



Science Communication Plan for Sierra Nevada Network Inventory and Monitoring Program

Version 1.0

Natural Resource Report NPS/SIEN/NRR—2012/499



ON THE COVER

Colorado State University graduate student Jennifer Rains Jones explains wetlands stratigraphy to Devils Postpile National Monument Superintendent Deanna Dulen, during installation and reading of a wetlands monitoring plot. Photograph by: Linda Mutch.

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1. Version numbers increase incrementally by tenths (e.g., version 1.1, version 1.2, ...etc) for minor changes. Major revisions should be designated with the next whole number (e.g., version 2.0, 3.0, 4.0 ...). Record the previous version number, date of revision, author of the revision, identify paragraphs and pages where changes are made, and the reason for making the changes along with the new version number.
2. Post new versions on the internet or other appropriate central location.

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Executive Summary

In response to a need for more information about the condition of resources in national parks, the Natural Resource Challenge established a National Park Service-wide Inventory and Monitoring Program to expand existing resource inventories and develop efficient ways to monitor the vital signs of natural systems (NPS 1999). Through the Challenge, 270 parks in the national park system were organized into 32 inventory and monitoring networks of parks. The Sierra Nevada Network (SIEN) Inventory and Monitoring Program includes Yosemite National Park, Sequoia and Kings Canyon National Parks, and Devils Postpile National Monument.

A key component of this program is communication of inventory and monitoring results to a variety of audiences, with the primary audience being park staff who need natural resources information to manage resources, plan future activities, and share information with the public. This plan outlines the Sierra Nevada Network's communication goals and objectives and identifies target audiences. We review communication approaches and strategies of other networks and SIEN parks, and summarize the communication approaches we will use to share information. We also discuss the administration and implementation of the communication program, roles and responsibilities of SIEN staff, and timelines for products. Finally, we identify some procedures for evaluating the effectiveness of communication efforts and discuss future communication opportunities.

This plan is intended to be dynamic and responsive to changes in SIEN program capacity, lessons learned along the way, new technologies and communication opportunities, and park needs.

Acknowledgments

We thank the Park staff from Devils Postpile National Monument (DEPO), Sequoia and Kings Canyon National Parks (SEKI), and Yosemite National Park (YOSE) who provided feedback through questionnaires and meetings as this plan was under development. We especially thank DEPO staff -- Deanna Dulen, Superintendent, and Maureen Finnerty, Park Ranger, for providing useful comments on a draft of the plan. We gained information on communication needs and priorities in Yosemite that were also applicable to other Sierra Nevada Network (SIEN) parks from a science communication assessment conducted by the YOSE Resources Management & Science Division in 2009.

We thank Ted Gostomski (Science Writer/Biologist, Great Lakes Network), Megan Nortrup (Science Communicator/Writer, National Capital Region Network), and Michelle O'Herron (Science Communication Specialist, San Francisco Bay Area Network) for their valuable reviews of an earlier draft of this plan. We benefitted from the work of all the Inventory & Monitoring Networks who had already developed science communication plans. Reviewing these plans assisted us in identifying our own goals, objectives, and communication approaches. A peer review from Greg Kudray, Pacific Islands Network I&M Program Manager, resulted in additional edits and improvements to this plan.

Erin Drake's review of communication efforts for the NPS Inventory and Monitoring Program, conducted through the NPS Office of Outreach and Education, helped provide a framework of communication planning needs that we could relate to the Sierra Nevada Network. It was also useful to review the communication evaluation conducted by the Great Lakes Network to help identify communication challenges and effective approaches.

We thank the other SIEN I&M staff for their feedback on the goals, objectives, approaches, and roles and responsibilities. We especially thank Physical Scientist Jennie Skancke for reviewing a full draft of the plan.

Context and Justification

The management policies of the National Park Service (NPS 2006a) clearly state the importance of scientific information to support resource management decisions: *“Decision makers and planners will use the best available scientific and technical information and scholarly analysis to identify appropriate management actions for protection and use of park resources.”* Scientific information on park natural resources comes from various sources, including: outside scientists; collaborative projects with other agencies or organizations; historic data, records, and publications; and NPS programs that conduct research, inventory, and monitoring. To be useful to park decision-makers and accessible to a diversity of audiences, information about park resources must be communicated in a variety of ways – from peer-reviewed publications to interpretive talks with park visitors.

The Natural Resource Challenge (NPS 1999) identified areas where natural resource management programs needed to be enhanced, including inventory, monitoring, and information sharing:

We must expand existing inventory programs and develop efficient ways to monitor the vital signs of natural systems...Managers must have and apply this information to preserve our natural resources. Once this information is in our hands, we must share it widely, so that child and adult, amateur and professional can benefit from the knowledge uncovered in these places. The information contained in the parks should help the surrounding communities, both regional and global, in making choices about their future. Parks and protected places should become increasingly useful to surrounding communities as benchmarks and repositories of environmental information.

In this chapter, we provide an overview of the Inventory and Monitoring Program and the Sierra Nevada Network and discuss why a science communication plan is important to our program.

What Is the Inventory and Monitoring Program?

The National Park Service (NPS) has developed an Inventory & Monitoring (I&M) program to provide baseline data through inventories of park natural resources and to design and implement long-term monitoring that will enable managers to develop scientifically sound information on the current status and long term trends in park resources (Fancy et al. 2009). Networks of parks linked by geography and shared natural resource characteristics were established so that the inventory and monitoring could be conducted more cost-effectively. Working within networks improves the efficiency of inventory and monitoring because parks are able to share budgets, staffing, and other resources to plan and implement an integrated program. The Sierra Nevada Network, established in 2000, is one of 32 networks of parks. SIEN includes the following NPS units located on the west slope of the Sierra Nevada in California: Devils Postpile National Monument (DEPO), Sequoia and Kings Canyon National Parks (SEKI), and Yosemite National Park (YOSE; Figure 1).

The Sierra Nevada Network (SIEN) conducted biological inventories from 2000-2006 (see <http://science.nature.nps.gov/im/units/sien/inventories.cfm>) and prepared a long-term monitoring plan (Mutch et al. 2008) that provided the framework for developing and implementing the monitoring program. Currently the Network is developing and implementing specific monitoring

projects or protocols. Ultimately, SIEN will be implementing six monitoring protocols that incorporate 10 vital signs, or indicators of ecosystem condition (Table 1).

The Network has kept park staff involved with vital signs selection and protocol development through workshops, a Science Committee, and work groups that helped make decisions about protocol objectives and monitoring approaches. These groups in some cases also assist with logistics, management, and planning when monitoring is being conducted. The integration of park staff and local USGS scientists into SIEN's planning process has kept our monitoring program's focus on information needs that are a high priority for the SIEN parks and has kept parks engaged in our program. A recently formed Steering Committee and the Board of Directors provide management feedback and oversight.

Table 1. List of protocols for monitoring vital signs in Sierra Nevada Network parks.

Monitoring Protocol	Associated Vital Signs	Parks
Climate	Weather and Climate Snowpack	All
Wetlands Ecological Integrity	Plant Communities Macroinvertebrates Water Dynamics	All
Lakes	Water Chemistry Amphibians	SEKI, YOSE
Rivers	Surface Water Dynamics Water Chemistry (limited)	All
Birds	Birds	All
High-elevation Forest Dynamics	Forest Dynamics (Whitebark Pine, Foxtail Pine)	SEKI, YOSE

Inventory and Monitoring Program Goals

As part of the National Park Service's effort to improve park management through greater reliance on scientific knowledge, the I&M Program collects, organizes, and presents natural resource data in ways that are appropriate for a variety of audiences (Fancy et al. 2009). The primary goals of the program are to:

1. Inventory the natural resources under National Park Service stewardship to determine their nature and status;
2. Monitor park ecosystems to better understand their dynamic nature and condition and to provide reference points for comparisons with other, altered environments;
3. Establish natural resource inventory and monitoring as a standard practice throughout the National Park system that transcends traditional program, activity, and funding boundaries;
4. Integrate natural resource inventory and monitoring information into National Park Service planning, management, and decision making;
5. Share National Park Service accomplishments and information with other natural resource organizations and form partnerships for attaining common goals and objectives.

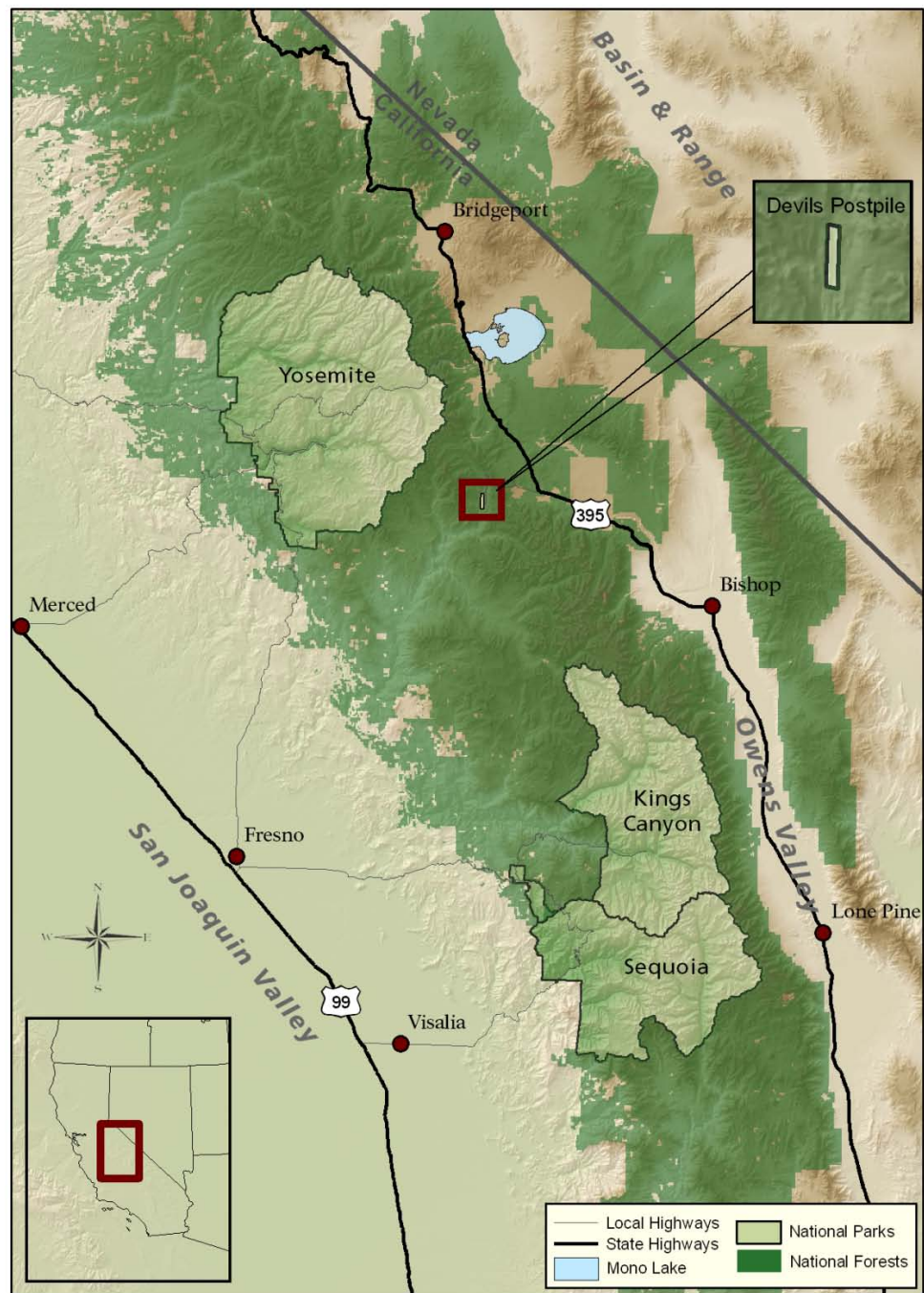


Figure 1. Map of Sierra Nevada Network parks. NPS map by Sandy Graban.

Why Do We Need a Science Communication Plan?

I&M Program Goals 4 and 5 emphasize the importance of communicating I&M information to NPS managers and to other organizations that may have similar information needs or goals and objectives. The purpose of this communication plan is to formalize our communication strategies and to ensure that we are reaching key audiences with the results, reports, and compelling stories that inventory and monitoring data provide. The I&M Program vision is that long-term monitoring data be used for management decision-making (e.g., comparing estimates of current condition for key resources with desired conditions as part of developing management strategies), and for informing policy makers and the general public about natural resource status and trends (Fancy et al. 2009).

In other planning documents, the Sierra Nevada Network has described other important elements of the program, including data management (Cook and Lineback 2008), administrative reporting and schedules for annual and periodic trend reports for monitoring projects (Mutch et al. 2008), and data analysis and report content for specific monitoring protocols (Gage et al. 2009, Siegel et al. 2010, Heard et al. 2012, McKinney et al. 2012, Skancke et al. 2012). This plan provides a framework and context for all of the network's communication needs and activities. It will detail the specific approaches that enable us to:

- ***Integrate natural resource inventory and monitoring information into National Park Service planning, management, and decision making (I&M Program Goal 4).*** We will participate in existing communication opportunities in SIEN parks as well as employing approaches targeted at specific park information needs. Where appropriate, we participate in park planning meetings and provide I&M-information relevant to resource management needs.
- ***Share National Park Service accomplishments and information with other natural resource organizations and form partnerships for attaining common goals and objectives (I&M Program Goal 5).*** We participate in local and regional meetings or conferences and seek opportunities to share information and collaborate with other agencies, universities, and non-governmental organizations.
- ***Keep program relevant*** to park staff needs through frequent and varied types of communication and periodic evaluation
- ***Clearly articulate our communication plans*** – identify communication approaches, responsible parties, and time frames so that park staff know the details of how we will communicate I&M information to them and outside audiences.

Existing Communication Opportunities in SIEN Parks

Each of the large SIEN parks (SEKI and YOSE) have complex Resources Management & Science programs and well-established means of communicating resources information to internal and external audiences. Much of the internal communication within and among divisions is done through various staff meetings, brown bag or other lecture series, Email, and parkwide E-newsletters. External communication is done in a variety of ways – websites, public lecture series, interpretive programs and various NPS staff contacts with visitors, engaging volunteer groups in resources management projects, and through involvement with partner groups and

organizations. Despite its small size and lack of resources management staff, SIEN's single small park, Devils Postpile, has numerous, highly-engaged partner scientists and has accomplished extensive outreach to public audiences through interpretive programs and signs, park newspaper, local press releases, public presentations, volunteer projects, and monitoring projects that include interpretation as a component of project implementation.

To the extent possible, we participate in many of these existing communication opportunities, which help us share information with a variety of internal audiences as well as stay informed about park projects, operations, and information needs. Our program does, however, have some unique communication needs and specific requirements that necessitate having a program-specific plan that ensures our communication approaches address our program's goals and objectives.

Development Approach

To describe the development approach for our science communication plan, we first introduce the concept of the information pyramid, which illustrates the different levels of scientific information behind the range of products we'll prepare, from detailed data to distilled briefs. We then define our audiences, which helps determine how information should be shared. Next, we studied other networks' communication plans and the Drake 2011 review of NPS I&M networks' communication approaches. What we learned from these documents helped us to focus our limited resources on the most effective communication approaches – particularly for park staff audiences. To make the plan relevant to our local parks, we also reviewed results from a Communication Assessment performed at Yosemite (NPS 2009a) and sought feedback from Interpretive and Resources Management & Science staff (SEKI and YOSE) and the DEPO Superintendent and Park Ranger.

The Information Pyramid

Field technicians and scientists collect raw data on plants, animals, water, and other natural resources. This large quantity of data must be managed properly, summarized and analyzed graphically and statistically, reported on in peer-reviewed technical reports and other publications, and translated for the needs of various audiences who need less technical information about park resources. An information pyramid can be used to represent these different levels of scientific information, to illustrate the steps in distilling large quantities of data into clear, relevant, and technically-sound information for various audiences, and to show that information at the upper levels of the pyramid is based on a strong foundation of data and analyses (Figure 2).

When information is being served in a well-organized and thorough way, multiple audiences should be able to access various layers of information in this pyramid. A college student doing a research report on high-elevation forests may first encounter a summary of a certain forest type of interest on a park website. This person should then be able to access a more specific summary of recent monitoring results, and if more information is desired, a technical report that provides an assessment of trends in forest insects, pathogens, and tree populations for the past five years.

In some instances, data may be requested for analyses by outside researchers, and it should be clear how those data can be obtained, if it is appropriate to share them. Thus, users of monitoring data should be able to move from the top layer of more distilled information through different levels of the pyramid to access the level of detail or depth that is appropriate for their needs. As Gostomski (2009) points out, each layer has its own audience(s), and this pyramid-shaped layered approach is similar to an iceberg in that most public audiences will only see the “tip” and not the data and other information that form the foundation or base of the iceberg.

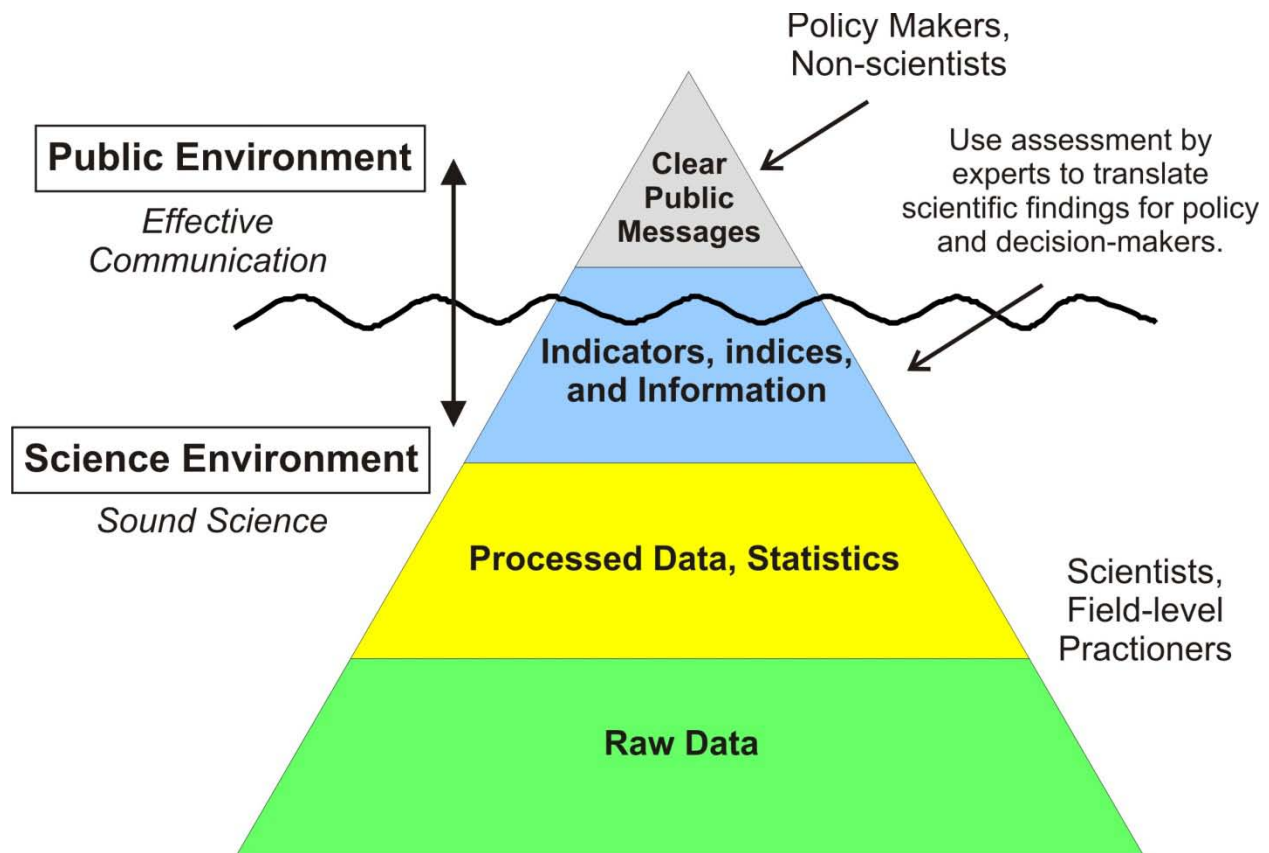


Figure 2. The information pyramid, adapted from Fancy et al. 2009.

Audiences

Defining the audience is a critical step in developing a communication program, including communication goals, objectives, and approaches. We have audiences that are both internal and external to the National Park Service. They have varying degrees of scientific knowledge and a wide range of interests in natural resource information. One person may just want to know what the weather will be for an upcoming visit to a park, while another may want monitoring data to use in an academic research project. Each communication product or tool will be developed with a specific audience in mind.

According to the Chief of the NPS I&M Division, the primary audience and users of the information produced through I&M programs are managers, planners, natural resource specialists, interpreters, and scientists at the local park level (Fancy et al. 2009; Table 2). This primary audience of NPS staff must be able to use I&M information to make decisions, plan for the future, and inform the public. Monitoring results can also be provided to the general public in partnership with other NPS programs and park interpreters (Fancy et al. 2009). Secondary audiences include state, federal, and other partners, scientists, park visitors, and local community residents (Table 2). These external audiences are not secondary because they are less important. Each audience requires a variety of communication approaches, and limited time and funds necessitate that we focus on the primary audience.

Table 2. Primary and secondary audiences for I&M information.

Primary Audiences
Superintendents
Resource managers
Park interpreters
Park planners
Resource protection staff
Maintenance staff
Park administrative staff
NPS cooperating associations
Other NPS I&M networks
Secondary Audiences
Scientists – partners, peers in scientific community
Other federal and state agencies
Educators and student groups
Park and web visitors
Local residents
Special interest groups
Political representatives

Learning from a Review of Other Network Science Communication Efforts

To make this plan more effective and build on the knowledge gained through communication efforts at other networks and parks, we start by referencing a recently completed review of communication efforts for the NPS Inventory and Monitoring Program conducted by Erin Drake through the NPS Office of Outreach and Education (Drake 2011). Drake conducted interviews with most of the 32 I&M networks about their approaches to science communication to inform development of the Chihuahuan Desert Network communication plan. She identified the following criteria for science communication plans, and each is followed with a description of how we address the criterion in our plan.

1. “The science communication plan should foster and institutionalize the strengthening of interpersonal relationships and information exchange between network and park staff.....The plan should identify goals, strategies, action items, and evaluation measures related to the reasonable and relevant priority for all involved.”

Within Sierra Nevada Network: Emphasize integration with existing park communication opportunities; take advantage of SIEN staff being in or near the parks to interact directly with park staff to the extent possible; maintain the flexibility to take advantage of evolving opportunities to integrate SIEN communication needs with park activities and programs.

2. “The science communication plan should provide a platform for consistent messaging between network and park staff regarding network information....Key messages should identify priority focus areas or ‘information sound bites’ to be conveyed to particular

audiences, depending on their level of expertise....Reference to these messages across communicators will aid in fostering a clear and consistent presentation of I&M information and its relationship with parks.”

Within Sierra Nevada Network: Development of focused goals and action-oriented objectives, and communication approaches and products that address these, will provide the Network with better consistency in how information is communicated at both the project and program levels. Defining key messages and levels of detail to share about SIEN’s I&M program for different types of audiences will improve the clarity and focus of our communication efforts.

3. “The role of who communicates I&M information to non-technical audiences (NPS staff, visitors, local stakeholders) needs to be clearly identified between the Network and network parks.... Does all non-technical I&M communication go through park interpretation divisions? ...Should the Network conduct direct outreach with non-technical audiences?.... How do network and park communication tools (websites, published documents, programs) cooperatively and complementarily exist?”

Within Sierra Nevada Network: Communication of I&M information to non-technical audiences occurs directly through SIEN web pages that provide program and project overviews, resource briefs, reports, and other products. While a more technical audience is targeted, the pages should also serve non-technical audiences. Direct outreach with non-technical audiences occurs through periodic presentations in parks to staff from multiple divisions, and to the public. The Network’s primary audience is park staff, but SIEN staff will provide public presentations at appropriate venues. Interpreters are the primary providers of information to public audiences and SIEN will work closely with them to ensure that they have the information they need to communicate about I&M projects, as they are able to do so, balancing I&M communication with their other park interpretive priorities.

4. “Determine the role of the local Science Learning Center (SLC) in dispensing network information for networks where centers are present..... Networks varied in their relationship with and use of local SLCs, ranging from no use of any kind to the SLC serving as the primary medium with which to deliver I&M information to non-technical audiences, which often replaced direct information-sharing with park staff.”

Within Sierra Nevada Network: There is not currently a SLC in the Sierra Nevada Network, although an Operational Funding System (OFS) request has been submitted to fund three science communication positions for the parks. Should this request be funded, there will be increased opportunities for shared communication activities between I&M and the parks. In the interim, there may be a science communication work group established consisting of the SIEN Science Communication Specialist and staff from Park Divisions of Interpretation and Resources Management & Science to strategize about how we might better share information among our programs.

5. "Physical communication 'products' for non-technical audiences should be limited and serve to support the Network's key messages through agreed-upon communication media... Many products fail to meaningfully engage non-technical audiences in such a way that supplements verbal communication beyond initial acquisition of the product.....Single-use, temporally-defined products should be critically evaluated before production; however, resource briefs and newsletters (both arguably single-use and temporally-defined) have received positive feedback from many networks.... The three most favored products (according to responses from networks) are:
 - 1) Resource Briefs
 - 2) Newsletters, and
 - 3) Accessible websites with simple "new media" enhancements (podcasts, vidcasts, blogs, digital photo albums)."

Within Sierra Nevada Network: The SIEN will need to limit its communication products to things that are most effective and possible to do with the staffing available. We will emphasize the products mentioned above that have been most effective in other networks and will produce additional products that focus on the highest priority audiences. "New media" products are desirable, and will be pursued as staffing or funds allow. All products must have a clear purpose, and periodic evaluation will be done to determine if they are effective, accurate, and meeting the needs of parks and other stakeholders.

Approaches of Other Networks

Numerous other I&M networks have developed Communication Plans, Strategies, or Analyses (NPS 2006b, Gostomski 2009, HaySmith and Nash 2009, Jocius and Garrett 2009, O'Herron 2009, Nortrup 2010, NPS 2009b, NPS 2010a). Most of these networks have queried park staff and partner organizations about how they currently receive information about park natural resources and science programs and for suggestions on how the I&M networks or other park programs can be more effective in sharing scientific information. These plans provide information and strategies that are relevant to our communication needs, and we will refer to them and build upon their efforts (as appropriate to our local needs and resources) in this plan.

Scope of plans

At this time, seven I&M networks have a formal science communication plan or strategy, one has an analysis of existing communication approaches and needs, and three are in the process of developing formal plans (including SIEN). All networks are engaged in science communication, with or without a separate formal plan, and most target park staff as the primary audience. For networks with science communication plans, most typically focus exclusively on I&M information, and communicating that information in a variety of ways to the primary internal audience of park staff. One network (San Francisco Area Network - SFAN) has a highly integrated communication strategy that was developed closely with park resources management and interpretive staff (O'Herron 2009). In the SFAN, efforts to communicate natural resources information are coordinated among I&M, other network programs (fire, exotic plant management), park programs, the Pacific Coast Science and Learning Center, and outside partners. The network has a science communication position that is shared among the different network programs, the parks, and outside partners. SFAN is one of several I&M networks that use an external website to share information on natural resources with the public and outside

partners (<http://www.sfnps.org/>). Their website is based upon the model initially developed in the Greater Yellowstone Network (<http://www.greateryellowstonescience.org/>), and its structure and content facilitate integration of information about specific resources across NPS programs and outside research groups.

While park staff are a primary audience for all networks, and all networks use websites to communicate with both internal and external audiences, some networks invest additional time in communicating directly with external audiences. They use public media such as press releases and radio spots (for example, NPS 2006b); public presentations, courses, or lecture series; and citizen science monitoring projects, curriculum development focused on monitoring projects, or other outreach to school groups (NPS 2006b, Jocius and Garrett 2009, Kozlowski 2009). It is not practical for all networks to engage citizen or student scientists in monitoring, but those who have managed to make this a part of their monitoring programs are enthusiastic about its benefit to both the network and the citizen scientists or students involved.

Common Approaches and Tools

All networks developed long-term monitoring plans that provided the framework and timelines for the technical reports produced for each monitoring project. These technical reports include the monitoring protocol, annual reports, and periodic trend reports. While these reports are critical products, they typically only reach an audience of resource managers and scientists. To communicate with broader internal and external audiences, additional products and tools are needed. Among many other networks, these additional products and approaches may include:

- Websites – typically served through the NPS Inventory & Monitoring Program (<http://science.nature.nps.gov/im/index.cfm>) and are used to provide program overviews, staff contact information, and project-specific overviews and products. As noted above, some networks are also using .org websites to integrate I&M information with natural resources information from parks, outside researchers, and various park partners.
- Resource briefs that provide one- to two-page overviews of inventory or monitoring projects
- Periodic newsletters that give program updates (typically biannual to quarterly)
- Brochures that give overviews of network I&M programs
- Road shows or science days/symposia that provide opportunities to interact with parks and other partners to share information on specific projects, or on common themes that may be addressed by I&M as well as parks or other programs. Some networks conduct these road shows or science days annually. For others, in-person presentations may be done more opportunistically when network staff are in specific parks.
- Some networks are adding “new media” to their web presence. Additional tools for getting out I&M information and stories include: podcasts, vidcasts, blogs, Facebook, Twitter, RSS feeds, and photo albums on Flickr.

Effectiveness of Approaches

In her surveys of network science communication approaches, Drake (2011) reported that the three most favored communication products were:

- Resource briefs
- Newsletters

- Accessible websites with simple “new media” enhancements (podcasts, vidcasts, blogs, digital photo albums)

These results overlap with some of the results of a communication evaluation survey that the Great Lakes Network (GLKN) conducted with their parks’ staff. Gostomski (2011) found that E-mail updates and the biannual newsletter were the most popular forms of communication at GLKN, and resource briefs were the most widely used communication product. On-site presentations by network staff also ranked high. Technical reports and annual reports were much less widely utilized, but were valued by resources management staff in particular. Many survey respondents recommended that the network prepare informational products that were already being produced, indicating that the respondents were not aware of the products and suggesting that the products were not being widely distributed. They concluded that more announcements of new products should be sent to all employees rather than relying on points of contact to distribute information.

Yosemite National Park Science Communication Assessment

Yosemite National Park’s recent assessment of science communication (NPS 2009a – Draft report) provided a helpful starting point for SIEN’s Communication Plan as it provided an overview of current science communication in Yosemite, highlighted areas in need of improvement, and proposed some potential solutions to the issues raised. Most of the communication needs and useful approaches identified in this report apply to all SIEN parks.

The Science Communication Assessment for Yosemite National Park (NPS 2009a) inventoried existing communication sources for science information and surveyed NPS staff members across numerous divisions, along with various park partner organizations through a combination of interviews and questionnaires. Respondents were asked about how they currently receive scientific information, their preferred sources of information, their informational needs, and their suggestions for improving the park’s science communication.

The responses to the Yosemite science communication survey showed that the most commonly used sources of information are personal communication, presentations, factsheets, briefing statements, and reports. Many respondents wanted to have more scientific information available through the park’s website. Some staff and park partners found it difficult to access needed information, especially completed reports. A frequent suggestion was creation of a centralized, searchable database for all current and completed park research, where products and information could be located. The hiring of a data manager and a writer/editor has helped Yosemite begin to address some of these needs.

A majority of respondents noted personal communication to be the most efficient way to access current information about specific topics. Examples of these kinds of communications include trainings, presentations, and science updates at various staff meetings.

Those requiring scientific information in the greatest amount of technical depth included the Resources Management and Science Division, USGS scientists at the Yosemite Field Station, Network Inventory & Monitoring Program staff, and NPS staff in Planning and Project Management Divisions. These groups prefer to receive information in clear, in-depth reports as

well as concise briefing statements. Interpretive staff and partner organizations prefer to receive information in a less technical and more accessible format.

While different groups had different information needs, almost all respondents expressed interest in receiving regular updates about current scientific research in the park. The Yosemite Science Communication Assessment recommended monthly email updates and a frequently updated science web page (served through Resources Management and Science Division) as the most efficient means to reach a maximum number of people. In-person communication is also highly valued and effective, and could be enhanced by encouraging collaboration among park branches and divisions (NPS 2009a).

Park Feedback for SIEN Inventory & Monitoring Communication

To obtain initial feedback on SIEN's Science Communication Plan goals and objectives, the SIEN Science Communication Specialist met with the Division of Resources Management and Science at SEKI and the Acting Chief of Resources Management and Science in YOSE, attended staff meetings for the YOSE Division of Interpretation and Education and the SEKI Division of Interpretation, Education and Partnerships, and held a conference call with the DEPO Superintendent and Administrative Assistant. Brief questionnaires were also sent to Resources Management & Science and Interpretive staff. The return rate on questionnaires was low, but the responses we received were helpful. Following below are summaries of feedback from park staff who participated in the above-mentioned efforts (see Appendix A for more detail).

Resources Management & Science (RMS) Divisions at SEKI and YOSE

There are many research scientists who do projects in the parks as well as local USGS field stations at both SEKI and YOSE with scientists who do a large portion of their work within SIEN parks. These scientists are somewhat comparable to SIEN I&M staff in that they collect, manage, and report on information of value to park managers, but are outside the parks' organizational structure. Those RMS Division staff members who responded prefer to get information from outside scientists in the following forms:

- Reports or publications that can be emailed directly, or accessed through the web.
- Brief summaries that provide locations where more detailed information can be found.
- Data in Microsoft Access or Excel formats
- Newsletters that provide up-to-date summaries of projects
- Conference or symposia sessions and proceedings

Existing communication opportunities that RMS staff recommend SIEN I&M should take advantage of included:

- RMS staff meetings
- All employee meetings
- Seasonal orientation trainings
- Brown bag lecture series (SEKI), Croaking Toad lecture series (YOSE)
- Email updates through direct email or all-employee E-newsletters (SEKI Bulletin and The Yosemite Daily)

Some networks coordinate a science symposium or science day annually or periodically to provide an opportunity for sharing information among I&M, parks, and outside researchers. When asked if they would find something like this useful, RMS staff were interested and thought it would provide a good opportunity for maintaining communication among network parks and could facilitate sharing of ideas for future research and funding opportunities.

Interpretation Divisions at SEKI and YOSE

The following feedback was received from park interpreters (and Sequoia Natural History Association staff) via SEKI and YOSE staff meetings attended by Linda Mutch or via the brief questionnaire.

Interpreters prefer to get scientific information about park resources through email, websites, in-person presentations, and resource briefs. A central web or Sharepoint site or a searchable database where science information is organized by topic and includes information from multiple groups (I&M, USGS, university scientists, park resource management staff) would be very useful.

Existing communication opportunities that interpretive staff recommend SIEN I&M should take advantage of included:

- Park newsletters (SEKI Bulletin, The Yosemite Daily)
- Seasonal trainings (early one in May, mid-season in July)
- Contribute summaries to Interpretive Handbooks
- Brown bags or other lecture series in parks (but not all interpreters can attend)
- Video-taping of presentations, or using webinars for those who are scattered around parks and cannot attend centrally located presentations.
- Cooperating association publications, such as Sequoia Natural History Association's "Nature Notes".
- Sharepoint is being used more all the time to communicate within the parks – making announcements, sharing documents, etc.

Interpreters indicated that they will use the website to access resource briefs and did not need to have hardcopies provided. They recommended creating more links between the I&M and Park websites. They also suggested I&M invest some time in social media. Both SEKI and YOSE use Facebook and Twitter, and I&M could participate by providing occasional highlights, images, and topics to "tweet".

Most of I&M's communication efforts target internal (NPS) audiences. Opportunities to work collaboratively with interpreters to share information more directly with public audiences include: occasional evening programs for visitors, participation in a science communication team with Interpretation and Resources Management & Science, and participation in developing a vision for funding and developing a Science Learning Center.

Devils Postpile National Monument

Devils Postpile has a very small staff and therefore does not have specific positions dedicated to resources management. DEPO staff currently use in-person communication, Sharepoint, Email, and seasonal training to share information among DEPO staff. I&M could contribute to a seasonal training notebook that is compiled each year to summarize different programs or projects.

Effective ways for others to share information with DEPO staff include in-person presentations or participation in symposia or meetings, resource briefs, a rack card to summarize the program, interpretive talks to staff and visitors, articles in the DEPO newspaper, and participation in other local forums or public lectures that take place in the eastern Sierra Nevada.

Other Comments from SIEN Parks

Park staff are most interested in results from inventory or monitoring projects (rather than plans of what we will do). New findings or insights that result in management changes or new ways of thinking about resources management can provide compelling stories to share with the public. DEPO staff suggested we might want to have short-, medium, and long-range goals, with longer range goals providing flexibility to take advantage of new opportunities to work closely with parks on shared needs. For example, if the SIEN parks receive Science Learning Center funds, there may be more opportunities for information sharing and outreach activities among parks and the SIEN I&M.

Communication Goals and Objectives

The purpose of this plan is to articulate the network's goals, objectives, and specific strategies for effectively communicating inventory and monitoring results to primary (internal) and secondary (external) audiences.

Goals

Our communication goals are longer term in scope (at least 5 years) and reflect the purpose and specific audiences of our outreach and communication efforts.

Goals for this communication plan are:

1. Park staff members feel well-informed about the progress and current results of Network monitoring programs. They have access to information at the level of detail they need.
2. Communication facilitates collaborative relationships among park programs and the SIEN I&M program so that I&M data are well-integrated into park management, planning, and interpretation.
3. The public and our partners and peers in the scientific community have access to information about the Sierra Nevada Network Inventory and Monitoring Program and what we are learning from our monitoring programs.

Objectives

We define objectives under each communication goal, and these are intended to be accomplished within a short time frame (1-3 years). We have written the objectives to be specific, feasible, and result-oriented.

Goal 1: Park staff members feel well-informed about the progress and current results of Network monitoring programs. They have access to information at the level of detail they need.

Objective 1: Beginning in Spring 2011, we will publish and distribute a newsletter twice a year – spring and fall. The primary emphasis will be to preview and summarize, respectively, that season's work. Additional program highlights may be provided, as appropriate.

Objective 2: Project managers will complete a monitoring protocol that documents the purpose, objectives, design, and methods associated with each monitoring project; an annual report that summarizes the field season and provides basic data analyses; and a periodic synthesis report that analyzes trends and patterns in vital signs monitored.

Objective 3: We will provide park staff with Resource Briefs each year that a monitoring project is conducted. These will be a brief overview of the project's work for the year, and any major findings or highlights. If time allows, we will periodically provide park-specific summaries of one or more projects, but typically our briefs will emphasize network-level status and trends for vital signs monitored.

Objective 4: We will complete an annual administrative report to summarize accomplishments, public interest highlights, and expenses for the previous fiscal year. We develop a work plan to give an overview of goals for the coming year. These are reviewed with the Network's Steering Committee and Board of Directors each fall.

Objective 5: We will maintain internet and intranet sites to provide an overview of our program and individual projects, provide staff contact information, and share reports, briefs, and other summary products. We will input project products to the NPS Integrated Resource Management Applications (IRMA) and will transition our website to link directly to documents and data products in IRMA. An I&M page on Park Sharepoint sites will be used as a gateway to the I&M website.

Goal 2: Communication facilitates collaborative relationships among park programs and the SIEN I&M program so I&M data are well-integrated into park management, planning, and interpretation.

Objective 1: We will take advantage of existing Email news sent to parks (Yosemite Daily Report and Sequoia and Kings Canyon Bulletin) to give frequent brief updates to park staff. These updates will also be sent to all DEPO staff, who are not on the mailing list for SEKI and YOSE newsletters.

Objective 2: We will participate in seasonal staff trainings (General Park, Resources Management & Science, and Interpretation) to provide a brief presentation focused mainly on monitoring project highlights or specific resource information requested, if desired by parks and as network staff schedules permit.

Objective 3: We will participate in local park lecture or brown bag series at least once per year to give updates to local staff on monitoring results, or we will visit parks each year to present results and updates from at least one monitoring project.

Objective 4: We will participate in local park meetings or trainings to stay informed about park management or planning needs and policies, and to provide information about our program. Examples include (but are not limited to): All-employee meetings, safety stand-downs, Wilderness operations meetings, strategic planning meetings, management team meetings, Division of Resources Management and Science meetings, Strategic Comprehensive Call planning or review sessions, and Southern Sierra Conservation Cooperative meetings.

Goal 3: The public and our partners and peers in the scientific community have access to information about the Sierra Nevada Network Inventory and Monitoring Program and what we are learning.

Objective 1: Project-specific resource briefs, annual reports, publications, and other program information are available on SIEN's web site, and a set of hard-copies of resource briefs can be provided upon request. IRMA will become the main repository for reports that we will link to via our web pages.

Objective 2: We will work with park interpreters to share information with public audiences, i.e., attend interpretive training sessions, provide updates and briefs for interpretive handbooks annually, and provide new information through emails, websites, or personal contacts as it becomes available.

Objective 3: We will occasionally participate in existing local public lecture forums (Examples: ‘Sequoia Speaks’ at SEKI, ‘Parsons Memorial Lodge Series’ at YOSE, and local organizations like Audubon or California Native Plant Society chapters).

Objective 4: We will periodically publish articles in peer-reviewed journals and do presentations at conferences as appropriate and feasible to share monitoring results with the larger scientific community.

Communication Approaches

This section is modeled after portions of the Upper Columbia Basin Network's and Great Lakes Network's overviews of their communication methods or types (Jocius and Garrett 2009, Gostomski 2009). We organize communication products into sections: written media, presentations, digital media, and interpreting inventory and monitoring information for public audiences. Each product description includes: 1) key topics and themes; 2) guidance and timeline for production; 3) distribution, where appropriate; 4) audience and review process; and 5) responsible parties – SIEN staff who are responsible for each product. SIEN's communication approaches seek to integrate to the extent possible with effective existing communication opportunities in the parks as well as to use program-specific products to share SIEN I&M information with NPS staff and other audiences. A summary table of communication products organized by goal is provided at the end of this chapter (Table 3).

Written Media

Annual Administrative Report

Purpose: Details the accomplishments of the previous fiscal year and accounts for Network expenditures (Figure 3).

Content:

- Program activities and accomplishments for inventories, monitoring, and water quality monitoring
- Public interest highlights
- List of personnel, personnel changes, and BOD/STC membership
- Budget: Summary and breakdown of expenses
- List of reports, publications, and presentations

Guidance and Timeline for Production:

- Produce report annually at the end of the fiscal year in September.
- Report is submitted as draft to the SIEN Steering Committee in September, to the Regional I&M Program Manager on October 7, and in final form to the Washington I&M Program Manager by November 1.
- Format of the report is determined by servicewide I&M program managers.

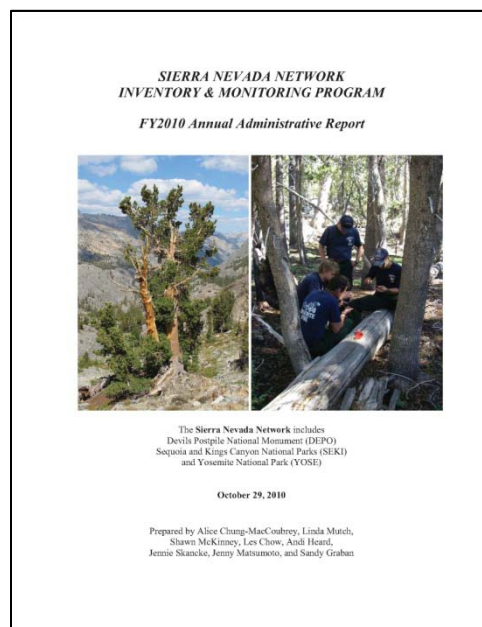


Figure 3. SIEN Annual Administrative Report example.

Distribution:

- In addition to distribution to the Steering Committee, Board of Directors, Pacific West Regional and National I&M Program Managers, the report is available on SIEN's intranet site.

Audience and Review Process:

- Internal audience – reviewed and approved by SIEN Steering Committee and Board of Directors, PWR I&M Program Manager, NPS I&M Program Manager.

Responsible Parties:

- The SIEN I&M Program Manager is the primary author, with contributions from other SIEN staff.

Monitoring Protocols

Purpose:

- Describe why and how we are monitoring the selected vital signs.

Content:

- Provide background and justification for the selection of vital sign(s) for long-term monitoring.
- Provide specific monitoring objectives and a detailed sample design that addresses the objectives.
- Provide analytical tools for interpreting and presenting monitoring data.
- Include step-by-step standard operating procedures (SOPs) and narratives which describe more fully the methods required to implement the protocol.
- Address one to several vital signs.

Guidance and Timeline for Production:

- All protocols follow Oakley et al. (2003) for content guidance and the NPS Natural Resource Publications Natural Resource Report (NRR) template (Figure 4).
- Protocols and SOPs should be well-written and easy to follow for SIEN staff, field technicians, cooperators (where appropriate), and park resource managers.
- A customized Microsoft Access relational database is developed for each protocol and is designed to store and manipulate the data associated with the protocol.
- All project data are certified for accuracy and completeness prior to development of final reports.

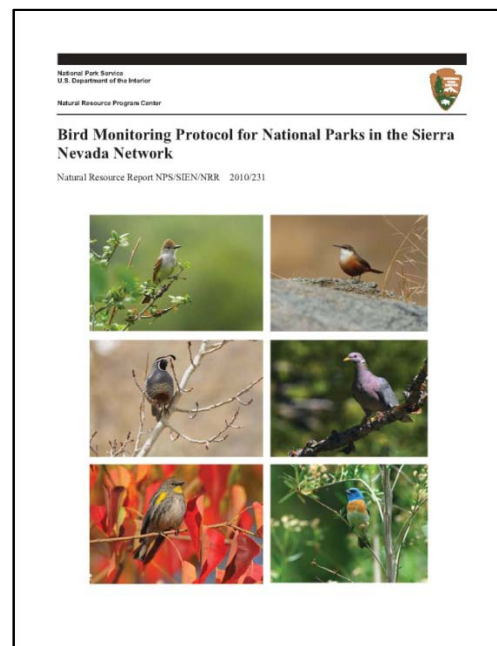


Figure 4. Bird monitoring protocol.

- All protocols and SOPs are peer-reviewed, published, and posted to the IRMA online reference application when finalized.
- Protocols are completed according to schedules outlined in the annual work plans. We expect to have all protocols that are being implemented completed by 2012.

Distribution:

- Hard copies of protocols and SOPs are distributed to the PWR I&M Program Manager, protocol work group members, and other interested park managers. At least two copies are kept at the SIEN SEKI office and one at the YOSE office.
- Final protocols and SOPs are posted on the SIEN website, to the NPS Protocol Database, and to IRMA.

Audience and Review Process:

- Primarily internal audience, but some protocols are conducted with cooperators, and protocols are shared with other agencies and organizations if requested. Protocols are reviewed internally by the protocol work group members and are submitted to the PWR I&M Program Manager for external peer review.

Responsible Parties:

- Protocols are written by SIEN staff, outside cooperators, and occasionally park staff who are protocol work group members. The Network Ecologist, Physical Scientist, Data Manager, and Program Manager are the primary staff involved with protocol development.

Annual Data Summary Reports

Purpose:

- To document monitoring efforts, provide summary data, and communicate the major findings of the previous field season without detailed interpretation or discussion. These are concise reports of the previous one to two years of field work. The frequency of these reports is typically annual, and is specified in each individual protocol.

Content:

- Document the annual monitoring effort and activities, including any changes to the protocols, sampling limitations due to weather or other issues, and any unusual observations or results. Describe the current status of monitoring results (using basic summary statistics) and provide brief discussion.
- Provide maps of current or recent years' sampling sites and data to display results spatially.
- Evaluate data quality and identify any data quality concerns and/or deviations for protocols that may affect data quality and interpretability. Make recommendations for improvements in field operations, data management, or other protocol activities, if needed.

Guidance and Timeline for Production:

- Data summary reports are produced annually for any protocol where data collection has occurred.
- Most annual reports will follow the NPS Natural Resource Data Summary (NRDS) report format provided by the Natural Resource Program Center's national publication series.
- Some annual reports may use the NPS Natural Resource Technical Report (NRTR) format if more detailed analyses are desirable for a particular year.
- Annual reports should be clearly written and provide useful summary information to park managers and SIEN staff about the monitoring project for that year.
- All project data are certified for accuracy and completeness prior to development of annual reports.
- Annual reports will be completed as soon as possible after the completion of a sampling season. This will vary among protocols, as some require laboratory analyses (water chemistry) or taxonomic support that may delay data finalization for some months after the field season.

Distribution:

- Annual reports will be posted on the SIEN website and distributed electronically to park staff.
- Hard copies will be provided to park staff when requested.
- If published, reports will be uploaded to IRMA as part of the publication process.

Audience and Review Process:

- The primary target audience is park staff, but reports will be available to internal and external audiences. They will be reviewed internally (SIEN and work group staff) before being submitted for regional level review by a key official.

Responsible Parties:

- The protocol leads are the primary authors. This is usually network staff (Ecologist, Physical Scientist, or Program Manager), but may include cooperators. The Science Communication Specialist assists with editing and formatting when needed.

Periodic Analysis and Synthesis Reports

Purpose:

- To analyze, synthesize, and interpret monitoring data after completing a full rotation through all sample panels or when a minimum of three years of data are available. These reports incorporate trend analyses.

Content:

- Do trend analyses and more in-depth analysis of vital sign status.
- Evaluate results in relationship to environmental variables, climate data, and known stressors, where feasible or relevant.
- Discuss results within the context of long-term park management goals.

- When possible, include regional-level comparisons or analyses (such as with multi-network, high-elevation forest monitoring protocol).
- Evaluate operational aspects of the monitoring program.

Guidance and Timeline for Production:

- Produced approximately every four to five years or at least every 10 years. Frequency is determined by the specific protocol. More frequent reports or analyses may also be done when specific needs for information arise, such as major park planning documents, lawsuits, or studies of large-scale disturbances.
- These reports will follow the NPS Natural Resource Technical Report (NRTR) template, unless they are being published in a scientific journal.
- All project data are certified for accuracy and completeness prior to development of analysis and synthesis reports.
- These reports will be completed as soon as possible after a panel rotation has been completed, or the desired number of years of data has been collected as specified in the protocol document. This time frame will vary among protocols due to post-season laboratory analyses or taxonomic support needs. Where possible, analysis and synthesis reports should be drafted by March and submitted for publication by early May.

Distribution:

- Published reports are posted on the SIEN website and distributed electronically to all stakeholders. Reports will also be uploaded to IRMA.

Audience and Review Process:

- Both internal and external audiences: The target audience will be the parks, other I&M Networks and the Regional and National I&M programs, and the broader scientific community.

Responsible Parties:

- The protocol leads are the primary authors. This is usually network staff (Ecologist, Physical Scientist, or Program Manager), but may include cooperators. The Science Communication Specialist assists with editing and formatting when needed.

Scientific Journal Articles

Purpose:

- To reach the scientific community in a way that internal NPS reports cannot
- To share particularly noteworthy results with a broader scientific audience
- To encourage collaborative investigations that complement or add value to the monitoring program and provide additional useful information to parks
- Obtain more in-depth, outside peer review of monitoring work and analyses
- Encourage partnerships for the establishment of threshold conditions

Content:

- Communicate advances in knowledge gained from monitoring.

- Present innovative monitoring techniques or approaches.
- Describe the importance of monitoring data in understanding long-term changes in resource condition and the resulting management implications
- Highlight scientific and management benefits of a network-scale approach to monitoring natural resources and processes.

Guidance and Timeline for Production:

- Specific style or format will depend on target publications. Each publication must be reviewed by the Network Program Manager prior to submission. If warranted, the Program Manager will facilitate review by parks or regional or national personnel.

Distribution:

- Provide links to article if possible from SIEN website and if possible get permission to post publication on website.
- Obtain a limited number of re-prints to distribute to park and outside audiences.

Audience and Review Process:

- Primary audiences are park staff and the scientific community beyond the National Park Service.

Responsible Parties:

- Protocol leads, Program Manager.

Resource Briefs

Purpose: To provide a condensed summary of the important findings for each inventory or monitoring project, taken from final reports, annual reports or the periodic synthesis reports.

Content:

- Provide a distillation of project-specific results for a more general audience.
- Describe how monitoring data informs resource management.
- Provide photos, key graphics, and data summary or analysis tables.

Guidance and Timeline for Production:

- The format for briefs has common elements among monitoring projects (fonts, graphics, key sections) and is generally limited to one to two pages (Figure 5).
- Most inventory or monitoring resource briefs include:
 - Project name
 - The importance of the resource inventoried or vital sign(s) monitored



Figure 5. Example resource brief.

- Brief overview of what we are doing
- Status and trends (include graphic or table)
- Discussion (includes any management applications)
- Parks where inventory done or vital sign(s) monitored
- Contact information
- See Appendix B for more information about resource brief development and content.
- Resource briefs are the most widely circulated SIEN communication product. As such, they must be professional, attractive to readers, and written clearly for a less technical audience. Guidance for brief text, graphics, and format is provided in Appendix B.
- Occasionally, longer, more detailed briefs with somewhat different formats may be developed. These could be focused on topics where in-depth synthesis reports have been developed in preparation for vital signs monitoring. Examples include birds, climate, and hydrology. These may be three to four pages in length, include more graphics and discussion, and target a more technical audience.
- Annual briefs will be produced in conjunction with annual or synthesis reports and are completed within a month after the draft report is produced for each protocol. Occasionally, as time allows park-specific briefs will be produced on certain projects or sets of projects, but typically resource briefs will have a network-level focus.
- For briefs that are printed, use color printing on semi-gloss paper for a professional appearance.

Distribution:

- All resource briefs will be served on SIEN's website.
- New briefs will be announced via Email and links provided to them for park staff.
- Hardcopies will be printed for limited distribution to park staff at trainings and update meetings. Other hardcopies will be provided if requested, although we do not plan on distributing these at visitor centers, which have reduced the numbers of brochures and handouts in more recent years.
- Resource briefs will be handed out at presentations, meetings, and alongside posters at conferences.

Audience and Review Process:

- Primarily non-technical NPS audiences, such as Park Superintendents, Interpreters, and other non-resource management staff. However, resource managers may use these as quick summaries for their programs and to help communicate inventory & monitoring results to other park staff.
- Resource briefs can be made available to public audiences, but are primarily a starting point from which NPS staff can develop interpretive materials for public audiences.

Responsible Parties:

- Project leads are responsible for preparing briefs on their projects at an appropriate interval. The Science Communication Specialist may initiate other types of briefs and assists with editing and formatting. The Program Manager reviews all content before distribution.

Newsletters (bi-annual minimum, an additional one if needed)

Purpose: To provide a means of regular communication between Network staff and Parks.

Key Themes/Content:

- Communicate SIEN's purpose and accomplishments to park staff and partners.
- Provide information about the status of SIEN's monitoring projects, pre- and post- field season.
- Emphasize the value of inventory and monitoring information to our understanding of the parks, and its importance in our ability to manage park resources and communicate about their condition to the public.

Guidance and Timeline for Production:

- Distributed biannually. In April, the newsletter will focus on a preview of the field season, and in November, it will provide a summary of results from the field season. Additional program highlights (data management, new staff, etc.) will be included as space and time allow.
- An Adobe InDesign newsletter template was developed in 2011 to help streamline its production twice a year (Figure 6).
- The newsletter will focus on short articles about monitoring programs and preliminary findings. It will be graphic- and photo-rich.
- Park staff, researchers, and cooperators may be invited to contribute articles, in relationship to monitoring projects we feature.
- See Appendix C for more details on content, timeline, and format.

Distribution:

- Emails will be sent out to all park employees that include brief highlights from the newsletter and a link to the newsletter on SIEN's website. An additional mailing list will be developed to include outside cooperators.
- Hardcopies will be distributed to park superintendents, Division and Branch Chiefs in RMS and Interpretation, Education, and Outreach Divisions, and others who request them. We will distribute some hardcopies to more remote areas of the parks and place some in break rooms and on bulletin boards in park administrative buildings.

Audience and Review Process:

- Primary audience is park staff, visitors to SIEN's website, and cooperators. A mailing list will be maintained, and anyone can request being included on it.



Figure 6. Sierra Nevada Network newsletter.

- Format and content will be evaluated periodically with park staff to determine usefulness, interpretability, and relevance of the information presented.

Responsible Parties:

- Organized and compiled by Science Communication Specialist, with contributions from SIEN staff – especially Program Manager, Ecologist, Physical Scientist, and Data Manager.

Other Written Communication Opportunities

The written communication activities described above represent core responsibilities of the SIEN I&M Program. There are additional written communication opportunities in the parks or outside of the parks, but these are a lower priority, given limited staff time and resources. If we have time and have appropriate material to share directly with public or broader NPS audiences, the following are some potential opportunities to consider:

- Articles in park newspapers. These are usually produced seasonally (two to four times each year) and they provide information to the public about park programs and recreational opportunities.
- Magazines or newsletters of cooperating associations or foundations: Examples of these include the Sequoia Natural History Association newsletter (*Nature Connections*) and the Yosemite Conservancy E-newsletter (*Yosemite Conservancy Explorer*) or the biannual *Yosemite Conservancy* magazine.
- Park Science: Brief articles on inventory, monitoring, research, or resource management work in parks. Sometimes these are theme-based, such as wilderness or climate change. They are widely circulated to parks across the country, primarily to Resources Management or I&M Program Managers. Park Science is also distributed electronically now, so can more easily reach a broader NPS audience.
- Magazine or other popular press articles

Presentations

Park Lecture Series or Site Visits

Purpose:

- To communicate in-person with park staff about I&M program accomplishments, give project-specific updates, and provide opportunities for discussion and questions about the program.

Key Themes/Content:

- Communicate SIEN's purpose and accomplishments to park staff.
- Provide information about the resources being monitored – natural history, status and trends in resources, interesting observations or highlights from the field.
- Provide linkages between Inventory & Monitoring data and products and specific park information needs for management decisions, long-term planning, and education and outreach activities.

- Offer park staff the opportunity to ask questions, discuss natural resource related issues with SIEN staff, and provide suggestions about other communication opportunities.
- Create and maintain a positive rapport with park staff and demonstrate that the program provides an important service to each of the SIEN parks.

Guidelines and Time Frame for Presentations:

- Take advantage of existing lecture series in parks to schedule talks about the I&M Program. Examples include the SEKI brown bag lunches and the YOSE Croaking Toad morning monthly talks. At DEPO, summer to early fall visits will be needed to be able to interact with more monument staff and be on-site during the months when the monument is open.
- If travel must be restricted due to a low travel ceiling, SIEN staff will give these presentations at the parks where they are stationed. If SIEN has adequate travel funds, other SIEN may travel occasionally to give presentations. If park staff have the time and their schedules allow, SIEN staff may occasionally conduct a ‘road show’ with several staff traveling to network parks and presenting information on a number of I&M projects. Most years, we expect that one staff member would present information on one project in the parks (birds one year, lakes another year, etc.), or we would present projects based on local park needs and interests.
- Develop and maintain an up-to-date presentation about the I&M program that will include a brief overview and summaries of existing monitoring projects. Occasionally, more in-depth project-specific talks will be given, to be developed and presented by the project lead.
- Investigate interest in webinars to reach park staff who are located in more remote areas and cannot easily get to presentations at park headquarters.

Audience:

- Park staff and local USGS scientists

Responsible Parties:

- Program Manager, Data Manager, Ecologist, Physical Scientist, and Science Communication Specialist

Program or Project Informational Posters

Purpose:

- To provide a program overview that can be posted in park office buildings or to provide summaries of specific projects that are underway in parks.

Content:

- Communicate SIEN’s purpose and accomplishments to park staff, or other cooperators or partners attending meetings and activities in parks.
- Emphasize the importance of inventory and monitoring information to an understanding of the status and trends of park resources.
- Highlight specific projects for certain events or meetings (for example, bird monitoring during Migratory Bird Day celebrations).

Guidelines for the Production and Display of Posters:

- Posters follow a standard template using the NPS graphic identity standards and SIEN-specific information (contact information, logo, website).
- Posters are appealing to view – are photo and graphic-rich, use large enough fonts to read easily, and contain succinct, clearly written text.
- Posters will be displayed in I&M offices at SEKI and YOSE, where other park staff either work or meet, in rooms where presentations are given in parks, and for certain public events in parks where displays are appropriate.
- Project-specific posters will only be developed as needed for specific events but can then be displayed in I&M office buildings in parks and provided to DEPO for the monitoring projects that occur in the monument.

Audience:

- Primarily park staff, but the public could also be a target audience for certain events that occur in the parks or in the local communities.

Responsible Parties:

- Science Communication Specialist, with contributions from Program Manager, Ecologist, Physical Scientist, and Biological Science Technician.

Seasonal Park Staff Orientations

Purpose:

- To interact with seasonal staff at Network parks and inform them about the I&M program and activities specific to the park for that summer (Figure 7).

Key Themes/Content:

- Provide information about the importance of collecting natural resource inventory and monitoring data to inform park decision-making, planning, and educational programs.
- Provide highlights about SIEN projects being conducted in the park of interest.
- Communicate SIEN's network-level organizational structure and the advantages of working across parks, and in some cases in partnerships with other networks to accomplish common monitoring needs.
- Provide an opportunity for questions from seasonal staff.



Figure 7. SIEN I&M information table at Sequoia National Park seasonal training. Photo by Jenny Matsumoto.

Guidelines and Timeline for the Presentations:

- These are typically non-technical, informal presentations, and at both SEKI and YOSE are often done outdoors. At SEKI, groups rotate through established stations where 10-minute overviews are given for each program.
- The timeframe and format for these presentations is determined by the Resources Management & Science Division staff members who organize the training, and may vary from year to year.
- Seasonal trainings are usually scheduled between mid-May to mid-June.
- For DEPO, we will provide handouts for seasonal training information packets. When feasible, we will try to attend DEPO's seasonal training or have a staff member make a presentation at DEPO when conducting monitoring fieldwork or other network business there.

Audience:

- Park seasonal staff (may sometimes include USGS seasonal staff who work at the local SEKI or YOSE Field Stations).

Responsible Parties:

- Program Manager, Data Manager, Ecologist, Physical Scientist, Science Communication Specialist. Invitations to participate in seasonal orientation activities should be directed to the Program Manager. It is likely that the SIEN staff duty-stationed at a park will typically be the ones to represent the network at seasonal training sessions.

Conferences

Purpose: To share information with and learn from the broader scientific community, as well as land managers and members of various conservation organizations.

Content:

- Present advances in understanding of natural resources and processes in SIEN parks.
- Present successful methods for balancing spatial and temporal monitoring objectives at the landscape-scale in large wilderness environments.
- Provide project-specific examples of how monitoring data inform management decisions about park resources or processes.
- Discuss the efficiencies and scientific advantages of monitoring common resources across multiple parks and networks.
- Provide information on research opportunities associated with the long-term datasets that the I&M program is collecting, maintaining, and analyzing.

Guidelines and Timelines for Presentations:

- These are typically formal presentations given as part of a larger thematic or general scientific conference, thus they need to be professional and targeted to strict time limits established by the conference organizers.
- Conference attendance will be limited by travel budget restrictions and other program needs (field crew supervision, other time commitments of staff). While attending at least

one scientific conference each year is desirable for all professional staff, SIEN's limited travel budget and demands on staff time will constrain staff participation in this activity.

Audience:

- Scientific community and others at regional and national conferences. Potential conferences include those sponsored by the Ecological Society of America, the Society for Conservation Biology, the American Geophysical Union, The Wildlife Society, Natural Areas Association, and the George Wright Society. Local or regional symposia can offer less costly opportunities to participate in scientific meetings. Examples include the Yosemite Hydroclimate Workshop, the Yosemite Fire Symposium, and other occasional regional meetings.

Electronic Media

I&M E-News Updates

These will be periodic brief updates (as needed) to park staff sent via Email, primarily using existing park Emailed newsletters. We are encouraged by park staff to try this approach in order to avoid sending a separate all-employee email. If we find these existing newsletters are not an effective way to share I&M information, we will discuss other options with park staff, such as an I&M-specific E-News Update, perhaps to a targeted mailing list, rather than to all park employees.

Purpose: To provide park staff with periodic brief updates on I&M results, products, field work, staffing, events, or other topics of interest.

Key Themes/Content:

- Keep park staff informed of I&M activities, information, and products and that are relevant to park management, planning, or interpretation.
- Increase awareness and understanding of what the Inventory & Monitoring program does in SIEN parks.
- Encourage park staff to contact I&M staff to obtain more information.

Guidelines and Timelines for E-News Updates:

- At this time, we will use existing park newsletters that are sent out to all employees at least twice per week at SEKI (SEKI Bulletin) and daily at YOSE (Yosemite Daily Report). We will include updates from I&M at least quarterly, and more often, as needed.
- Updates will be in bulleted format, or no more than one to two paragraphs of brief text. Staff will be reminded of SIEN Sharepoint pages at SEKI and YOSE for staff contact information and will be directed to the SIEN website for reports, briefs, and bi-annual newsletters.
- Appendix D provides instructions on how to submit E-news items.

Audience:

- Park staff, USGS staff, and in some cases, local cooperating associations (such as Sequoia Natural History Association).

Responsible Parties:

- The Science Communication Specialist will be in charge of submitting brief highlights to appropriate park contacts. Other SIEN staff will contribute content to the Science Communication Specialist at the end of the month when the SIEN monthly accomplishments database is updated, or at any other time that there are news items to share. The Program Manager will review prior to submission and will help prioritize highlights to share.

Internet/Intranet

The Network's public website (<http://science.nature.nps.gov/im/units/sien/>) is the primary means of communicating information about our activities, products, and findings (Figure 8). We have attempted to find a balance between using the website to inform the more technical audience of park staff and partners to individuals in the public. An intranet site (<http://10.147.158.160/im/units/sien/>) is used to share administrative, draft, or internal documents, and this site is available to NPS audiences only.

Purpose: To provide park staff and the public access to SIEN products, such as reports and resource briefs, to describe the mission and goals of the I&M program, and provide current information about inventory and monitoring projects.



Figure 8. Sierra Nevada Network website home page.

Key Themes/Content:

- Provide one central location where anyone interested can answer the what, why, where, who, and how questions about the SIEN I&M program.
- Provide a central location where web page visitors can learn about specific monitoring projects and find products associated with SIEN inventories and monitoring.
- Facilitate information sharing and collaboration among I&M and the parks, and provide linkages to related subjects on park Nature & Science web pages.
- Communicate the importance of inventory and monitoring to the understanding of park resources and natural processes and to effective management of parks.

Guidelines and Timelines for Web Page content and maintenance:

- Web pages are kept current and relevant.
- New products are posted as soon as possible after they are peer-reviewed and finalized, and the website serves as the main repository for serving finalized reports and other program summaries.
- Contact information is easy to find for all long-term SIEN staff.
- The website follows NPS I&M webpage formatting standards.
- Dreamweaver is the primary software program used to update the website.
- Sensitive data or reports are protected from unauthorized access.
- The SIEN Science Communication Specialist and Data Manager review the website at least quarterly for accuracy, additions, revisions, and uploading new information.
- Park staff periodically evaluate (~every two years) the website for interpretability, usefulness, and relevance; to identify linkages with park pages; and to suggest other improvements. This will be done through a questionnaire or a work group.

Distribution:

- Include internet URL on Email signatures and include links to products on the website periodically in E-News Updates.
- Include the URL on all printed and digital material distributed by the network (reports, resource briefs, newsletter, brochure, etc.).

Audience: The internet pages are aimed at a somewhat more technical or scientific audience, but are available to all internal and external audiences. The intranet serves only internal NPS audiences.

Responsible Parties:

- The Science Communication Specialist is the primary person responsible for maintaining and updating web page content. SIEN project leads provide or edit material pertaining to their particular projects, and the SIEN Program Manager reviews page content, where needed.
- The Data Manager provides technical support and oversight, uploading new content when that support is needed, determining more effective ways to serve products as they become more abundant over time, and being in charge of serving any data that we provide on SIEN's website.

- The SIEN Biological Science Technician (who provides GIS support to the network) will assist the Data Manager in serving spatial data on the website and in applying tools such as Google Earth to display information spatially.

Sharepoint

SIEN currently uses a Network site as well as having a tab/page on park Sharepoint sites. The Network site and Park I&M tabs serve different purposes.

The SIEN Sharepoint site (<http://imnetsharepoint/sien/default.aspx>) is located under the NPS I&M Program's Sharepoint framework, and the Network currently uses this page primarily to track staff schedules, time frames for leave, meetings, and due dates for various reports or products. It may be further developed for collaborative editing of documents or sharing information among dispersed SIEN staff and between SIEN staff and Park staff we work closely with, such as protocol work groups, but at this time it serves the internal administrative function of tracking schedules and deadlines.

SIEN also has a tab as part of SEKI/DEPO and YOSE Park Sharepoint sites:

<http://inpsekihq3/sites/insideseeki/IM/default.aspx> and
<http://sharepoint.yose.nps.gov/im/default.aspx> .

The Parks are using Sharepoint as a tool for sharing information among divisions and making announcements of special events, road conditions, meetings, etc. SIEN has posted an identical page on both SEKI's and YOSE's Sharepoint sites with the primary purposes of increasing program visibility in parks and providing a gateway to more detailed information.

Current Objectives for SIEN Park Sharepoint Page:

- Provide a brief (two short paragraphs) program overview.
- Provide names, titles, and contact information for SIEN staff.
- Provide links to SIEN's internet site, our monitoring plan and to the NPS Natural Resource Information Portal.

We may explore using Park Sharepoint pages to make announcements of new I&M reports or resource briefs, new findings, or events and provide links to products on our internet site, since Sharepoint has become an important means of sharing information within the SIEN parks.

Audience:

- Park Sharepoint page-- Park staff. Internal SIEN Sharepoint –SIEN staff (administrative)

Responsible Parties:

- Data Manager and Science Communication Specialist work together to update content on Park Sharepoint pages. All SIEN staff update schedules on the SIEN Sharepoint site.

NPS Integrated Resource Management Applications (IRMA)

The following overview is excerpted from the NPS Resource Brief on the Natural Resource Information Portal, available at: <http://science.nature.nps.gov/im/datamgmt/IRMA.cfm>.

The National Park Service - Natural Resource Program Center (NRPC) has developed the Natural Resource data and Information Portal, or IRMA, the beginning of a web-based “one-stop shop” for natural resource data and information, including reports and other documents, data sets, maps, images, links, and more.

IRMA allows users to easily search, view, download, and print information from multiple sources and systems, all from a consistent user interface. The architecture supporting IRMA also promotes data sharing with other data systems, federal and state agencies, and cooperators.

The full functionality and content of IRMA is currently available to all NPS staff at <http://irma.nps.gov>. A subset of records is also available to partners and the general public via the same url; the number of publically-available records will increase as the initial quality assurance steps are completed and sensitive data have been protected.

As of October 2010, all NPS staff can search, view, and download information from IRMA, as well as create, edit, and upload reference-related data.

Key features currently available on IRMA include:

- Search for documents and data
- Get a species list for a park
- Add a reference record and upload the associated file
- Find information on air, climate, geology, water, and more - Clicking on other portal tabs will take you to multiple data sources and websites, including maps, webcams, inventories, and tools.
- Access IRMA data directly using REST - An advantage of the underlying portal framework is the ability to fetch data directly without going through the portal user interface. REST (Representational State Transfer) allows users to compose a URL using specific patterns, which then executes a fetch command to retrieve data. For example, a URL can be embedded in a park website that will retrieve, on the fly, a list of references or a species list directly from IRMA.

This is something that SIEN will need to take advantage of in the near future, as posting queries to reports, publications, and other documents on our website will likely be a better way to manage accessibility to I&M products. It will become inefficient to store all of these documents on our web server when each project has many reports and other products, and they will be available in IRMA.

Audience:

Primarily NPS staff initially; over time IRMA will become a major source of information for cooperators, scientists doing research in parks, and various other public audiences.

Responsible Parties:

The Data Manager is ultimately responsible for ensuring that SIEN products are uploaded to IRMA and providing guidance to SIEN staff. Other staff provide support to get project-specific products uploaded. The Ecologist and Physical Scientist will be responsible for the protocols they manage, the Program Manager for the bird protocol and other program-level projects, and the Biological Science/GIS Technician will provide support as needed. The Science Communication Specialist and the Data Manager will work together to serve the products available in IRMA through SIEN's website. Tools are currently being developed through the national I&M program to facilitate serving documents and data from IRMA via network websites.

Interpreting Inventory & Monitoring for Public Audiences

While we have defined our primary audience as park staff, we recognize the importance of sharing inventory and monitoring information with the public. Our website and the reports, resource briefs and other information it provides are available to a wide diversity of public audiences. We will occasionally give talks to local public audiences about the work we are doing. For the most part, however, our success in communicating effectively with the public about inventory and monitoring will depend on our ability to communicate and work with park interpreters.

High- quality interpretation will be the shared responsibility of all levels of NPS staff, from the Washington and regional directorates, through park superintendents and chief interpreters, to field interpreters and non- interpretive staff. It will be achieved through interpretive and educational services, media, ongoing research, planning, technical excellence in implementation, a well- trained staff, broad public input, and continual reevaluation. (Chapter 7, Management Policies Guidebook, NPS 2006a).

The I&M Program shares this responsibility, and we will work closely with local staff to provide the kind of information needed to facilitate interpreting I&M information to public audiences.

The SIEN parks all have long-range interpretive plans that define interpretive themes (Sequoia and Kings Canyon National Parks 2006, Yosemite National Park 2010, and National Park Service --Devils Postpile National Monument-- 2011). These themes describe ideas, concepts, or messages about the parks and provide opportunities for visitors and audiences to make personal connections to the meanings and significance of the parks (Yosemite National Park 2010). Interpretive themes link tangible park resources (such as a geological formation) to less tangible concepts (such as erosion). Among the numerous cultural and natural resource themes articulated in the SIEN parks' plans, at least three of them relate to the kind of information that Inventory and Monitoring projects provide, and are common among the parks: biological diversity, natural processes, and anthropogenic. The Klamath Network provides an example of a collaborative project between I&M staff and park interpreters that related resource topics from I&M and other research projects to park interpretive themes, and generated ideas of approaches and products to be pursued as student projects (National Park Service 2005). This theme-based, interdisciplinary approach to interpretation presents an avenue for creating meaningful stories where natural resource monitoring projects and interpretive themes overlap.

Communicating and Working with Park Interpreters

Purpose:

- To share inventory and monitoring program information and highlights, to learn what kinds of information and communication approaches are useful for park interpreters, and to share ideas about how best to communicate I&M information to a diversity of public audiences.

Opportunities:

- Through periodic meetings and trainings, I&M and Interpretation learn about each other's programs and communication needs, and share ideas about interpretive opportunities.
- Discuss possibilities for collaborative projects related to I&M information and educational opportunities (for example, seek funding to develop podcasts or short videos related to one or two monitoring projects that could be served on I&M and park websites).

Guidelines and Timeframes for Communicating:

- I&M staff attend one to two interpretive meetings each year to share new information, answer questions.
- I&M staff participate in seasonal training (if requested) to provide general programmatic or topic-specific information that can be used in interpretive programs.
- I&M provides updates each year to the seasonal Interpretive Handbook (SEKI) and the resource binder YOSE keeps on hand for interpreters. We will provide the same information to DEPO for their seasonal training. The Yosemite Annual Implementation Plan that is compiled by September of each year is a good location for annual updates to Yosemite interpretive staff.
- I&M seeks feedback and guidance on resource brief content and formats that may be most useful for public audiences.

Responsible Parties:

- Science Communication Specialist, Program Manager, Ecologist and Physical Scientist – program overviews, project-specific talks or subject-area information sharing.

Public Presentations

Purpose:

- To give a program overview or a topic-specific talk to local public audiences, typically done as a result of an invitation.

Key Themes/Content:

- Depends on group and their particular interests.

Guidelines and Timelines for Presentations:

- Usually done by invitation, and if staff are available to present.

Audience:

- Variable public audiences. Examples have included Tulare County Audubon Society and Park-organized lecture series (Tuolumne Meadows Parsons Memorial Lodge summer lecture series and the Yosemite Forum in Yosemite, ‘Sequoia Speaks’ series in Three Rivers outside of Sequoia National Park, etc.).

Responsible Parties:

- Depends on topic and venue. The Program Manager, Science Communication Specialist, Ecologist, and Physical Scientist are the most likely staff to give public presentations.

Other Interaction

Steering Committee and Board of Directors Meetings

Purpose:

- To provide updates on program activities, accomplishments, work plans, and expenditures and get input on major decisions that need to be made.

Key Themes/Content:

- Maintain open lines of communication between the I&M program and Park Superintendents, Chiefs of Resources Management & Science, and the PWR I&M Program Manager.
- Ensure accountability and transparency in program decisions and funding allocations.
- Communicate program highlights, accomplishments, and work plans to NPS leadership and other staff members at the local, regional, and national levels.

Guidelines and Timeline for Meetings:

- The Network charter defines the roles and responsibilities of the Steering Committee and the Board of Directors and outlines typical meeting content, which is generally focused on keeping Park Superintendents and Steering Committee members informed of Network accomplishments and work plans and seeking feedback on major decisions.
- The Board and Steering Committee each meet at least once per year, in the first quarter of the year when the work plan is developed. Other meetings may be called as needed.

Audience:

- Primary audience is Superintendents, Chiefs of Resources Management & Science, and the PWR Program Manager, Chief Scientist, and Deputy Regional Director. Meeting notes are made available to other network and park staff through local file directory structures and the intranet site.

Responsible Parties:

- The Program Manager chairs the Steering Committee and serves as staff to the Board and is the primary SIEN staff member responsible for preparing the agenda, presentations and handouts for these meetings. Other SIEN staff provide support as needed, and the Administrative Technician takes notes at meetings.

Various Other Park Meetings

- Wilderness management meetings
- Resources Management & Science Division meetings
- Park planning meetings related to natural resources
- Management Team monthly roundtable meetings (SEKI)

Table 3. Summary of SIEN communication products and approaches.

Communication Approach	Content and Purpose	Primary Audience(s)	Production and Distribution	Principal Author(s)
Goal 1: Park staff feel well-informed about the progress and current results of Network monitoring programs. They have access to information at the level of detail they need.				
Newsletters	Review and summarize network activities and findings of general interest. Describe the role and purpose of monitoring natural resources to non-technical audiences.	Park staff Partners and other more general public audiences	Bi-annual schedule (spring and fall) Provide hardcopies to park staff Mainly distribute via website	Science Communication Specialist with SIEN staff
Monitoring Protocols	Describe rationale and objectives for monitoring Direct monitoring operations Describe sampling design, field methods, data handling, analysis, and reporting, personnel requirements, training, and operational requirements	NPS staff or cooperators who are doing the monitoring	Developed according to protocol timeline Revised as needed Go through PWR peer review process prior to approval	Project lead, Data manager, and other SIEN staff or cooperators
Annual Reports	Communicate and evaluate annual monitoring effort Provide basic descriptive statistics and data summaries for vital sign(s) monitored Provide recommendations for protocol changes	Park resource managers	Follows NRTR or NRDS format Peer reviewed internally by SIEN and park staff before submission to regional review Distributed via web	Project lead

Table 3. Summary of SIEN communication approaches and products (continued).

Communication Approach	Content and Purpose	Primary Audience(s)	Production and Distribution	Principal Author(s)
Trend Analysis and Synthesis Reports	Synthesis of multiple years (dependent on protocol) of monitoring data to assess trends Discuss applications to resources management, as appropriate.	Park resource managers Cooperators and external scientists	Follows NRTR format Peer reviewed internally by SIEN, other scientists if appropriate, and park staff before submission to regional review Distributed via web	Project lead
Resource Briefs	Describe importance of monitoring selected vital sign(s) Give brief summary of monitoring methods Give highlights of monitoring results and management applications.	Park staff External audiences via web	Annual frequency, or as per protocol	Project lead and Science Communication Specialist
Annual Administrative Reports	Provide overview of program status and accomplishments Report on how funds were used in previous fiscal year Include project or program highlights	National and Regional I&M Program Managers SIEN Board of Directors and Steering Committee Other park staff	Produced at the end of fiscal year. Reviewed by Steering Committee and PWR Regional Program Manager in late Sept/early Oct. and to WASO by early Nov. Distributed to others via intranet site.	SIEN Program Manager and staff
Steering Committee and Board Meetings	Communicate program accomplishments, funding allocations and work plans to Superintendents, Resource Mgt Chiefs, and PWR. Seek review and input on major funding allocation and programmatic decisions.	Superintendents Resource Mgt. & Science Division Chiefs PWR I&M Program Manager, Chief Scientist, and Deputy Regional Director	Annual (fall), and other meetings if needed.	Program Manager, with input from other SIEN staff. Administrative Assistant helps with coordination and note-taking.

Table 3. Summary of SIEN communication approaches and products (continued).

Communication Approach	Content and Purpose	Primary Audience(s)	Production and Distribution	Principal Author(s)
Internet and intranet pages	Provide central location for information about the SIEN I&M program. Serve products that meet the needs of various audiences and provide links to related information.	Internet: All audiences Intranet: NPS staff	Update as needed – at least quarterly	Science Communication Specialist coordinates content with other SIEN staff.
Sharepoint	SIEN Sharepoint: Calendar of events, deadlines, staff leave; document sharing Park Sharepoints: Gateway to SIEN websites, serve current newsletter, provide staff contacts.	SIEN Sharepoint: SIEN I&M staff Park Sharepoints: SIEN park staff	Update SIEN Sharepoint as needed. Park Sharepoint pages updated only infrequently at this time.	Data Manager and Program Manager
IRMA	Central depository for reports, datasets, maps, and other documents. As feasible and tools are available, SIEN website will link to documents in IRMA.	Initially: NPS staff. Future: All audiences.	On-line: Site managed by NPS I&M Program and SIEN-specific data and documents updated by SIEN staff as needed.	Data Manager-primary. Document owner for reference application.

Table 3. Summary of SIEN communication approaches and products (continued).

Communication Approach	Content and Purpose	Primary Audience(s)	Production and Distribution	Principal Author(s)
Goal 2: Communication facilitates collaborative relationships among park programs and the SIEN I&M program so I&M data are well-integrated into park management, planning, and interpretation.				
E-News updates	Provide updates on I&M activities, products, and information. Increase awareness and understanding of I&M program in SIEN parks.	Park staff	Frequency – as updates are available to share. Incorporate into SEKI Bulletin, The Yosemite Daily, and send to DEPO separately.	Program Manager or Science Communication Specialist with input from project leads.
Park seasonal orientations	Communicate program purpose and project-specific highlights. Provide brief overview of upcoming field season. Provide more in-depth subject-matter information if requested.	Park seasonals Local USGS seasonals	May or June – may be multiple seasonal training events. Participate as requested and schedules allow.	Program Manager, Project leads, and Science Communication Specialist
Posters	Communicate program purpose and accomplishments Provide project-specific summaries	Park staff External audiences at specific events	Program poster available to post at network offices and for park events Project-specific posters can be developed as needed for specific events	Program and project leads with Science Communication Specialist
Park lecture series or site visits	Present results and updates to park staff on projects. Provide opportunity for discussion and questions.	Park staff Local USGS scientists	Variable	SIEN staff – especially project leads and Program Manager
Other Park meetings or trainings	Park staff and SIEN staff – specifics depend on type of meeting, training, etc.	Variable	All SIEN staff	

Table 3. Summary of SIEN communication approaches and products (continued).

Communication Approach	Content and Purpose	Primary Audience(s)	Production and Distribution	Principal Author(s)
Goal 3: The public and our partners and peers in the scientific community have access to information about the Inventory & Monitoring Program and what we are learning.				
Internet pages and IRMA	Discussed in Goal 1 section above.			
Working with Park Interpreters	Exchange information with park interpreters to facilitate interpretation of I&M results to public audiences. Seek collaborative opportunities for outreach and education.	Public is ultimate audience.	Provide updates for seasonal training – Interpretive Handbooks, presentations. Seek interpretive reviews of some I&M products – briefs.	Science Communication Specialist, Program Manager, occasionally Ecologist or Physical Scientist.
Public Presentations	Provide program overview or project-specific talk, as requested by public group.	Public – may be general audience or a special interest group (like Audubon, etc.)	Infrequent – by invitation.	Program Manager, Ecologist, or Physical Scientist.
Conferences	Present advances in understanding natural resources and processes. Present successful approaches and designs for monitoring in large wilderness parks and within a network-structure.	Peers in NPS and outside scientific community	Variable	Program Manager, Ecologist, Physical Scientist, and Data Manager
Journal Articles	Communicate advances in knowledge. Draw relationships between monitoring data and related research. Review information on a specific subject area. Share latest findings to peers.	Park resource managers, research scientists, contractors, and cooperators	Variable frequency Peer review as per journal requirements	Project lead

Administration and Implementation of Communication Program

Communication about the SIEN Inventory & Monitoring Program to our key audiences will be a responsibility of all SIEN staff. The network can only afford a part-time science communication position; thus all staff must contribute towards fulfilling the network's science communication goals. The Science Communication Specialist will coordinate communication activities with the Program Manager, Data Manager, Ecologist, and Physical Scientist and with park staff who may play a role in organizing meetings, events, or communication activities that provide an opportunity to communicate I&M information. The Program Manager and project leads will play important roles in developing content for communication products, and the Science Communication Specialist will edit, format, and finalize content.

Staffing, Roles, and Responsibilities

The GS-09/11 Science Communication Specialist position will be funded as a full-time position through December 2011 – to complete this communication plan and initiate its implementation. Starting in calendar year 2012, the position will transition to part-time (probably a 0.3 FTE, or full-time equivalent), which is the long-term plan for this position and all that can be afforded given the six monitoring protocols that must also be supported. Ideally, the science communication position would be cost-shared with one to two other networks or SIEN parks. At this time, these are just possibilities that are dependent on other programs' specific needs and available budgets.

All SIEN staff will play a role in communicating program activities and results. Following is a narrative summary of each position's role and responsibilities related to communication needs. At the end is an estimated timeline of communication products and activities (Table 4).

Science Communication Specialist: Establishes and updates or revises as needed the network Science Communication Plan. Coordinates I&M science communication activities among SIEN staff and with the Parks and outside partners. Provides templates and content guidance to SIEN staff for science communication products. Works with the SIEN Program Manager to establish the annual work plan and timeline for science communication activities. Edits, formats, and finalizes communication products such as annual reports, resource briefs, newsletters, and web page content with SIEN staff or other partners involved with inventory and monitoring projects. Shares responsibility for web page updates and revisions with SIEN Data Manager. As time permits, develops posters and PowerPoint presentations for general program use, participates in local park meetings or trainings, and takes training in communication tools and new technologies.

Program Manager: Supervises science communication position, managing the budget and helping define and prioritize communication activities. Serves as the lead in developing SIEN's annual administrative report and work plan and in communicating with the Board of Directors, Steering Committee, and Park leadership teams. Provides review for reports and other communication products. Gives presentations about or represents the SIEN I&M Program or specific projects for local meetings and trainings as well as regional or national meetings. Assists

in defining and modifying as needed the science communication roles and responsibilities of other SIEN staff. Prepares communication products (reports, briefs, presentations) for one monitoring project that he/she leads. Assists with or leads coordination of symposia or network meetings that provide I&M information to SIEN park staff and other scientists.

Data Manager: Serves as the lead person communicating data management information, news, or training to SIEN and park staff and cooperators. Oversees the network file directory structure that helps SIEN and park staff organize and share information. Provides training and updates to parks about information management and sharing tools or programs, such as the national I&M program's Integrated Resources Management Applications (IRMA). Plays the lead role in managing and updating SIEN Sharepoint sites in cooperation with the Science Communication Specialist, and shares responsibility for updates and revisions of the SIEN internet and intranet site; helps the network make decisions about content and format for these sites and stays up-to-date with current national and local guidance. Periodically represents SIEN at local park meetings and trainings. Gives presentations about SIEN I&M Program or projects at local, regional, or national meetings, when feasible. Serves as an internal reviewer for some reports and other communication products, provides data management support for reporting needs, and contributes content related to data management or wildlife projects to the newsletter, resource briefs, and the web page.

Ecologist: The Ecologist is responsible for communication activities related to monitoring projects for which he/she is the Project Lead. These projects currently include the high-elevation forests and wetlands monitoring projects. The Ecologist may also support the Program Manager in developing or reviewing other reports and communication products. The most important responsibilities include writing annual reports and periodic trend reports, and developing content (text and images) for resource briefs associated with these reports. Other activities associated with the protocols include occasional newsletter articles, helping to develop or update web page content, and giving presentations at local, regional, or national meetings or trainings. Will periodically represent the SIEN I&M Program at local park meetings or trainings, and occasionally at regional or national meetings. May occasionally give talks to public audiences about monitoring projects and the SIEN I&M Program.

Physical Scientist: The Physical Scientist is responsible for communication activities related to monitoring projects for which he/she is the Project Lead. These currently include the lakes, rivers, and weather/climate monitoring projects. Data management staff will assist with weather/climate data summaries and reporting. The most important responsibilities include writing annual reports and periodic trend reports, and developing content (text and images) for resource briefs associated with these reports. Other activities associated with the protocols include occasional newsletter articles, helping to develop or update web page content, and giving presentations at local, regional, or national meetings or trainings. May periodically represent the SIEN I&M Program at local park meetings or trainings, and occasionally at regional or national meetings. May occasionally give talks to public audiences about monitoring projects and the SIEN I&M Program.

Biological Science Technician: Provides GIS support to project leads to develop maps and other spatial analyses and products associated with monitoring projects, to be used in annual or trend reports. Develops maps and figures for web pages, newsletters, and resource briefs, if needed.

Provides support to the Data Manager in sharing data management tools and information with SIEN and Park staff members.

Administrative Assistant: Provides support to Program Manager in the organization of meetings or symposia. Takes notes at staff, Board, and Steering Committee meetings. Reviews resource briefs, web text, poster, or other products for readability and understanding for interpretive needs and public audiences. Provides support in editing and formatting of reports and other documents.

Annual Timeline

Table 4. Estimated science communications annual timeline. Web and Sharepoint updates or revisions are done as needed throughout the year. Monthly park staff meetings (roundtables, etc.) are not included.

Month	Communication Products and Activities
October	Annual Administrative Report to Steering Committee Meetings (dates variable): - Yosemite Hydroclimate Meeting - Steering Committee and/or Board Meeting
November	1 -- Annual Administrative Report to WASO 15 -- Fall newsletter completed 30 -- Periodic (every 3-5 years depending on protocol) trend and synthesis reports
December	1 -- Annual Work Plan to Steering Committee
January	Participate in park lecture series or make site visits to talk with specific staff (as needed) E-news updates sent out to parks 30 -- Annual Work Plan to WASO
February	Participate in park lecture series or make site visits to talk with specific staff (as needed)
March	Participate in park lecture series or make site visits to talk with specific staff (as needed)
April	1 -- Written I&M summaries to Interpreters for training references 15 -- Spring newsletter completed
May	1 -- Finalized annual reports provided to parks and posted on web 1 -- Finalized resource briefs provided to parks and posted on web Meetings or Trainings (dates variable) - Seasonal interpretive training, as requested - General park seasonal training, if schedules permit
June	Meetings or Trainings (dates variable) - Park Resources Management & Science seasonal trainings - Periodic presentations at DEPO at start of field season
July	E-news updates sent out to parks
August	
September	E-news updates sent out to parks

Evaluating Success of Communication Efforts

The major problem with communication is the illusion that it has occurred.

- George Bernard Shaw

It is tempting to think having a current website and numerous communication products and activities translates into successful communication. But effort is not always equivalent to success, and evaluation of our communication program is needed to let us know which products and activities are effective, and to tell us something even more basic – does our communication even reach most of the people in our target audiences? In this section we propose some approaches for evaluating our communication efforts and products.

Feedback on Science Communication Plan

We sought initial feedback from park staff (primarily Resources Management & Science and Interpretive staff) as we developed this plan. Their comments and suggestions are incorporated into our goals, objectives, and communication approaches. We also obtained external review from two other networks' science communication specialists prior to finalizing this plan.

Tracking SIEN Communication Efforts

We currently do some tracking of communication activities, most of which are reported in our Annual Administrative Report (AAR). We note formal presentations at park or public lecture series, participation in park staff meetings or trainings, contributions to park planning efforts, and reports, publications, or other written media produced. For our own information, we have also more recently begun to track when we have provided technical support or responses to specific information requests for park staff or others. Some of these more significant support efforts are included in our AAR.

Participation in Park Meetings or Planning Sessions

Network staff participate in some regular park meetings and others on an occasional basis, as requested. To better document these meetings and our role in them, we will note the following about the meeting:

- Purpose of meeting
- I&M role in meeting
- Date(s) of meeting

Personal Communications and Technical Support

We have kept track of information requests from park staff and technical support for specific projects in recent years. These include things like data requests, participation in proposals, reviews of papers or abstracts, consultation for data analysis methods, and GIS guidance. We do a monthly accomplishments report for the PWR I&M Regional Program Manager, and this is the most logical place (Access database) to track these kinds of information requests, if fulfilling a request takes a substantial amount (half day or more) of SIEN staff time. Indicating the type of support, who it was provided to, wider audience reached (if applicable) and approximate time it took SIEN staff to respond to request would better document these kinds of communications.

Staff Review of Communication Products

Obtaining periodic review and feedback from park staff on I&M communication products is an important way to keep these products as useful as possible to our primary audiences. There are a number of potential ways to get review and feedback. In theory, the easiest way for us to get feedback from staff across park divisions would be to send out a brief survey or on-line poll (such as through Survey Monkey) to all employees, or to a subset of all employees based on recommendations from Division Chiefs about who on their staffs should respond to these surveys. In practice, park staff members are so busy that return rates on such surveys are likely to be quite low. After this plan has been implemented for three to four years, we will attempt an on-line survey of park staff regarding our communication products. If attempted on-line survey efforts yield poor response rates, we will attempt to get more through in-person or phone queries:

- Do brief phone interviews with a few people from each division using specific survey questions and giving an opportunity for suggestions (see example surveys in Appendix E).
- Get more detailed feedback at Resources Management and Science and Interpretive staff meetings.
- If a science communication work group becomes well-established, one role for the group could be review of I&M and Park communication products and suggestions of improvements and new products.

Improving Communication Effectiveness

Feedback obtained from park staff will be summarized and discussed by network staff every three to five years, and products and approaches will be modified as feasible to better meet park needs. If some products are not getting used by park staff, we will evaluate whether they should be produced as often or at all, or if they can be improved to be more useful to parks. Some core products are critical to maintaining the scientific integrity of the program, to evaluate project progress, to determine whether we are meeting project objectives, to inform us about status of resources monitored, and to evaluate data quality and project effectiveness (e.g. annual reports and trend reports). As the mainstay of our program, these core products cannot be omitted, but rather should be improved to increase usefulness and relevance.

Future Opportunities for SIEN Communications

This plan needs to be dynamic and flexible to take advantage of new communication opportunities and to ensure we are meeting the needs of our primary audiences. Additional communication opportunities to consider or evaluate in future years could include the following:

- More integration of communication with parks
- Use of new media to expand communication approaches and reach wider audiences
- Regional or national science communication strategies or opportunities that have overlapping goals or subject-area emphases with the SIEN I&M Program

The following sections provide more detail about these potential opportunities.

Better Integration with Parks

The SIEN I&M program is integrated with park staff and operations in numerous ways, but other opportunities for integration still exist. Current integration includes SIEN staff being duty-stationed in parks, sharing offices in buildings with other park staff, fostering work groups of park staff who have contributed to protocol development, participating in local trainings, meetings, and planning sessions, and sharing field technicians across park and network projects (for one monitoring protocol). Other opportunities for integration exist in the realms of communication and reporting.

Science Communication Work Group

A science communication work group has been initiated at Sequoia and Kings Canyon National Parks, and it currently includes staff from the Division of Resources Management and Science, the Division of Interpretation, Education, and Partnerships, and the SIEN I&M network. The park staff members on the group currently want to limit the group's focus to SEKI and the southern Sierra Nevada to keep the effort and workload manageable. The I&M network staff must focus our efforts on all SIEN parks, thus will need to work with all parks on improving integration of science communication efforts between the parks and I&M.

The current SEKI work group is interested in:

- Effective communication of monitoring results and other relevant scientific information to park audiences
- Improved accessibility to scientific information about park resources
- Strengthening linkages among groups doing science and science education in the parks (e.g., integrated reporting of scientific results on natural resources)
- Developing a unified approach toward combining efforts via a virtual science learning center, examples including—

--website hosted on a .org or .net site that incorporated information on resources and research from multiple sources (if these continue to be allowed by the NPS). The SIEN

parks all have multiple governmental and non-governmental partners that may have an interest in participating a shared website.

--doing a science symposium that brings together multiple agencies and outside scientists to share the state of the knowledge about natural resources and major stressors like climate change with the public. This proposed idea was from the SEKI Chief of Resources Management and Science, and was focused on making the public aware of the Natural Resource Condition Assessment information as well as climate change implications. I&M may participate, but would not play a lead role.

--work on a prospectus to fund a Science Learning Center for the southern Sierra Nevada

- Providing a venue for regular and consistent information exchange
- Translate information from the Natural Resource Condition Assessment for various audiences
- Developing better definitions, needs, and capacities of key audiences
- Evaluating the effectiveness of science communication efforts

This group has only recently been initiated by the Chiefs of Resource Management & Science and Interpretation, Education, and Partnerships. Its goals and objectives are under development and will be refined and prioritized in subsequent meetings. The I&M Network staff's role will need to be limited to activities that help us better share the information we produce, and to extend successes of this effort to our communication activities with the other SIEN parks.

A few of the topics mentioned above have particular relevance to the communication needs and priorities for I&M, so we provide further elaboration on them below:

Website

A website that follows the Greater Yellowstone Science Learning Center model (<http://www.greateryellowstonescience.org/>) would facilitate integration of scientific information on park resources and ecosystem processes from multiple sources. Numerous other networks or groups of networks have developed websites based on this model. A website outside of the .gov environment facilitates information exchange with non-governmental organizations, partners, and cooperators. A key challenge would be maintenance and keeping the site current once it is established. It has also been noted on some of these sites that visitation rates are low – there would need to be some thought given to the target audiences and how to engage them to visit a site that is outside the NPS framework of websites. Long-term support would need to be available to ensure the continued relevance and success of such a site.

Reporting

At SIEN's three-year program review in October 2010, one recommendation from I&M Program Manager Steve Fancy and other review panel members was to consider more integrated reporting of resource condition between the SIEN monitoring program and the monitoring and research projects conducted by park staff or other scientists. The Yellowstone National Park 2008 Superintendent's Report on Natural Resource Vital Signs (Yellowstone National Park 2009) was

held up as a good example of how information about resource condition from a number of different programs can be reported on together to provide a more complete picture for a park superintendent. At the program review, we briefly discussed the potential to do this with at least some park monitoring programs – in particular fire effects and air quality, which have been long-standing park monitoring programs.

Science Learning Center

If a Science Learning Center (SLC) can be pursued, virtually through a website, or on-the-ground through development of a physical center, it would offer further opportunity for SIEN I&M to collaborate with parks in science communication projects or activities. At a minimum, we would benefit from participating in a web-based learning center to improve the quantity and quality of information on park resources accessible to web users. If a physical learning center is funded and developed, SIEN would need to determine with the park staff what the relationship would be between the SLC and the SIEN I&M Program. Some networks have used SLCs extensively for communication of I&M information to non-technical audiences.

New Media

New media opportunities include videos, podcasts, short videos, blogs, digital photo albums, and social media such as Facebook and Twitter. A number of other networks use new media effectively, and some of these approaches offer appealing ways to share project highlights and other natural resource-related news. Many more people are more likely to read a blog or look at a video than read an annual report! However, with limited long-term staffing for science communication, much of our time will be taken up with the core communication products.

A few things we could pursue that would not take a lot of time include the following:

Video(s): If additional funds become available, a contractor could be hired to do a short (three to five minutes) video or two on our program and/or on a specific monitoring project. Some time would be needed to write a script and participate in the film for some of the staff, but once it would be done, it could be posted on the website. Other networks who have done videos could also be potential partners in a short-term project like this.

Digital photo album(s): We could post photo albums associated with the monitoring project websites. These would take a little time to put together, but once there, would likely be relevant for some time. This could be a good intern or student project.

Park Facebook and Twitter: SEKI and YOSE already use Facebook and Twitter, and we could provide them with periodic information to share on Facebook or Twitter. This would allow us to participate as we had information to share, but would not require we be responsible for daily activity on the accounts.

Since we have defined our primary audience as park staff, we will not invest a lot of time in new media in the near future. However, some of these new media may be effective with our internal audiences as well as the external ones, and investing a little time may help pique interest in the program with a wider internal audience.

Regional and National Strategies and Opportunities

Identifying some common threads that can help link Sierra Nevada Network I&M information and communication priorities to the most closely relevant regional or national science communication strategies or opportunities may give a larger context and relevance to the I&M Program efforts.

Regional Initiatives

NPS Pacific West Region Science Strategy

A Pacific West Region Science Strategy is currently under development. This strategy “provides a framework for harnessing the region’s scientific capacity, identifying the complex issues faced by parks, and providing the most efficient and effective means to deliver science to park management and the general public.” (D. Graber, personal communication)

The strategy has a component that focuses on communication and education, and it will likely overlap with and provide an additional larger framework for the communication goals and activities of PWR I&M networks. When this strategy is released and available, it should be evaluated for any ideas or opportunities it may provide for integration with regional science communication objectives.

National Strategies or Initiatives

National Park Service Climate Change Response Strategy

The NPS Climate Change Response Strategy (CCRC) provides direction to the NPS and its employees to address the impacts of climate change (NPS 2010b). It describes goals and objectives to guide NPS actions under four integrated components: science, adaptation, mitigation, and communication. While the I&M program has areas of overlap with potentially all of these components, we focus on the Communication component for the purpose of this plan.

There are objectives under the following two CCRC communication goals for which the KLMN Inventory & Monitoring Program may be able to contribute information and expertise:

Goal 12

Coordinate and distribute climate change information throughout the National Park Service.

Goal 13

Increase climate change knowledge and understanding within the National Park Service.

Most of the SIEN vital signs will be sensitive to climatic change. While additional research would be needed to link changes in vital signs with changes in climate, the trend data from monitoring projects may contribute to larger regional stories of change in response to various large-scale stressors. More information on the NPS Climate Change Response Strategy is available at: <http://www.nps.gov/climatechange/>.

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Appendix A: Park Staff Input on SIEN Science Communication Plan

To obtain initial feedback on SIEN's Science Communication Plan goals and objectives, the SIEN Science Communication Specialist met with the Division of Resources Management and Science at SEKI and the Acting Chief of Resources Management and Science in YOSE, attended staff meetings for the YOSE Division of Interpretation and Education and the SEKI Division of Interpretation, Education and Partnerships, and held a conference call with the DEPO Superintendent and Administrative Assistant. Brief questionnaires were also sent out to Resources Management & Science and Interpretive staff. The return rate on questionnaires was low, but the responses we received were helpful. Following below are summaries of feedback from park staff who participated in the above-mentioned efforts.

Resources Management & Science (RMS) Divisions at SEKI and YOSE

There are many research scientists who do projects in the parks as well as local USGS field stations at both SEKI and YOSE with scientists who do a large portion of their work within SIEN parks. These scientists are somewhat comparable to SIEN I&M staff in that they collect and publish information of value to park managers, but are outside the parks' organizational structure. Those RMS Division staff members who responded prefer to get information from outside scientists in the following forms:

- Reports or publications that can be emailed directly, or accessed through the web.
- Brief summaries that provide locations where more detailed information can be found.
- Data in Access or Excel
- Newsletters that provide up-to-date summaries of projects
- Conference or symposia sessions and proceedings

Existing communication opportunities that RMS staff recommend SIEN I&M should take advantage of included:

- RMS staff meetings
- All employee meetings
- Seasonal orientation trainings
- Brown bag lecture series (SEKI), Croaking Toad lecture series (YOSE)
- Email updates through direct email or all-employee E-newsletters (SEKI Bulletin and Yosemite Daily)

Some networks coordinate a science symposium or science day annually or periodically to provide an opportunity for sharing information among I&M, parks, and outside researchers. When asked if they would find something like this useful, RMS staff responded:

- YOSE has a biannual fire symposium that may be expanded to include SEKI. An I&M symposium that would alternate with a fire science symposium might be worth thinking about.

- I think this would be of tremendous value, and would like to see it include all RMS programs. I'd like to see this happen on a network scale, so that we can maintain communication with our YOSE counterparts.
- That sounds like a very valuable service. It makes sense for it to be centrally located or rotating between the parks. Annual seems like about the right timing.
- It would be nice to coordinate quarterly or annual meetings among I&M and park staff to share ideas about future research, funding possibilities, and current research.

Interpretation Divisions at SEKI and YOSE

The following feedback was received from park interpreters (and Sequoia Natural History Association staff) via SEKI and YOSE staff meetings attended by Linda Mutch or via the brief questionnaire.

How do you prefer to get scientific information about park resources?

- By email, or link to locate information on parks' or I&M website.
- In-person presentations from those doing the science.
- Resource briefs are useful. A few suggestions were given to improve them (inset box giving brief overview of what I&M program is, catchy titles, emphasize "why I should care", and inset box of key findings or points).
- I would like to see a central site (Sharepoint or website) where science information from park staff, I&M, USGS, and other scientists could be linked to by topic – summaries, reports, etc. It would be great to have a searchable database of literature – with subject-matter headings that are appealing, intuitive.

What existing communication opportunities should I&M take advantage of?

- Park newsletters (SEKI Bulletin, Yosemite Daily)
- Seasonal trainings (early one in May, mid-season in July)
- Contribute summaries to Interpretive Handbooks
- Brown bags or other lecture series in parks (but not all interpreters can attend)
- Video-taping of presentations, or using webinars for those who are scattered around parks and cannot attend centrally located presentations.
- Cooperating association publications, such as Sequoia Natural History Association's "Nature Notes".
- Sharepoint is being used more all the time to communicate within the parks – making announcements, sharing documents, etc.

Most of I&M's communication efforts target internal (NPS) audiences. What might be some opportunities for I&M to work collaboratively with interpretive staff to share information more directly with public audiences, if we have the resources to do this?

- Do occasional evening programs for visitors.
- Participate in science communication team with Interpretation and Resources Management & Science.

- Participate in a brain-storming session for a Science Learning Center

Is the I&M website a place you would visit to get information on our program? Other ideas to improve sharing information on the web? Would you also like hardcopies of anything we produce?

- If the briefs are on the I&M website, that's adequate. An up-to-date website is very important.
- Create more links to park websites from I&M website, and vice-versa.
- Consider investing time in Facebook and Twitter – both SEKI and YOSE are using these social media. There is a Facebook work group at SEKI that I&M could participate in.

Other comments?

- Your program is still new. It's the results and "look what we found" kinds of things that will be of most value. Descriptions of planned projects or programs are not as compelling to the public as actual new findings or results from field projects.
- The kinds of things we are often interested in are things learned that result in management changes, or new ways of thinking about resources management.

Devils Postpile National Monument

Devils Postpile has a very small staff and therefore does not have specific positions dedicated to resources management. The Superintendent Deanna Dulen and Supervisory Interpretive Park Ranger Maureen Finnerty participated in a conference call with Linda Mutch to provide their science communication feedback. They responded to the following questions:

What are your existing primary means of sharing information among local staff and with other SIEN parks?

- In-person communication is used a lot at DEPO.
- Sharepoint has been a great recent tool – everyone can access it, documents can be organized and shared there.
- Email is a common communication tool.
- Seasonal training is done each year, and a seasonal notebook is put together with summaries of different programs or projects. I&M could contribute to this.

What are the most effective ways for others (I&M, outside researchers, etc.) to share scientific information with DEPO staff and visitors to DEPO?

- In-person presentations or participation in symposia or meetings is great when possible.
- Resource briefs are great – please notify us when new ones come out.
- A "rack card" (like a mini-brochure) could be done on the I&M program as a handout to use with resource briefs – this would explain the overall program and provide a link to the website.
- Interpretive talks to staff and visitors
- Articles in the DEPO newspaper – primarily a public audience

- Participation in other local forums or public lectures – an example is the annual Summer Solstice Mono Basin Bird Chautauqua organized by the Mono Lake Committee. It would especially be a good place to talk about SIEN's bird monitoring project.

Other comments?

- Deanna suggested we might want to have short-, medium, and long-range goals, with a longer range goal to collaborate with development of a Science Learning Center for the network, if a recent funding request is successful.

Appendix B: Resource Briefs - Guidance

Description

Resource briefs are one- to two-page synopses explaining the importance of a particular resource, why it was selected for monitoring (including stressors of concern), what we are doing to monitor the resource, discussion, where we are monitoring, and contact for more information (Figure B-1).

Development Guide

This guide provides recommendations on style, structure, and content for resource briefs.

- Fits on one or two sides of a 8¹/₂" x 11" page
- Contains 1-2 (for 1-page) or 3-4 (for 2-page) relevant photos, maps, charts, graphs, etc.
- The main content sections for the brief are as follows:

Importance: A short explanation of why the resource matters. This could refer to its ecological role, its importance to humans, stressors of concern, and should pertain specifically to the Sierra Nevada Network.

What we are doing: Brief summary of what indicators are being monitored and general approach.

Status and Trends: A short summary of the current status and how the resource has changed over a specified period of time or an event of interest that monitoring data have captured. Include specific data where possible, but not data that require extensive qualifiers or explanations. Include a graph, chart, or graphic.

Discussion: The discussion section should provide concise, insightful comments on the monitoring results. The discussion could include: patterns and relationships in the data, emergence of new questions, explanation of unexpected results, inconclusive nature of the data, comparisons with existing literature, relevance to specific management decisions or educational activities, ecological implications of an event or change, or key reason(s) for any changes that have occurred.

- Graphics: The text should be accompanied by relevant eye-catching graphics, such as photos, maps, and/or graphs with captions. Photos should be at least 300 dpi resolution. Where longer term data are available, include graphs that show the most important trends over a period of time.

Steps for Development

A resource brief typically is generated after an annual or trend report is done for a monitoring protocol, but briefs can also be generated from inventory reports, park Natural Resource Condition Assessment chapters, or other kinds of reports. The I&M program will generally focus resource briefs on inventory or monitoring results. In most cases the monitoring briefs will be

written by the project leads. Some briefs may be written by the Science Communication Specialist.

1. Identify project and sources of information for resource brief.
2. Review the existing information and determine what information will be the focus for the resource brief. If someone other than the project lead is writing the brief, some discussion may be needed to make sure the project's most relevant information is highlighted.
3. Review Importance section. This section should remain the same through each update of the brief unless it has become dated or the project lead sees the need to improve it.
4. Draft the What We Are Doing, Status and Trends, and Discussion sections and prepare appropriate images – the project lead and science communication specialist will work together on this.
5. Text will be reviewed by the Program Manager or some other appropriate SIEN staff member before being imported into InDesign for layout and finalizing. General templates are available, but layout will vary somewhat depending on graphics used and variation in length of text among projects for different sections of the brief.
6. Monitoring lead will review the final InDesign draft for accuracy.
7. Publish and upload to website – announce to park staff via park E-newsletters and/or all-employee emails.



HIGH-ELEVATION FOREST MONITORING

IMPORTANCE – Whitebark, foxtail, and limber pine are five-needle white pines that occupy high-elevation Sierra Nevada treeline and subalpine habitats, environments often too harsh for other tree species to thrive. Because these pines often occur in pure to nearly-pure stands, they can have a large influence on key ecosystem processes and community dynamics, such as regulating snowmelt and stream flow and providing habitat and food resources for birds and mammals. These pine species are currently threatened by the combined effects of *Cronartium ribicola*, a non-native fungal pathogen that causes the disease white pine blister rust, outbreaks of the endemic mountain pine beetle, and climate warming. Severe declines in whitebark pine are occurring nearly range-wide, and the species is now being evaluated as a candidate for federal endangered species status. Whitebark and foxtail pine reach their southernmost distribution in the Sierra Nevada range where health conditions are the best for both species.



Foxtail Pine (Shawn McKinney)



Whitebark Pine (Peggy Moore)



Limber Pine (Connie Millar)

WHAT WE ARE DOING – Sierra Nevada Network (SIEN) staff are working with two other Pacific West Region Inventory & Monitoring Networks (Klamath and Upper Columbia Basin) to develop a long-term monitoring protocol for whitebark, foxtail, and limber pine forests. Tree- and plot-level data are collected to determine the status and trends in forest structure, species composition, demographic rates, cone production, incidence and severity of white pine blister rust, occurrence of mountain pine beetle, and dwarf mistletoe infection. Common approaches among these networks will facilitate regional comparisons of high-elevation white pine forest condition. SIEN plans to begin its white pine monitoring program in 2011, focused on whitebark and foxtail pines. Earlier surveys detected low levels of blister rust in Sierra Nevada whitebark pine plots (<5% of trees infected) and none in foxtail pine plots (Duriscoe and Duriscoe 2002).

DISCUSSION – Monitoring white pine populations will increase the likelihood of detecting change of concern in these forests – such as blister rust infections and increased incidence of mountain pine beetle. It also improves understanding of white pine stand dynamics at local and regional scales. This information is important to land managers who make decisions affecting long-term management of these forests, to the research community trying to better understand these important ecosystems, and to the public who enjoys the beauty of these high-elevation forests.

WHERE MONITORED – For SIEN: Sequoia, Kings Canyon, and Yosemite National Parks

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RESOURCE BRIEF

<http://science.nature.nps.gov/im/units/sien>

Figure B-1. Example 1-page resource brief. This brief was written prior to field implementation of the monitoring project, so there is no Status and Trends section. The brief will be expanded after monitoring data are available.

Appendix C: Network Newsletter – The Sierra Nevada Monitor

Description

The newsletter is planned to be a biannual publication, a spring issue to precede the field season and a fall issue to follow the field season. It provides an opportunity to give a preview of the field season and a summary of interesting findings post-field season, along with an update on other program news or project status. An overview of the newsletter (purpose, audience, general content and guidance) can be found in the Communication Approaches chapter of the main Science Communication Plan document. This appendix goes into more specific information about content, timeline, and format.

Content

The newsletter will primarily be project-focused, highlighting interesting results and stories. We will usually limit the newsletter to four pages, although it's possible we could increase to 5-6 pages when numerous projects have particularly interesting results to share. Attention needs to be paid to the number of pages and how they affect layout if the newsletter will be printed.

All newsletters will include a box with a general description of the Sierra Nevada Network I&M program, our website url, and staff contact information. We will include a section that provides staff profiles, staffing changes, or other program news or updates. All newsletters will also include a “Nature Feature” on the last page that features some resource or process – modeled after the “Creature Feature” initiated by the Klamath Network.

In addition to the standard content, the spring newsletter will include:

- Feature articles on at least two monitoring protocols – past results and what’s in store for the field season
- Shorter summaries of the other projects
- Names of project leads and field crew members (if available) for each field project
- A general schedule of when the field projects will be in which parks over the season

In addition to the standard content, the fall newsletter will include:

- Highlights from the field season or from data analyses for a few projects

Steps and Timeline for Completion

Biannual Publishing Dates

Spring: April 15

Fall: November 15

Newsletter Preparation and Publication**Deadlines**

Send out request for submission/content development to monitoring project leads.	1 month prior to publication
Deadline for submissions	2 weeks prior to publication
Reminder sent 1 week prior to publication	
Compile newsletter content.	1 week prior to publication
Edit or proofread text and follow up on missing information.	
Collect images and captions – images should be at least 300 dpi resolution.	
Prepare layout in InDesign.	1 week prior to publication
Send draft to I&M Program Manager and project leads for review.	3 days prior to publication
Make final edits to newsletter.	1 day prior to publication
Post newsletter on I&M website and do link from Sharepoint.	
Do an announcement of SIEN newsletter in Park E-newsletters and any others on newsletter mailing list.	

In general the project leads will write the articles associated with their project, with guidance from the Science Communication Specialist about length and number(s) of images. Sometimes, the Science Communication Specialist may write the articles and do interviews with field staff and project lead about the project findings and the field season. The Science Communication Specialist (or other willing writers) will write the first draft of the “Nature Feature” and seek edits and revisions from other subject-matter experts.

Appendix D: Park E-Newsletters

Park Newsletters

We will take advantage of existing park E-newsletters when we can to make announcements and share updates with park staff. These newsletters are widely read by park staff and are an effective way to get information out. We will aim for four updates or news items each year in addition to the digital newsletter we produce two times a year. The Science Communication Specialist will be the main person submitting news items to park newsletters, but other SIEN staff, such as the project leads, may occasionally write summaries or updates about specific topics. Following are brief descriptions of the Yosemite Daily Report and the SEKI Bulletin and instructions for how to submit news items.

SEKI Bulletin

The SEKI Bulletin was initiated to reduce the volume of all-employee email traffic and to provide a central source of park operational information and other news or updates relevant to all employees. It includes weather forecasts for the major administrative areas of the parks, safety messages, announcements about park maintenance projects (such as road construction), and other miscellaneous news items. It includes photos and other graphics and weekly articles about park history. It is sent out as a link to the pdf document that is kept on the parks' Sharepoint site (<http://inpsekihq3/sites/insideseki/default.aspx>). This newsletter is sent to Park staff as well as local USGS scientists and the Sequoia Natural History Association staff. At this time the Bulletin comes out every Monday and Friday, and other days if there is enough information submitted. Items that need to be announced on days the Bulletin is not available will need to be sent out as separate All-Employee (or selected subset of employees) emails.

To submit news items:

The Bulletin is managed through the Division of Interpretation, Education, and Partnerships. Email text and image (if applicable) to SEKI_bulletin@nps.gov by 2:00 p.m. the day before the newsletter comes out. Links can be included in the text, so it's possible to provide links to newsletters or other new reports or publications on SIEN's website.

Yosemite Daily Report

Yosemite's Daily Report is an internal memorandum of long standing intended to provide timely administrative information needed for daily park operations. The primary purpose of the report is to serve as a communication tool for park management to pass specific operational information to field employees of Yosemite National Park, park partners, concessioners, and related government agencies in a fast and efficient manner and offer a format for interdivisional, interagency, and general intra-park notifications. Although the Daily Report is intended exclusively as an internal memorandum, it is also posted on-line (<http://www.nps.gov/yose/parknews/index.htm>) in an effort to extend timely operational information to the communities surrounding the park. Occasionally items in the Yosemite Daily Report can end up in the public media, so it's important anything submitted is accurate and appropriate for wide distribution.

To submit news items:

The Yosemite Daily Report is managed through the Division of Interpretation and Education. Entries must be in by 7:00am the day of publication. There are no weekend or holiday editions. Submissions must be concise and will be posted for two days, then on the day of the event. No images are accepted as the Daily Report is a text-only format so that it can easily be incorporated into All-Employee emails without being a large email. Submissions: email yose_daily_report@nps.gov.

Network E-News

There are additional people who we need to share information with who are not on mailing lists for the park newsletters, as they are staff at DEPO or are not employees at the parks. We will need to develop a mailing list of contacts to send news and announcements to. This list will include:

- Current Devils Postpile National Monument staff
- Cooperators
- Contacts from other I&M networks or the Pacific West Region (PWR) with whom we share information (PWR I&M networks, the PWR I&M Program Manager, other high-elevation, montane networks with common monitoring projects)
- UC Merced Sierra Nevada Research Institute staff
- Others to be determined

Appendix E: Sample Questionnaires for Park Review of SIEN Communication Products

To evaluate effectiveness of SIEN communication approaches and products, we will periodically need to get feedback from our primary audience – park staff members. Use of questionnaires through Email, meetings with park staff, phone interviews, or small work groups may provide insight on what activities and products are most useful so we can target our efforts most effectively. Evaluating our communication products will be more helpful once we have completed more reports on our monitoring projects.

We include the following questionnaires that will need further refinement before being used:

- Draft Questionnaire for Resources Management and Science staff
- Draft Questionnaire for other park staff

These questionnaires are currently largely based on questionnaires developed and used by the Great Lakes Network (Gostomski 2009).

Park _____

Date _____

Sierra Nevada Inventory & Monitoring Network Communication Evaluation

(Resource Management & Science staff)

Please take a few minutes to answer these questions about the communication products distributed by the Sierra Nevada I&M Network office. These evaluations are being used to improve our communications and better serve your needs. Thank you!

1. Which of the following do you use, and do you distribute these products to others?

Please select one of the choices (1-4) below for the first column of blanks near each product type.

1 = I read them myself.

2 = I read them and I circulate them to other park staff.

3 = I don't read them, but I circulate them to other park staff.

4 = I never use them, and I don't send them to anyone else.

Natural Resource Technical Reports _____

Resource briefs or fact sheets on projects _____

Project annual or summary reports _____

Network newsletter, *The Sierra Nevada Monitor* _____

Network web pages _____

If you selected 3 or 4 for any of your choices, please let us know why.

Lack of time _____

Information not relevant to my work at this time _____

Issues with product quality or organization made it difficult to read _____

Other _____

2. Are there other types of communication products you think should be added, or are there improvements you would suggest to the products above?

3. Do you have any other thoughts or suggestions about how we can better communicate our work and results with RMS staff?

4. Were there any product(s) that you were exceptionally pleased or disappointed with? Please name them below. A short description of what you liked or disliked about them would be very helpful.

Park _____

Date _____

Sierra Nevada Inventory & Monitoring Network Communication Evaluation

Please take a few minutes to answer these questions about the communication products distributed by the Sierra Nevada I&M Network office. These evaluations are being used to improve our communications and better serve your needs. Thank you!

1. In what capacity do you work for the park? Seasonal Permanent Other
Administration Interpretation Protection/Law Enforcement Protection/Fire
Maintenance Planning/Compliance

2. Are you aware of the monitoring programs being carried out by Network staff in your park? (Our monitoring projects include birds, lakes, high-elevation forests, wetlands/meadows, rivers, and climate.)

Yes No

If you answered "No" to question #2, you do not need to go any further with this survey. Please submit this evaluation as instructed.

3. How did you hear about the Network's monitoring programs in your park?
Email Presentation Mentioned in a staff meeting Report/publication sent around
Website Other _____

4. If you learned about the Network from a report or publication that was circulated, which of the following types was it? (Please check all that apply.)

Natural Resource Technical Reports	_____
Resource briefs or fact sheets on projects	_____
Project annual or summary reports	_____
Network newsletter, <i>The Sierra Nevada Monitor</i>	_____
Network web pages	_____

5. Are there other types of communication products you think should be added, or are there improvements you would suggest to the products above?

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

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National Park Service
U.S. Department of the Interior



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