultural resource.

The program is divided into two parts: a pre-visit training, and fieldwork. First, UCBN and park staff visit the schools to provide information on camas ecology and its cultural importance, and to train students on the use of field equipment. Then, students visit the site and work with NPS staff to collect data, following scientific procedures from a peer-reviewed monitoring protocol. Information collected from defined areas includes number of camas plants present, number of camas plants flowering, and the presence of invasive weedy species.

To communicate the science involved in this camas lily monitoring program, it is important to identify the audience the UCBN will be communicating with, and to use a variety of techniques. Another key component is to work closely with interpretive staff who can assist in the delivery of this information. Final results are presented to park staff in the form of reports and resource briefs. Park rangers then transmit this information to the public in the form of interpretive programs and talks. A website was created to allow researchers, science communicators, and the general public to find information about this program. In addition, the park and UCBN staff collaboratively produced a video that showcases the importance of camas lily and the current efforts of citizen scientists.

Citizen science initiatives are becoming popular. By providing an opportunity for the public to be involved in scientific research, parks gain a long-term and sustainable monitoring project that can help establish an informed and concerned local citizenry. Data collected by volunteers provide valuable information about the status and trends of natural resources. This information can be used by park managers to make scientifically-informed management decisions.

### **Conclusion**

The primary goal of the NPS I&M program is to “improve park management through greater reliance on scientific knowledge.” However, as scientists and NPS employees, we need to share scientific information in a way that helps people build personal connections with the parks. Using the tools presented here, we can make real progress toward that goal.

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