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ConserveOnline and Fortaleza: Sharing Conservation Success and Failure on the Internet

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ABSTRACT

[ConserveOnline](#) and Fortaleza are Internet libraries of conservation science, practice, and institutional development. Open to anyone with relevant conservation data or experience, these libraries are designed to foster sharing successes and failures across a broad community of conservation practitioners, from academic researchers to conservation organizations to government agencies. The partners in these efforts, who include [The Nature Conservancy](#), the [Society for Conservation Biology](#), and [NatureServe](#), as well as non-governmental organizations in Latin America and the Caribbean, hope to use the strengths of Internet communication to foster organizations that learn and adapt, and to build on the wealth of accumulated experience by providing accessible and easy-to-use tools.

KEY WORDS: conservation practitioners, ConserveOnline, Fortaleza, internet, knowledge sharing, learning, library.

INTRODUCTION

The apparently insatiable human desire to tame wildlands means that communities across the United States and around the world find themselves on the front lines of a biodiversity crisis. The next decade may determine whether we can slow and eventually reverse the loss of habitats, species, and ecological processes. Governments and individuals must make crucial decisions in the face of enormous uncertainty over the next 10 years (Costanza 2000). Although conservationists recognize that they can no longer afford blind trial and error and constant repetition of past failures, they do not yet have the techniques and commitment necessary to follow the alternative path of learning and adaptation based on a shared body of knowledge and experience.

At the same time, a growing body of conservation experience and the development of new technology offer hope that we may yet be able to prevent our worst fears from becoming reality. Conservation scientists have developed sophisticated tools for practitioners, such as software for selecting priority conservation areas and for designing conservation networks (Andelman et al. 1999), and spreadsheets for site conservation planning (The Nature Conservancy 2000). Conservation biologists in academic settings and in conservation organizations, such as The Nature Conservancy, the Association for Biodiversity Information, the Wildlife Conservation Society, and the World Wildlife Fund, have accumulated invaluable, field-tested data and experience in ecological management and restoration, institution building, education, and training, and have influenced the development of policy.

However, conservation practitioners (individuals and institutions making conservation-related decisions) often act without the benefit of this knowledge because they are unaware that it exists, do not have access to it, or simply do not recognize the significance of their role and thus do not identify themselves as practitioners. The key lies in getting the best ideas and practices to everyone who needs them. A handful of conservation successes only amounts to fingers in the dike. We need thousands of successes, and that means leveraging knowledge and building a community of conservation practitioners who can share their experiences, learn from each other, and take advantage of the best minds in conservation science.

The Internet provides an opportunity to link the countless, widely dispersed conservation practitioners with each other and with the academic community, conservation organizations, government land management agencies, and local communities. The worldwide web is growing in terms of reach, content, and importance, and is increasingly a place where users can find impressive amounts of information about particular topics and become knowledgeable. The Internet should be a place where anyone interested in topics relevant to conservation can easily find answers to questions and information that provokes further interest and engagement.

DISCUSSION

This article describes two experiments that use the Internet to connect conservationists with each other and to strengthen conservation practice. First, we outline the intended audience and goals for ConserveOnline, an online public library of conservation practice, and Fortaleza, a clearinghouse for information on institution building. We conclude with a discussion of some of the technical details underlying the two systems. Throughout this paper, we endeavor to address the social aspects of building communities online. The extent to which we can foster community will determine the success of the projects.

Although the Internet holds great potential as a shared communication medium, no university or conservation organization has the human or financial resources to build the public library of conservation information and single-handedly fill its shelves. The strength of the Internet is that once the virtual shelves exist, thousands of conservation practitioners with relevant data and experience can begin to fill them up. The weakness of the Internet, however, is that the "build it and they will come" strategy most often fails, as demonstrated by the hundreds of interesting, useful, and content-rich websites that either shut down after a few years or remain as mere shells, with stale material that no one bothers to maintain.

Any effort to create a means to share conservation information faces a considerable risk of just such a fate. Conservationists often do not communicate about their efforts except to trumpet their success to donors or potential donors. This type of unreflective, uncritical communication does not identify good practices in conservation or help others learn from previous mistakes, because mistakes and failures make poor material for fundraising campaigns. With donors also under pressure to report that their money has been well spent, no one discusses the things that went wrong. Without a culture that encourages innovation and experimentation, and that accepts the failures that must accompany those experiments, learning can never take place (Redford and

Taber 2000).

Conservation practitioners outside of academia, particularly those in the United States, rarely have writing as a key requirement of their jobs. Most write reports that fulfill donor or contractual requirements, or document their activities in other ways, such as spreadsheets or checklists. Any of these formats may contain a wealth of useful information, but they most often remain as gray literature. Only a small minority of the most senior conservationists in non-governmental organizations (NGOs) or government agencies ever publishes in the peer-reviewed literature. Non-academics were the lead authors of just three of 31 papers in the April 2001 issue of *Conservation Biology*, for example, and only four other papers listed co-authors without academic appointments. Yet by not sharing our experiences with others, we guarantee that we will at some point attempt something that has already failed somewhere else.

Sharing experiences among conservation researchers and practitioners will foster learning across a wide range of institutions. Without learning there can be no adaptation or adaptive management (Holling 1978, Walters and Holling 1990). Corporations in search of greater profits, not-for-profit organizations in search of greater effectiveness, and governments in search of improved services and public approval all increasingly recognize the impossibility of predicting events with absolute certainty. The ability to respond to changing internal and external environments has thus become an essential goal.

Few conservation organizations have formally embraced the idea of a learning organization (Senge 1990), relying instead on informal networks of practitioners and key, long-time employees with an intimate understanding of the organization and its staff. Such networks, or communities of practice, value interaction and sharing of information. Given that learning is a largely social process, communities of practice form a crucial part of organizational learning. Informal networks function particularly well in small, centralized organizations. Although too much structure can stifle informal communities of practice (Denning 2000), as conservation NGOs grow to meet the increasing threats to biological diversity, they will need to invest heavily in technical and human capacity for knowledge sharing. The Nature Conservancy, for example, has grown to over 3,000 full-time staff and hopes, by the end of the decade, to be working at over 600 landscape-scale conservation areas around the world. At this scale of effort, conservation organizations need to supplement informal networks with new tools to capture their institutional knowledge and experience so that new staff can tap into that knowledge base every day, and so that the organization can contribute to broader learning across the conservation community.

Although relatively slow to share their data and experience, conservation organizations immediately saw the power of the Internet as a fundraising tool. Every national organization and most smaller groups now have websites dedicated to raising awareness and money by informing the public, foundations, corporations, members, and other potential donors about the organization's conservation programs and positions. A few conservation organizations, such as The Nature Conservancy and Conservation International, are beginning to explore how to use the Internet to become more effective at carrying out conservation on the ground.

Corporations such as General Motors recognize that taking full advantage of the Internet means fundamental changes in the way they do business, because the technology changes the way people carry out their daily tasks on the job, in everything from sales to time sheets to performance appraisals. Conservation organizations now also see the transformative power of integrating the Internet across all of their activities. Many field practitioners resist the notion, because the Internet obviously has little place in the muddy-boots world of land management, and there are always crises that seem more deserving of scant conservation dollars than the purchase of expensive computer hardware and software needed to build a modern knowledge management system.

Nevertheless, the idea is taking hold that sharing data and practical experience will improve conservation practice, and will also help conservation biologists apply their skills to solving real problems and begin to bridge the gap between basic research and field practice. Noss (2000) called for constructing "a forum wherein basic researchers, applied scientists, and field practitioners can sit down, have a few beers, and talk to each other in the same language, without prejudice or pretense." A broad partnership of conservation organizations, including The Nature Conservancy, the Society for Conservation Biology, and the Association for Biodiversity Information, is attempting to nurture just such a forum using the Internet as the framework. These organizations have launched two related websites, [ConserveOnline](#) and [Fortaleza](#).

Description of the websites and related software

[ConserveOnline](#) is an online public library (Fig. 1) and toolbox for conservation scientists and practitioners.

[Fortaleza](#) will help build effective conservation organizations in the developing world through an information clearinghouse that will include practical tools, training opportunities, and links to individuals or institutions that offer capacity-building services. In its first iteration, Fortaleza (from the Spanish for "strength" or "fortress") will target NGOs in Latin America, the Caribbean, Asia, and the Pacific, regions where The Nature Conservancy has historically focused its institutional development efforts. Fortaleza will promote the development of an active community of institutional development and conservation information providers and users. The two sites serve

different audiences and involve different sets of collaborating institutions, and thus will maintain separate graphic identities while sharing the underlying database and technical infrastructure. Users of ConserveOnline will be able to search documents and other resources relevant to institutional development, and Fortaleza users will be able to search for practical conservation information. Together these two sites will provide conservation practitioners with the comprehensive, current, relevant, and trustworthy information they need to conserve species, habitats, and ecosystems.

Fig. 1. The general subject categories of the ConserveOnline library.

ConserveOnline Home - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print Edit Dell Home Size

Address <http://www.conserveonline.org/home.html:internal&action=buildframes.action> Go

SEARCH THE LIBRARY

[Advanced Search](#)

User: **nnickerson@tnc.org**

- Login
- Register
- Library
- Add to Library
- Partner Programs
- About this Site
- News and Events
- ListSers
- Contact
- Home
- Browse the Library
 - ConserveOnline
 - General Subjects
 - Adaptive Management
 - Birds
 - Botany
 - Climate Change
 - Community-based Co
 - Compatible Developm
 - Ecological Managem
 - Ecology
 - Ecoregional Planning
 - Ecotourism

ConserveOnline

Library: a collection of practical information for the conservation practitioner

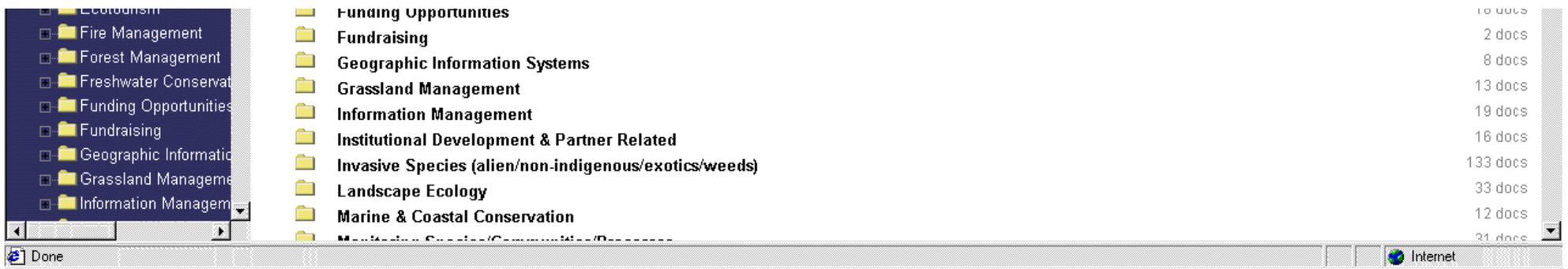
SEARCH [Advanced Search](#)

- Search and browse the library, which includes numerous types of resources, including publications, presentations, maps, and software.
- Submit document Reviews and Rankings.
- Download documents or read them online.
- [Add your documents to the library.](#)

Browse the Library

General Subjects

Type	Title	Date	Author(s)	Format(s)	Size
Folder	Adaptive Management				14 docs
Folder	Birds				137 docs
Folder	Botany				14 docs
Folder	Climate Change				1 docs
Folder	Community-based Conservation & Human Context				29 docs
Folder	Compatible Development				3 docs
Folder	Ecological Management				177 docs
Folder	Ecology				24 docs
Folder	Ecoregional Planning				54 docs
Folder	Ecotourism				5 docs
Folder	Fire Management				33 docs
Folder	Forest Management				11 docs
Folder	Freshwater Conservation				39 docs
Folder	...				10 docs



ConserveOnline: an online library of conservation practice

ConserveOnline has four key audiences: conservation practitioners, academic conservation biologists, community leaders and local government officials, and concerned citizens.

Conservation practitioners around the world require dedication, innovation, and solutions to succeed in their site-based challenges. In many projects and for many conservation practitioners, including volunteer environmental groups and land trusts, access to information about new techniques, tools, or approaches might make the difference in their ability to succeed. Yet, these practitioners are often isolated, and have limited resources to turn to for aid.

Academic conservation biologists are increasingly concerned with testing cutting-edge ideas in the field, thus linking theory and practice. The Society for Conservation Biology, for example, has launched a new publication, [Conservation Biology in Practice](#), in an effort to reach non-academic conservation practitioners, such as biologists and land managers in government agencies.

Community leaders and local government officials seek information that will help them balance growth with nature preservation. They may seek information about transferring development rights, managing river flows for biodiversity, or creating sustainable economic institutions. However, they may have little idea of where to turn to obtain such information.

Concerned citizens (including members of conservation organizations like The Nature Conservancy or the World Wildlife Fund) often seek in-depth information about conservation practices, approaches, and tools. The meetings they attend, their volunteer activities, and the organizational newsletters and magazines may quench some of this thirst but not all of it.

ConserveOnline began as an effort to meet the internal needs of The Nature Conservancy. The Conservancy has 50 years of practical experience and numerous informal communities of practice, but few formal mechanisms for sharing information across the organization or with partners. The Conservancy's initial knowledge management strategy focused on the organization's intranet. Many Conservancy field staff, however, had limited access to the intranet, and were anxious to communicate beyond the boundaries of the organization. They pushed hard for a public, Internet-based strategy.

That strategy required a team of six full-time staff to build both ConserveOnline and Fortaleza. Start-up costs included a powerful server, external hosting, software and associated licenses, and staff training. Once the Conservancy had made this initial investment (a small fraction of the long-term costs of the project, but significant nonetheless), the obvious next step was to build a service that would be broadly useful to the conservation community. The goal is to minimize the amount of money the community as a whole must spend on sharing information.

ConserveOnline thus faces two challenges: resolving the information and knowledge problems of a single large organization and also building knowledge networks that collectively pool and exchange knowledge on particular topics. With a small budget (approximately \$350,000), the short-term solution is a participatory approach to knowledge management, similar to that adopted by [oneFish](#), that encourages conservation practitioners to contribute their knowledge, review other contributions, refine the knowledge structure, participate in discussions, and so on.

The small team working on ConserveOnline chose to develop an interactive database of conservation information first, as this would meet an immediate need for The Nature Conservancy and would also attract users who would form the foundation for subsequent community-building efforts built on the experience of [SD Webworks](#) and [Scorecard](#). Various conservancy programs (e.g., the [Wildland Invasive Species Program](#) and the [Freshwater Initiative](#)) had content-rich websites but they were not integrated with each other. Compiling the content from these sites into a single, searchable database provided the building blocks for ConserveOnline's library.

The information on existing websites both inside and outside the Conservancy offers the readiest source of data for ConserveOnline. More challenging is the electronic gray literature: documents and data sets that exist in electronic format on individual computers throughout the conservation community. ConserveOnline has sought to design a simple process ([Fig. 2](#)) to encourage owners of this material to make it publicly available. Once this material is posted to ConserveOnline, users of the site can authenticate it through formal expert review, reader commentary, and discussions ([Fig. 3](#)). Enabling practitioners to participate in authenticating the content in ConserveOnline will help build trust in the site and allow users to register alternative viewpoints. A participatory process will make possible joint ownership and use of the knowledge.

Fig. 2. To submit documents to ConserveOnline, a brief submission form must be completed.

The screenshot shows a web browser window titled "Contribute File - Microsoft Internet Explorer". The page header features the "ConserveOnline" logo and the email address "your_email@nickerson@tnc.org" with a note "please login if incorrect". The main heading is "Contribute File". Below this, instructions state: "Follow the step-by-step instructions to contribute your file(s) to the ConserveOnline library. Required fields are in yellow. You may attach additional language versions of your file, different file formats, or associated files by clicking the [ATTACH MORE FILES] button at the bottom of the form. Large files, such as Powerpoints, may take a long time to upload. Please do not close the window; you will receive a verification message when the upload is complete." The form is divided into sections: "1. Title & Language" with a text input field and a language dropdown menu set to "English"; "2. Author" with a text input field; "3. Organization" with a text input field; and "4. Date Authored" (partially visible).

4. Date Authored
Enter the date the document you are submitting was created or published.
mm dd yyyy

5. Resource Types
Choose as many resource types as apply to your document.

Publications (Published documents, papers, scientific articles or analyses)
 Unpublished Documents (Informal discussion papers, notes, or "grey literature", FAQs, literature reviews)

Done Internet

Fig. 3. The community of users of ConserveOnline can authenticate material in the library through formal expert review, reader commentary, and discussions.

Submit Review

<p>A. Reader Review Any reader may submit a reader review on this document and share their comments with fellow conservation practitioners.</p> <p>click the button below:</p> <p><input type="button" value="Submit Reader Review"/></p>	<p>B. Expert Review If you are an expert in a particular field relevant to this document, write an expert review. You must first apply to become an expert reviewer.</p> <p>click the button below:</p> <p><input type="button" value="Submit Expert Review"/></p>
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Even more challenging than electronic gray literature is the paper gray literature that fills filing cabinets in conservation organizations and academic offices. Capturing this information requires substantial time and money, both for posting it to the web and for editorial review. The most difficult information to capture in an electronic medium is individual experience, the knowledge that people walk around with in their heads. ConserveOnline cannot by itself address this challenge and does not attempt to codify this kind of knowledge, although the website can help disseminate expertise and experience once it exists in electronic form.

After the ConserveOnline partnership secures adequate funding, a distributed network of Content Coordinators will solicit, edit, and maintain the material in the library. The Content Coordinators are the first level of quality control, as they review all contributions to ConserveOnline and are the people responsible for actually posting material to the site. Another role of the Content Coordinators will be to help practitioners translate their key knowledge and lessons into written form specifically for the website. One chapter of The Nature Conservancy, for example, is looking into hiring a staff person for this task, and others will follow. Electronic publishing, however, is but one part of communicating complex ideas, albeit an important one. Once documents and data are available, they serve as the basis for learning only if a community develops around them and that community creates an atmosphere of trust that encourages sharing and, ultimately, knowledge transfer.

Content Coordinators will also help make ConserveOnline a place for conservation practitioners to share their failures as well as their successes, and to recognize that what fails in one situation may work in another. Given the current culture of only communicating about success, ConserveOnline will develop explicit strategies for sharing failures: for example, working closely with key people in the conservation community so they come forward with their failures; follow-ups to show how the documentation of failure in one situation provided learning for a subsequent success; testimonials that having a failure recorded prevented some other group from going down that dead-end path; on-line workspaces in which groups can discuss their failures in private and distill the lessons learned into a public statement so that group members feel they are contributing something positive rather than just documenting something negative. The database and search features of ConserveOnline will enable us to link successes and failures by ecosystem type, geographic region, institutional setting, type of resource, or other features, and this linking may help to define general rules for application of a particular practice.

Building and maintaining this type of community requires more than an attractive and useful website. ConserveOnline has an advantage over other sites of its kind because it serves a real (as opposed to virtual) community within The Nature Conservancy. The more than 3,000 members of this community interact with each other on a regular basis, share a common language and goals, and have established modes of communication and community building, such as telephone calls, e-mails, working lunches, conferences, and so on. As awareness of ConserveOnline grows, the website will become an accepted communications medium itself within the community to the extent that it provides unrivaled features, such as a comprehensive online library and full-text search capability.

The culture within The Nature Conservancy also began to embrace frequent communication as a conservation strategy just as ConserveOnline was launched. A new president, Steve McCormick, took over in early 2001 and emphasized his desire to create a "boundaryless" organization that emphasizes communication across the Conservancy and to partners. The Conservancy also increasingly recognizes the need to leverage its techniques and experiences to a broad community of landowners and managers, and sees information technology as a crucial tool. Senior scientists in several large state chapters within the Conservancy have adopted ConserveOnline and have directed their staffs to post material to the site. The support of senior staff will be essential to make the cultural changes required for ConserveOnline to be widely adopted and used.

The core audience of Conservancy employees will help create the critical mass of information that will attract the other key audiences, ConserveOnline and Conservancy partners. These partners come from many different communities; they may have similar goals but do not necessarily physically interact with each other regularly. Although the attraction of ConserveOnline for these audiences will largely depend on the technical affinity of the individual or small working teams (unless there is an organization-wide directive), they will also benefit from the real-world informal networks created by Conservancy employees, networks unavailable to other virtual communities that lack large, established networks as their nuclei. The third, most general, audience of conservation practitioners most likely will not expend the energy to contribute to ConserveOnline until they believe that ConserveOnline provides an effective online service to them and that the benefits of working online outweigh the costs; a good example of an Internet community that has successfully attracted this third audience is [Ebay](#).

How ConserveOnline might work: a case study

A major goal of ConserveOnline is to leverage the most current tools and practices for conservation. At Florida's Eglin Air Force Base, for example, The Nature Conservancy has worked with federal land managers to reshape the way one of the largest military installations in the United States does its business. At Eglin, the Conservancy, the Base's land managers, and a handful of scientists used a series of workshops to build a simple conceptual model of longleaf pine ecosystem dynamics to enable the managers to experiment with systems and explore complex interactions (Hardesty et al. 2000). The Eglin managers quickly recognized the value of models as tools for experimentation and elucidation of complex interactions. Models provide managers, scientists, and citizens with an opportunity to learn outside their area of expertise, revealing hidden connections and establishing important gaps in existing understanding (see, e.g., [Eglin Forest Scenarios](#)). Once constructed, a model becomes a tool for reflection, and allows participants to see if they really believe what they thought they believed by clearly and explicitly displaying the interaction of ecosystem components and processes that the participant considered important. At Eglin, modeling also provided insights into the limits of biological intuition and experience.

At Eglin, the concept of ecological integrity guided goal and objective setting. Under the goals thus established, natural resource managers and scientists posed questions, formed management-related hypotheses, constructed models, predicted outcomes, and, where possible, conducted controlled and replicated experiments in a management context. Eglin managers and scientific collaborators used inventory, monitoring, research, modeling, and dialogue as tools to temper experience and provide input to policy making and practices. A key success of the theoretical and experimental research conducted at Eglin was the scale of their application: that of management. Researchers moved their focus from tiny square-meter plots to large plots, while maintaining the basic criteria of research, such as replication and no-treatment controls,

and defined a model reference condition.

Research, however, could not function in a vacuum. The constant feedback between the Eglin staff and the researchers promoted trust and credibility in the products delivered. Accepting such an adaptive process between them and outsiders further influenced Eglin's own [strategic planning](#). Eglin managers shifted from simply applying actions on the ground to learning while managing the lands. They became better stewards of the land and other public land managers started paying attention to Eglin.

The experience gained at Eglin offers numerous valuable lessons on conducting ecosystem-scale conservation, applying science to management, and working effectively with government agencies and local landowners. ConserveOnline will make those lessons broadly available (see e.g., [What Method Should You Use to Reduce the Hardwoods in the Longleaf Pine Forests You Manage?](#) and [Compilation of Methods Used by the Longleaf Pine Restoration Project](#)).

Priming the pump: how to start building a community of conservation practitioners

The catalyst to knowledge sharing on ConserveOnline is access to The Nature Conservancy's collection of distributed digital resources: elemental stewardship abstracts, grant proposals and reports, ecoregional and site conservation plans, and species management abstracts, among other things. Although making The Nature Conservancy's wealth of information available online is a resource-intensive process that requires a large number of skilled person-hours to solicit and categorize documents, the effort creates opportunities for social learning between contributors, other practitioners, and Content Coordinators. Contributors who are recognized experts in specific areas will be the first to have the opportunity to share their expertise through expert rankings and reviews. Similar to newsgroup moderators and directory guides, ConserveOnline experts add a human element to the Internet, and the strengths of these individuals will determine whether informal, social learning takes place.

ConserveOnline uses the best available web applications and technologies, and will continually search for the most powerful tools and resources to attract and retain users. Some of the initial tools include:

1. Access to a conservation practice knowledge base derived from The Nature Conservancy, the Society for Conservation Biology, and others
2. A broad range of information on:
 - a. invasive species
 - b. freshwater conservation (including water conservation tools and techniques)
 - c. site conservation planning and ecoregional planning
 - d. land conservation tools and techniques (conservation easements, transfer of development rights, etc.)
3. Institutional development through Fortaleza
4. Handbooks
5. Software
6. Maps
7. Contacts (real people from whom to get advice; conservation practitioners in your area)
8. Measures of success
9. Discussions groups
10. Listservs
11. Research tools (online journals, libraries, search capability)

Other features that will be implemented include access to expertise and funding databases and GIS applications. The listservs and discussion groups are available now, but are not yet extensive; more can easily be added as interest grows. ConserveOnline went live in February 2001 but, due to concerns over bandwidth, it was initially marketed by word-of-mouth only and most activity focused on building up the knowledge base from within The Nature Conservancy. The site moved to a secure hosting facility with adequate bandwidth in August 2001.

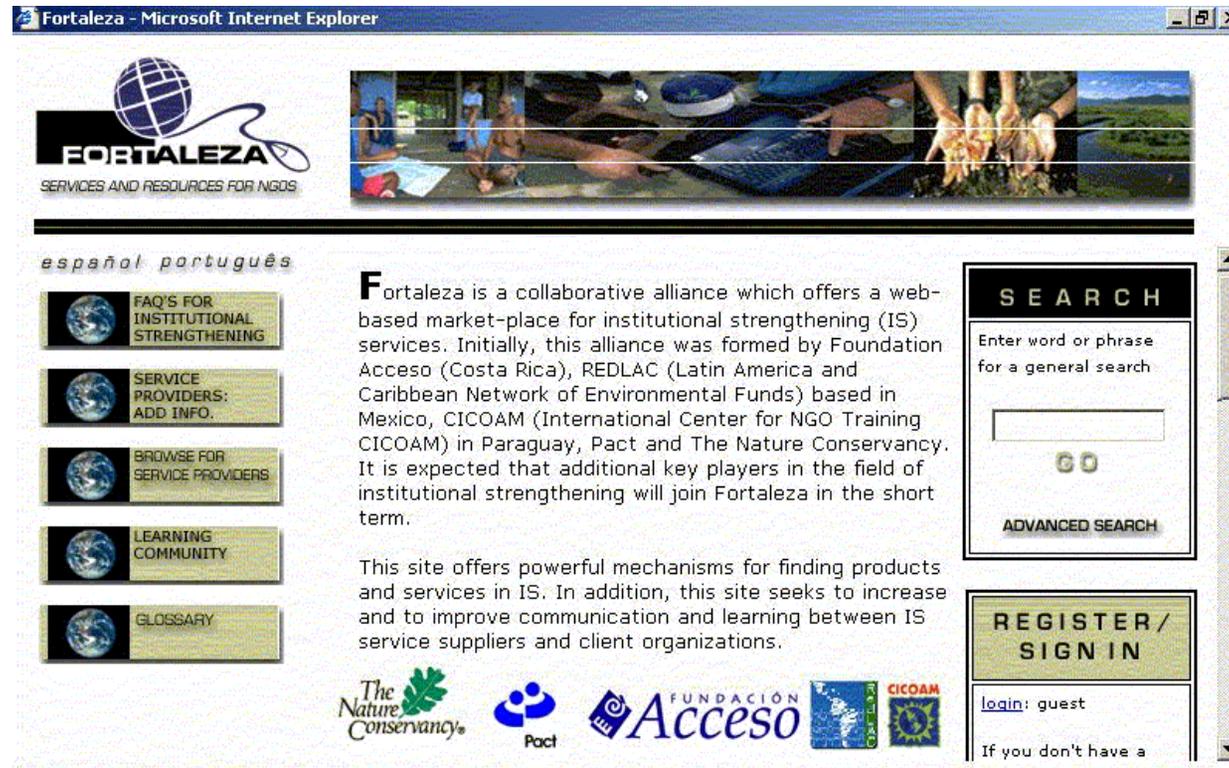
In order to create and maintain an effective website, ConserveOnline integrates adaptive management into the design and development of the website. ConserveOnline continuously monitors and gathers feedback from users to improve the site. Website usability testing is a regular part of the site maintenance and the feedback gathered guides the interface and system changes. The results from the first two rounds of usability testing provided valuable feedback that resulted in significant changes to the interface of the website to make it easier to use.

Once meaningful usage statistics are available, data on usage areas, number of users, documents uploaded and downloaded, etc. will be reviewed and analyzed to target areas for communication, and to monitor areas of high and low usage. In addition to statistical measures, ConserveOnline works closely with two pilot user groups in California and Florida that contain representative target users of the site. The users in these groups are committed to using the site as an information-sharing tool and providing pertinent feedback on required features for their continued use of the site. ConserveOnline monitors comments and activities and closes the loop from user feedback to web development by closely listening to the needs of target users. The site is evolving in response to the changing needs of users, a crucial component of the site's success as an effective tool for conservation practitioners.

Fortaleza: building communities to increase conservation capacity

Fortaleza is a web-based marketplace for capacity-building and institutional-strengthening groups to connect and service conservation NGOs. The preliminary version of Fortaleza (Fig. 4) will be launched in early 2002. This site emerged in response to the growing awareness that capable organizations are key to achieving conservation and sustainable development. Therefore, organizations are turning to institutional-strengthening initiatives in order to increase their capacity to fulfil their goals and mandates.

Fig. 4. Fortaleza is a web-based marketplace for capacity-building and institutional-strengthening groups to connect and service conservation NGOs.



Institutional strengthening, in general, consists of developing three integrated elements: financial resources, human resources, and management tools. Organizations must develop appropriate mechanisms to combine

and apply these three elements, but may lack the expertise to do so. Many organizations need training and assistance in basic areas such as developing fund-raising strategies, defining the role of governing boards, writing budgets, strategic planning, project management, and working with diverse communities and stakeholders. In Ecuador, for example, the Arcoiris Foundation grew rapidly in its first 10 years of existence and its activities became increasingly complex. By 1997, the organization needed a strategic plan as well as a financial plan to answer such key questions as: How do you decide which activities to do first and which to do later? How do you allocate limited funds among the various projects?

Training to answer such questions has traditionally been person to person, an effective but expensive and time-consuming approach. The resources available for this type of training, however, are diminishing as organizations that provide such training seek to broaden their impact and increase the leverage of limited conservation dollars. The risk is that the sharing of information regarding institutional strengthening will be curtailed, as will the capacity of organizations that specialize in institutional strengthening to reach and respond to partners' needs. Non-governmental organizations such as the Arcoiris Foundation often lack ready access to institutional-strengthening knowledge, and do not know the identity of the service providers working in this area or the products they offer. The few innovative, long-distance virtual efforts in transferring institutional-strengthening skills (e.g., [Social Leaders](#), see below) lack supportive information and links to existing resources.

Information about institutional strengthening exists on the Internet, but mostly in dispersed websites sponsored by individual organizations (e.g., [CICOAM](#), and [Fundación Acceso](#)). Institutional-strengthening information is not organized by topic, sector, country, or region anywhere on the web.

Fortaleza seeks to address these problems through a partnership-based initiative to establish a web-based marketplace of institutional-strengthening knowledge, lessons, products, services, and providers. The objective of Fortaleza is to strengthen organizations in Latin America and the Caribbean by improving their access to high-quality, tested products and services. The site, for example, will offer publications, training materials, and case studies (in Spanish, English, and Portuguese) on strategic and financial planning to assist groups such as Arcoiris, and will help link organizations needing assistance with service providers who possess the appropriate skills. The main targets for Fortaleza are NGOs, but government institutions, the private sector, individuals, and networks that are involved in conservation and sustainable development will also benefit.

Fortaleza is an alliance of key players in the NGO capacity-building sector: [The Nature Conservancy](#), [Latin American Network for Environmental Funds](#), [CICOAM](#), and [PACT](#), as well as local NGOs with experience in information management (such as [Fundación Acceso](#) in Costa Rica). The alliance members work with over 150 partner organizations that potentially may need institutional-strengthening services. The alliance will bring the membership of partner networks and the existing institutional-strengthening products and services (contained in branded websites) to Fortaleza.

The Fortaleza alliance will connect carefully screened in-country institutional-development service providers (highlighting menus of services offered by each, online publications, good practices, and many other features) and will link members of this community to each other, to partners of The Nature Conservancy, and to other local and international nonprofit organizations. As well as providing lessons learned, Fortaleza will organize institutional-strengthening products, services, and providers by topic, sector, country, and region. In this way, participating organizations will be able to share experiences and approaches, strengthen their civil society institutions, and foster broader exchanges and partnerships among countries of the southern hemisphere. By enhancing the effectiveness of local service providers and intermediary NGOs, this initiative will enable in-country nonprofit organizations, local communities, and key leaders to improve their shared capacity to achieve success.

Fortaleza will use Internet technology to help NGOs in the region adapt, improve, and apply good practices in organizational development, and will foster international exchange of lessons. The information available through Fortaleza will also help develop a cadre of new leaders with the skills and knowledge necessary to spearhead the conservation movement in their respective countries in the 21st century. Local organizations will have the necessary knowledge to establish their own capacity for regular self-assessments, resulting in self-directed institutional monitoring and ongoing adaptive management.

Fortaleza will not centralize the production of institutional-strengthening information, or the institutional-strengthening resources produced in different organizations in different countries, but will be a reference to resources that already exist, offering interfaces that allow product and service providers to publish information in a decentralized way. Whenever possible, the information contained in the databases, forums, and news will be provided and administered by the same people who produce this information.

Fortaleza will be linked to innovative long-distance training initiatives such as the [Social Leaders](#) program of Tecnológico de Monterrey's Virtual University (Mexico). This innovative virtual education program is currently benefiting more than 300 students from over 250 organizations. It is expected such links will

bring additional users and content to the Fortaleza website.

Fortaleza's partner organizations will be sharing their experience on institutional-strengthening practice through a Lessons Learned Exchange room within the Fortaleza website. Additionally, end users' feedback on the viability of products, services, and providers will be available at Fortaleza.

The partnership that forms the foundation of ConserveOnline and Fortaleza provides the credibility and critical mass needed to attract users and contributors and to build even broader partnerships. The long-term success of the site depends on broad participation from universities, conservation organizations, government agencies, local land trusts, and so on. The site will have a strong education and training component that university partners can expand upon, and the tested, practical techniques should be of broad interest to government agencies and other conservation organizations, including land trust alliances, in the United States and internationally.

Technology supporting ConserveOnline and Fortaleza

ConserveOnline and Fortaleza are built on a common hardware and software infrastructure. The foundation of the system is the [Hyperwave Information System](#) (HIS, Kappe 1999), which provides a single point of access for text, video, and graphics. The HIS was designed as an intranet platform for sharing information within corporations or universities. ConserveOnline and Fortaleza have customized the HIS for the Internet by limiting the number of features available and the ability of site users to edit and manipulate the database.

The HIS has three layers; protocol conversion, session, and database. Protocol conversion defines the visual appearance for the user. The interface can be viewed across many platforms, including web browsers, wireless application protocol (WAP) enabled phones, Java clients, and Windows Explorer. Cross-platform access will allow for easy integration into other technologies, such as wireless devices and instant messaging. In addition, the interface supports the following languages: English, German, French, Italian, Danish, Japanese, Spanish, Dutch, Swedish, Norwegian, and Portuguese. The sites will also support software that will create CD-ROM versions of the database, which will help reach users with little or no bandwidth, who make up a large portion of our target audience. Other distribution channels for our remote audience include site mirrors, web-to-email gateways (e.g., <http://www.bellanet.org/email.htm>), and Internet fax services (e.g., <http://www.tmcnet.com/comsol/oe0301.htm>).

The second layer, session, acts as a mediator between the protocol conversion and database layers. For example, the session layer checks security rights to decide whether to grant a ConserveOnline user access to a document. The implementation is transparent; users who do not have access to a particular piece of data do not see it. In addition to restricting accessibility of sensitive data, the security model supports user-centric design. For example, when a Conservancy employee contributes data to ConserveOnline, he or she will see metadata elements not available to regular users, such as the option to designate the data as only accessible by the Conservancy (such data represents a small fraction of the information available on ConserveOnline). Experts are another user type; they have the option to write expert reviews. If a non-expert user tries to write an expert review, he or she will be given the opportunity to apply to become an expert user.

The third layer, database, stores the data and metadata that comprise the knowledge base. Data are normally kept separately in a database application, such as Oracle or MS SQL Server, for reasons of security, interoperability, convenience, and performance. Metadata-information about objects in the database that allows for proper indexing and retrieval native to the HIS includes Author, Description, Title, Rights, etc. ConserveOnline and Fortaleza have additional metadata, including Subject, Class, Program, etc. The metadata nomenclature and structure currently do not follow an established standard, such as the Dublin Core, but will evolve toward one as the platform allows.

The database layer indexes the data for searching in addition to storing and caching it. The default full-text search engine, licensed from [Verity](#), indexes more than 200 document formats and 10 languages (Kappe 1999). The Verity product can search for synonyms; singular, plural, or declined variations; words with similar pronunciation; multiple words related by different degrees of proximity; documents that match the selected one; or combinations thereof. The HIS also offers the option of using the [Autonomy](#) search engine, which can analyze any piece of text (independent of the document's language) and identify and rank the main ideas, automatically categorize information by subject matter, profile users based on the ideas in the text they read or write, and deliver information to those most likely to be interested.

In addition to full-text search, the HIS supports searching indexed metadata and object attributes. When a user performs a search on ConserveOnline, the search engine returns the parsed results from three simultaneous searches: one each for full text, metadata, and attributes. For the average user, the complexity and advanced features of ConserveOnline's search mean more accurate results and less time spent looking for information. In the future, ConserveOnline will implement other advanced features, such as scheduled

searches that e-mail results back to the user and searches that only look through the most recently contributed data.

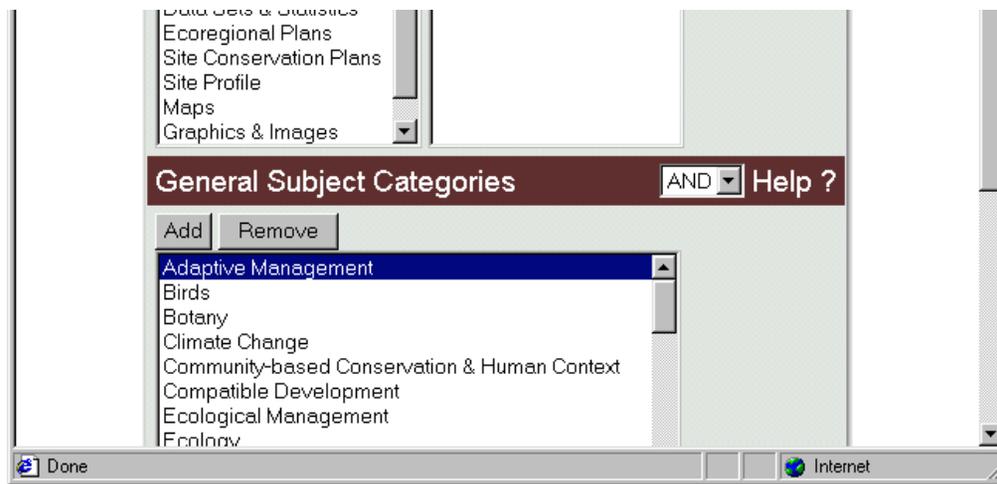
The three-layer design of the HIS platform yields organizing principles around the client, the user, and the data. ConserveOnline and Fortaleza are accessible by multiple clients, online or offline, in various visual designs. ConserveOnline tailors content for different types of users and ensures the security of sensitive data. ConserveOnline accepts various data formats and organizes them so they can be easily browsed or searched.

Users can add to, search for, read, download, and review conservation information and resources in the library. A user can add resources to the site after an initial registration and log in. Each document in the library is classified by relevant resource types, general subject categories, geographical references, and Nature Conservancy programs. This classification organizes information in such a way that users can easily browse or search through it. The site will accept documents in any file format or language and, if specific information needs to be linked together, documents can be associated and displayed together for other users.

The design of the library makes extracting information easy. A user can either browse for documents through the database folders of general subject categories, geographical reference areas, or Nature Conservancy programs, or simply type in a search word in the search box. Through an advanced search option (Fig. 5), users can limit the scope of their search by title, author, resource type, general subject category, or a combination of these items. The database search engine will search through all the classification information for each document and through all the text inside each document. This search capability is pivotal for finding a large number of related documents.

Fig. 5. The advanced search option allows users to limit the scope of their search by title, author, resource type, general subject category, or a combination of these items.





The broad community of conservation practitioners can rank and review the information available through ConserveOnline. Any user can post online reviews of documents in the library on the site, and recognized experts in a particular field can post expert reviews of documents. The search engine will sort documents according to expert reviews and users' rankings, with the more highly rated documents appearing higher on the search result list, thus helping the user to differentiate among a potentially large number of related items.

Readers can also respond to comments on documents in the library and, in turn, authors can respond to those comments (http://www.conserveonline.org/2001/04/m/RJKOSE_2001-45). The result is a threaded discussion focused on particular issues. Thus, each document in the library can be interactive and can help build communities of conservation practice. Many conservation practitioners are beginning to see the importance of this type of a community, which can exist only on the Internet, for the future of all conservation efforts.

CONCLUSION

A growing body of conservation science now informs the work of conservation organizations and government land management agencies. One of the key lessons that these institutions are beginning to absorb is the need to conserve areas large enough to preserve intact the ecological processes that support biodiversity. This means working at broader scales than ever before and developing techniques appropriate to the new scale of conservation.

No single institution, indeed no consortium of organizations, can meet the challenge alone. The entire conservation community needs far more efficient means of learning which methods work and which do not. Information technology can play a small but important role by fostering the free exchange of information and helping to build communities of practice within which learning can take place. ConserveOnline and Fortaleza hope to be part of a new culture among conservation organizations that uses this powerful technology to advance conservation on the ground through experimentation and learning.

RESPONSES TO THIS ARTICLE

Responses to this article are invited. If accepted for publication, your response will be hyperlinked to the article. To submit a comment, follow [this link](#). To read comments already accepted, follow [this link](#).

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