Case Study

Using virtual Research Learning Centers for disseminating science information about national park resources

By Tomye Folts-Zettner, Tom Olliff, Cheryl McIntyre, and Tom Porter

HOW CAN SCIENTISTS AND scholars engage busy park superintendents and the general public with the results of their research? Several programs in the National Park Service (NPS) are mandated to provide scientific information in different forms: peer-reviewed papers, quick references for superintendents, reports to managers, and articles geared toward a general audience. How can we make these documents and their data more useful? How might we centralize storage of this information and make retrieval and use easy for a variety of audiences?

A collaboration among 51 national park units in five NPS Inventory and Monitoring (I&M) networks, three Cooperative Ecosystem Studies Units (CESUs), and six nonprofit partners has developed an approach to answering these questions: using virtual Research Learning Centers as a means of storing, organizing, and reporting information that results from science conducted in the National Park System. Based on the Research Learning Center program created under the Natural Resource Challenge, the Greater Yellowstone Science Learning Center (GYSLC) and the Learning Center of the American Southwest (LCAS) maintain Web sites that provide quick, easy access to the most recent scientific information for natural and cultural resources found in their member parks. Designed to reach a varied audience (agency managers and resource specialists, university scientists and students, educators and guides, media representatives, members of the public, and other stakeholders), data are presented in a hierarchy of increasing detail, allowing users to access both general concepts and project-specific results.

The virtual Research Learning Center concept grew out of practical need and fiscal necessity. First, the Web sites of national park units are, by design, geared primarily toward providing visitor services information, channeled through Web pages organized by park unit. Although resource information is often available, it can be of limited depth and scope, and difficult to access. In particular, full-length documents, such as study plans, completion reports, reports to managers, and annual reports are seldom available on these sites, and can be obtained only by request from the author or a library. Finally, park Web sites are limited to describing resources within the specific, bounded areas of their units. To gain a regional perspective, users often must piece together bits of information gleaned from numerous sites, making cohesive knowledge or understanding difficult to achieve.

Designed to act as a complement to park Web sites, the virtual Research Learning Centers take a resource-centric, rather than park-centric, approach to information organization and communication; that is, they are organized around resources, not simply park units, even though information is also assessable by park unit. Under this framework, resources no longer "stop" at a park's boundaries. They can be viewed in a regionally holistic manner that encourages exploration at multiple levels of scale and detail, and that highlights the significance and connectivity of smaller parks with their larger neighbors. We also believe that the resource-centric approach will help to de-emphasize the artificial boundaries between "cultural" and "natural" resources. Because Research Learning Centers are designed to be interdisciplinary, one of the exciting goals and challenges for the GYSLC and LCAS is to go beyond simply making information on natural and cultural resources available to exploring their interaction and interdependence. As such, these new Web sites present an opportunity to interweave the Natural Resource Challenge (NPS 1999) and the Vanishing Treasures Initiative (NPS Intermountain Region 1998).

Creating a Web-based "one-stop shop" for science outreach was more fiscally attainable for parks within the Greater Yellowstone I&M Network than trying to staff a physical Research Learning Center and develop programs in each park. Accord-

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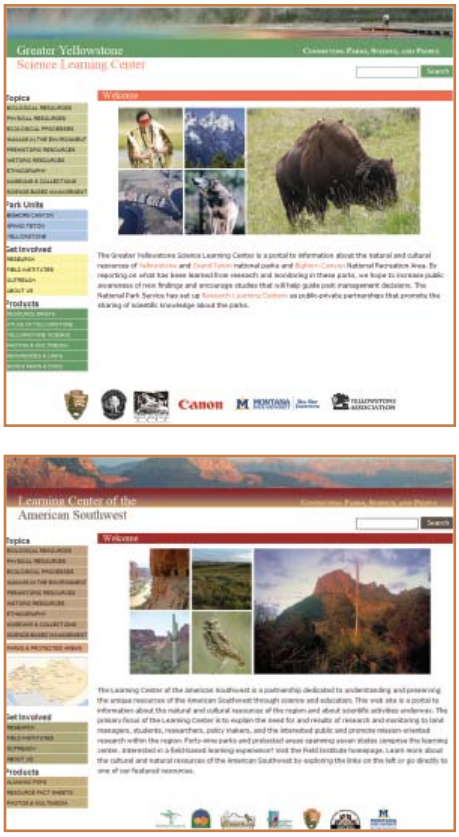

Figure 1. The two virtual learning centers have a similar look and feel, and a nearly identical navigation structure as shown here for the GYSLC.

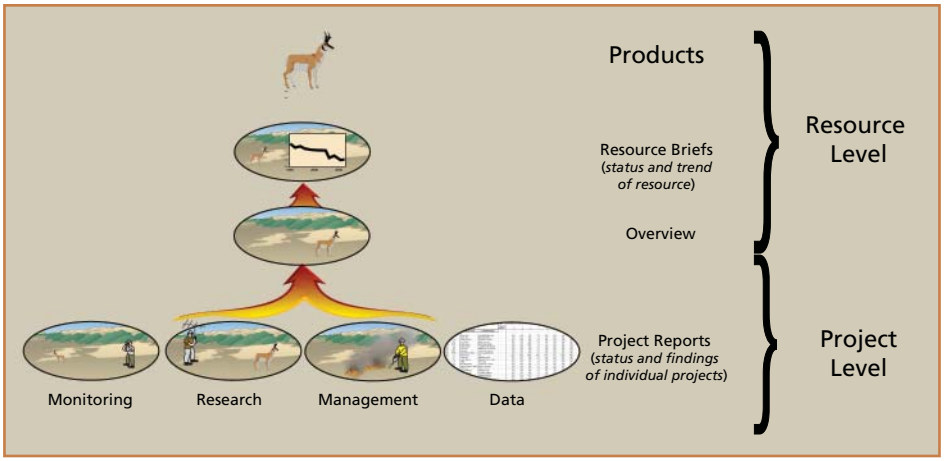

Figure 2. Research Learning Center products are hierarchical, from resource-level materials to project-level materials.

ingly, the parks led the way in developing the GYSLC, a virtual center that is accessible, interactive, and easily updated and has multiple layers of information products to meet the needs of different audiences. In 2005, Canon U.S.A., Inc., agreed to fund this prototype effort through the Eyes on Yellowstone program, administered by the Yellowstone Park Foundation. This funding paid for staff and partners to design the look and architecture of the Web site and develop initial content, and also supported Web hosting on a dot-org site—largely to accommodate the non-NPS partners who will directly contribute to the site, and to avoid overburdening the bandwidth of the parks' official Web sites. Though promotion for the public rollout is yet to come, the GYSLC is available now at www.greateryellowstonescience.org.

Subsequently, parks within the Sonoran Desert, Southern Plains, Southern Colorado Plateau, and Chihuahuan Desert I&M networks, which share many similar resources, collaborated to create the Learning Center of the American Southwest. This Web site, still in development, is expected to be launched in fall 2008 at www.southwestlearning.org. To facilitate user familiarity, the two sites share a nearly identical navigation structure (fig. 1).

How the Web sites work

From the home pages, users can choose from a list of topics that include natural and cultural resources as well as supporting concepts, such as environmental factors that influence these resources (e.g., climate, land use), museums and collections, and integration of science and management. This arrangement allows users to quickly locate a variety of scientific information about a given resource. The sites offer a dual navigation system that lets users choose from a list or map of network parks and then access a list of park-specific topics.

For each resource addressed on the Web sites, content is presented in a hierarchy of increasing detail, allowing the user to drill down from information consolidated at the resource level to information about specific projects (fig. 2). Each resource has its own introductory page with a paragraph describing the resource and a list of available information products, presented in downloadable, printable formats. *Resource Briefs*, updated annually, are a one-page synopsis of the significance, status, and trends of the resource, with a short discussion of the stressors and drivers affecting it. For natural resources, the *Overview* provides an in-depth description of natural history, management history, and ecological function. Cultural resources are described in similar detail in terms of origin, significance, and context. In some cases, *Fact Sheets* provide condensed information from the *Overview*. *References/Links* enables a user to find management documents, laws and regulations, and non-NPS publications and programs relevant to the resource. *Researchers* offers Internet links to scientists, agencies, and organizations associated with the resource.

More detailed information on scientific investigations can be found in *Projects*, which lists past and ongoing projects for the resource in the region. From here, links may include a *Project Summary*, providing a synthesis of methods, cur-

rent status, and results. Annual *Project Reports* outline the past year's work effort on a project and include a short narrative that puts these results into context and discusses possible management implications. A *Project Protocol* or *Study Plan* may provide detailed methodology for the given project, while *Project Contacts* lists the project investigators and their contact information.

To maximize efficiency of the Web sites as portals of information delivery and exchange, GYSLC and LCAS partners intend to transform their routine reporting to use common formats ready for posting to the sites. For instance, new agreements with cooperators could specify deliverables that are consistent in format with virtual Research Learning Center products. Efficiencies will also be gained in areas such as annual reporting. *Fact Sheets*, *Overviews*, *Protocols*, and *References/Links* pages are all relatively static documents that will require minimal updating. The remaining products require regular reporting, but much of this can be accomplished by updating information already formatted in an existing template, rather than generating a whole new report each year. This approach also greatly lessens the time that elapses before information becomes available.

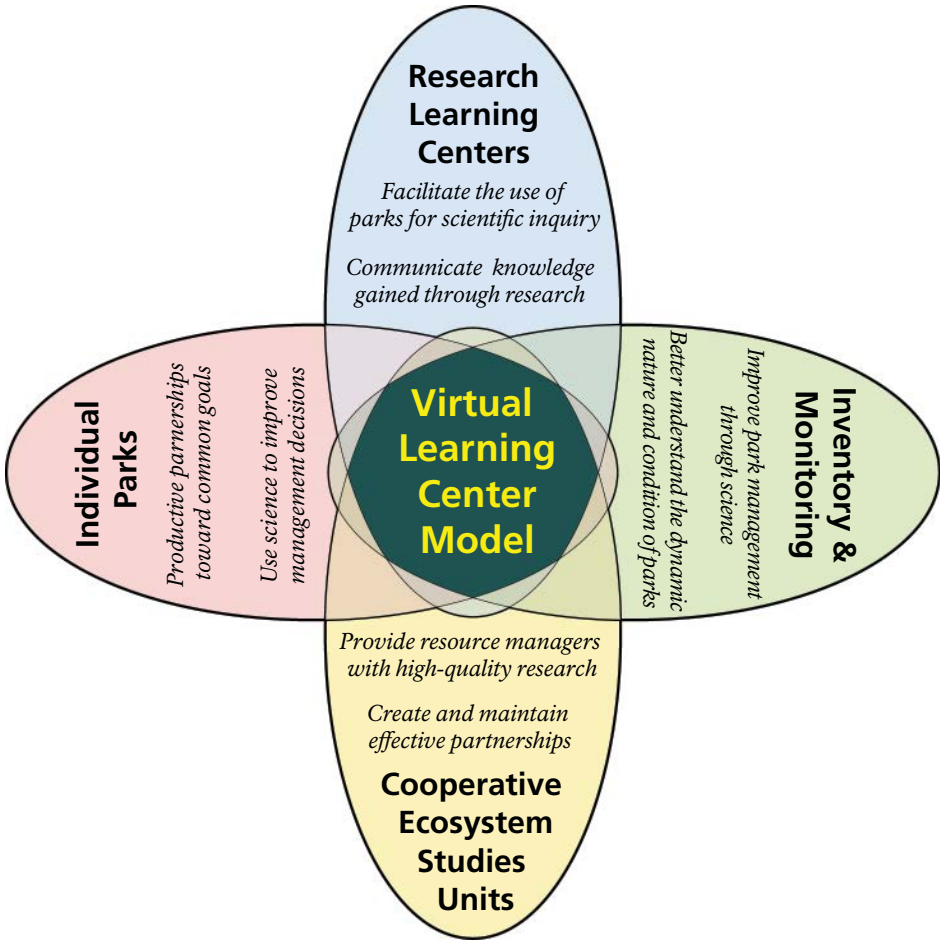

Figure 3. Research Learning Centers allow for increased efficiency by combining efforts for goals that overlap among programs.

A cross-program model for attaining mutual goals

Government mandates and the limitations of NPS fiscal resources demand that we constantly strive to increase efficiency. The GYSLC and LCAS promote these efforts by attempting to minimize duplication of effort among programs and allowing the resulting savings to be redirected to projects. In particular, the initial NPS partners in the virtual Research Learning Center effort (i.e., Research Learning Centers, CESUs, the I&M Program, and individual parks) have scientific goals (fig. 3). Other programs with scientific goals, including the Exotic Plant Management Teams established under the Natural Resource Challenge, have also expressed interest in partnerships. By combining efforts, we hope to gain considerable efficiency and effectiveness by identifying where the goals of these programs overlap and expanding partnerships within the NPS and among other organizations.

Individual parks both contribute to and gain from this facilitation of enhanced collaboration and communication among programs. The synthesis of park resources is ideal for informing new park employees and volunteers. Easily assimilated park resource information is readily available for use in supervisors' reports, interpretive programs, planning efforts, and visitor-oriented printed materials. The GYSLC and LCAS Web sites are linked to the parks' official Web sites, allowing the latter to become part of a comprehensive, Web-based information system.

The GYSLC and LCAS are similarly efficient outlets for fulfilling I&M Program reporting requirements and science outreach goals, and for rapidly reporting project results to inform park management decisions. Enhanced communication of activities among I&M networks with similar resources is also achieved, and in cases where monitoring is conducted by park staff or with park funding, the Research Learning Center Web sites facilitate integration of park-based and network-based

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science by reporting through a common platform. This enhances communication between network and park staffs and can lead to broader understanding and application of monitoring results.

The GYSLC and LCAS benefit their associated CESUs by serving as a forum to increase awareness of research needs; providing research-permit and logistical information to scientists who want to conduct research in parks; connecting scientists performing different studies on similar resources; and offering a template and platform for posting reports and data. The potential for expansion of partnership opportunities can widen the scope of CESU research efforts. Rapid reporting of project results meets the CESU goal of providing a source of timely, usable knowledge for technical assistance to resource managers.

Finally, virtual Research Learning Centers can complement and promote the efforts of physical Research Learning Centers—facilities that provide an "in-park" lab and housing—and foster synergistic effects. Many of the varied products and services of other Research Learning Center programs can be readily incorporated into these virtual sites. The GYSLC and LCAS Web sites increase awareness of field institutes, can promote opportunities for citizen scientists and volunteers to assist with needed research, and provide Research Learning Center staff with additional information to synthesize and transfer to local communities and broader audiences, resulting in expanded capacity for educational activities and learning opportunities.

Conclusion

Our approach to dissemination of science through virtual Research Learning Centers provides an efficient, effective venue for reaching a wide audience, ranging from park superintendents to scientists, educators, and the public. Once it is developed, the ease of information update, through shifting reporting practices, will ensure that the most current data are available to all who are interested. The benefits of these Web sites extend not only to all levels of the National Park Service but also to a cadre of partners and the public. The structure of these Research Learning Center Web sites will be made available to other interested NPS I&M networks and Research Learning Centers in the hope of creating a broader and more interconnected information resource system for the National Park Service.

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