DOUGLAS CHRISTOPHER PARSONS
The Development of the *Water-for-Life* Web Page: An Environmental Outreach Tool on
     Water Resource Issues for Costa Rica and Latin America
(Under the Direction of CATHERINE PRINGLE)

This thesis identifies the most useful and relevant Internet strategies used by freshwater conservation organizations. These strategies were used in the development of a web page that will be accessible to Latin America and environmental organizations based on the successful *Water-for-Life* Program in Costa Rica. A brief history of the *Water-for-Life* environmental outreach program in Costa Rica is described along with a summary of how a fellowship awarded to me from the Organization for Tropical Studies evolved to incorporate both environmental outreach and, ultimately, the creation of an environmental outreach web site. I also discuss the history of the Internet and how non-governmental organizations (NGOs) involved in freshwater conservation are exploiting Internet technology and how those Internet resources were utilized in the development of the *Water-for-Life* web site. Finally, I identify how freshwater NGOs are specifically using the Internet by analyzing the results of an e-mail survey.

INDEX WORDS: Internet, Freshwater conservation, Costa Rica, Environmental
                    Outreach, Web site

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ENVIRONMENTAL OUTREACH TOOL ON WATER RESOURCE ISSUES FOR

COSTA RICA AND LATIN AMERICA

by

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INTRODUCTION

Although tremendous progress has been made to restore and maintain freshwater

ecosystems in developed countries, either through legislative action (e.g., the Clean

Water Act in the U.S.A.), or through direct citizen environmental outreach, substantial

work remains to be done. Many of the non-governmental freshwater conservation

organizations present today in the U.S. were established as a response to direct and

indirect threats to freshwater ecosystems. Involving the public has made the freshwater

conservation movement one of the more effective ones in the sphere of environmental

protection within the U.S.A.

In developing countries, specifically in Latin America, the conservation of

freshwater ecosystems is particularly challenging, given rapidly expanding human

populations, socioeconomic factors, lack of sufficient legal protection and most

importantly, the lack of enforcement of existing environmental laws. (Pringle et al. 2000).

These challenges highlight the need for environmental outreach and education on

freshwater issues in developing countries. While there have been some local outreach

success stories, such as the *Water-for-Life* Program in Costa Rica (Pringle 2000),

outcomes from such programs are not easily reproduced by other organizations in Latin

America with similar goals because of lack of resource and knowledge sharing. [The

Water-for-Life Program is a joint collaboration between citizens of rural communities in

Costa Rica, the Organization for Tropical Studies (OTS) field stations, the OTS

Education Program and graduate students and faculty from the University of Georgia and

other academic institutions. OTS is a nonprofit consortium of 55 universities and

research institutions from the United States, Latin America, and Australia that focuses on education, research and the wise use of resources in the tropics.] This thesis attempts to bridge this information availability issue by developing an environmental outreach program using the Internet.

The Internet market in Latin America is projected to be the fastest growing market in the world (Faiola and Buckley 2000). Thus, a major goal of this thesis is to explore and identify the most useful and relevant Internet strategies used by environmental organizations that focus on freshwater conservation in the U.S. and to use those strategies in the development of a web page that will be accessible to Latin American people and organizations based on the successful *Water-for-Life* Program in Costa Rica. My ultimate goal is to make the *Water-for-Life* Program accessible to all of Latin America.

In Chapter I, I provide a brief history of the *Water-for-Life* environmental outreach program in Costa Rica, in addition to a brief summary of how a fellowship awarded to me from the OTS evolved to incorporate both environmental outreach field work and, ultimately, the creation of an environmental outreach web site. The *Water-for-Life* web site is currently 'housed' on the Institute of Ecology's web site for Office for Public Service and Outreach at the University of Georgia (http://www.ecology.uga.edu/outreach/wfl/home.htm) and cross-linked with the Organization for Tropical Studies' homepage (http://www.ots.duke.edu). Hosting the *Water-for-Life* web site reaffirms the Institute's commitment to outreach and it puts graduate students in a position to make changes to the web site as the *Water-for-Life* Program evolves. There are few Spanish language aquatic conservation resources online

and the *Water-for-Life* web site offers an exciting opportunity for Internet users in Latin America to take advantage of legitimate, science-based environmental outreach tools that were produced by students working in the *Water-for-Life* Program. By providing this information online, the *Water-for-Life* Program will now be immediately accessible to anyone in either the developed or developing world.

In Chapter II of my thesis, I briefly discuss the history of the Internet and how non-governmental organizations (NGOs) involved in freshwater conservation are exploiting this technology to further the goals of their organizations. I focus on freshwater NGOs because goals of the *Water-for-Life* Program are very similar to the goals of many freshwater NGOs. Both seek to preserve freshwater ecosystems. By understanding how NGOs in the developed world use Internet resources for freshwater conservation, my goal is to incorporate that information into the development of a web site for Latin America. The Internet has been functioning for almost three decades, but it is only within the past five years that substantial portions of the population have begun to 'log on.' Internet users in Latin America can learn from the mistakes and the successes that users in developed countries are experiencing. Chapter II describes the different Internet strategies available to NGOs involved in freshwater conservation issues.

In Chapter III, I discuss different web site tools and resources being used by NGOs in the U.S. and how those resources can be utilized in the development of the *Water-for-Life* web site for Latin America. A web site is an important interface between an organization and the online world. It is important that NGOs create an effective web site that incorporates the latest tools and developments in Internet technology. The low cost of web design software and the proliferation of technological resources make web

site construction an option within the reach of most NGOs, and more importantly, to users in the developing world. This chapter analyzes the different Internet tools available for web sites.   Internet tools appropriate for freshwater NGOs can range from educational resources and listserves to online forums for published scientific data. Although not all these tools were used in the creation of the *Water-for-Life* web site, this chapter provides a glimpse into the potential future of the *Water-for-Life* Program and identifies the different tools and resources available for future graduate students participating in the program.

Finally, in Chapter IV, I identify how existing freshwater conservation organizations are currently using the Internet. To obtain this information I conducted an e-mail survey. I applied this information in the overall design and development of the *Water-for-Life* web site. I surveyed NGOs in the U.S. who are working at a state or watershed level, albeit with a few exceptions. My goal was to survey organizations that were resource limited so that I could determine the priority that they placed on web site construction and Internet use. Fifty-one organizations were contacted and twenty responded to the questionnaire. I discuss their use of current Internet tools, and some perceived benefits. These benefits may be in the form of increased membership, expanded fundraising, or online campaigns that have ultimately resulted in conserving aquatic ecosystems.

CHAPTER I

The History of the *Water-for-Life* Program and the Development of an Environmental

Outreach Web Site

The goal of my thesis was to create an outreach product that would be useful and

practical to persons participating in the *Water-for-Life* Program.   The information

gathered in Chapters II-IV reinforced my belief that the Internet would be an excellent

medium in which to develop this outreach tool. It became clear that a web site would

provide an opportunity to communicate the work of previous graduate students who have

contributed outreach products to the *Water-for-Life* Program and to serve as a portal to

"link" participants in the program to other aquatic conservation resources available on the

Internet. Here, I will present a brief history of the *Water-for-Life* Program and then

describe the development of the *Water-for-Life* web site

(http://www.ecology.uga.edu/outreach/wfl/home.htm).

The *Water-for-Life* Program was initiated through the STREAMS Research

Program (http://www.ots.duke.edu/cm/projects/streams/) directed by Dr. Catherine

Pringle (University of Georgia) at the La Selva Biological Station in central Costa Rica.

The STREAMS Project was established to study the ecology and biogeochemistry of

tropical lowland streams and has been funded by the National Science Foundation almost

continuously since 1988 (http://www.ots.duke.edu).

Water quality and quantity problems in the nearby community of Puerto Viejo

spurred Pringle to expand her research program to include environmental outreach.

Pringle recruited Rodney Vargas, a Costa Rican national, for graduate school at the University of Georgia to study the economic, social, and ecological water issues in the Puerto Viejo region. His Master's thesis summarized the history of water quantity and quality problems. He documented how local groundwater resources became contaminated with fecal coliforms, forcing the town to depend on water resources located 8 kilometers away at the northern end of Braulio Carrillo National Park and the southern boundary of the La Selva Biological Station (Vargas 1995, Pringle 1997).

As the *Water-for-Life* Program progressed, Vargas recruited another graduate student to participate in the program, Tina Laidlaw. She focused on developing an environmental outreach program that would encourage local citizens to conserve and clean up their water resources. Laidlaw eventually settled on the *Adopt-a-Stream* program, modeled after Georgia (USA) state's program. The goal was to empower local people to take an active interest in their waterways by participating in the chemical, physical, and biological monitoring of these resources. By sampling their own waterways, the participants could see first-hand what was degrading their water resources (Laidlaw 1996).

Laidlaw was able to recruit students from an upper level agroecology class in a Puerto Viejo high school to participate in the *Adopt-a-Stream* program. The program became part of the students' curriculum. After being trained, students and volunteers went out on a monthly basis to gather data on the status of the streams (Laidlaw and Pringle 1995). The students monitored various water quality components, which included physical (channel alteration); habitat (diversity of bottom strata); chemical (oxygen); and

biological (fish and insects). The students recorded the data from their monitoring trips for a total of two years (1994-1996) (Pohlman 1998).

Scott Pohlman, the third graduate student to participate in the program, continued Laidlaw's and Vargas' work by interviewing local landowners to determine attitudes about water issues in the Puerto Viejo region. Pohlman later analyzed his interview results and incorporated them in the design of his outreach poster (Pohlman 1998).

All of the graduate students who have worked with the *Water-for-Life* Program have created outreach products. Rodney Vargas created a three dimensional map of the Puerto Viejo de Sarapiqui watershed illustrating the geographic location of potable water supplies for local communities. Tina Laidlaw created an *Adopt-a-Stream* manual that was translated into Spanish. Scott Pohlman designed an outreach poster focusing on the threats to local water quality and also created four educational instructional activities designed for high-school students with an emphasis on water quality. These instructional activities were disseminated to several communities throughout Costa Rica.

My participation in the *Water-for-Life* Program started in the summer of 1998. OTS awarded me a three thousand-dollar grant in the summer of 1998 to continue the outreach work of the previous three graduate students. After discussing my options with Claudia Charpentier, (Universidad Nacional) the Education Coordinator for OTS, Rodney Vargas (OTS Costa Rica Development Coordinator) and Cathy Pringle, we determined that introducing the program to a new location in Costa Rica would be the next logical step in the progression of the program. The idea of introducing the program into other parts of Costa Rica had been discussed by Tina Laidlaw, during the course of her work at the La Selva Biological Station (Laidlaw and Pringle 1995). This fact, along

with the interest from Luis Diego Gomez, the director of the Las Cruces Station, to bring the program to the community of San Vito, provided the incentive to relocate the *Adopt-a-Stream* Program.

My strategy was to introduce the *Adopt-a-Stream* Program to a local high school in the community of San Vito, a small town in southern Costa Rica, located a few kilometers from the Las Cruces Biological Station. For logistical purposes, we picked an area near an OTS field station so that I could stay at the station and still have access to the community. Humberto Melon High School was asked to participate in the *Adopt-a-Stream* Program. One of our primary goals in San Vito was to identify local educators interested in participating in the program, thereby allowing us access to their students. Raul Rojas, a former OTS outreach staff member at the Las Cruces Station, and I, found several teachers who expressed a desire to participate in the program. They recommended that we work with a 10th grade class. During several classroom meetings with the students, we discussed a variety of issues related to water quality and management. Part of our strategy for implementing the program was to make *Adopt-a-Stream* part of the academic curriculum at the school. The teachers agreed to substitute *Adopt-a-Stream* projects for other graded projects at the school that the students were required to complete.

I spent a total of two months at the Las Cruces Biological Station, with two of those weeks in the home of a Costa Rican family in San Vito. To introduce the local community to the *Water-for-Life* Program, I wrote an article for a local newspaper that serves the entire Cota Brus region. The article focused on the merits of the *Adopt-a-Stream* Program, along with information about the school that was going to participate. I

also created an outreach flyer that included general information about water quality issues, along with a more detailed explanation of the *Adopt-a-Stream* Program. This flyer was inserted within the pages of a local San Vito newspaper (July 1998). Randal Zuniga, a member of the family that I stayed with in San Vito, facilitated this work. His contacts and resources allowed me to promote my message to a much wider audience.

Upon my return to the United States I began discussing thesis options with my adviser, Cathy Pringle, and other individuals associated with the *Water-for-Life* Program. My desire was to create a useful tool that people in Costa Rica could use to facilitate their participation in water conservation. I also wanted to create a medium that allowed the products of other graduate students to be used as frequently and efficiently as possible. Based on these considerations, Pringle and I decided a web site would be a most useful tool that I could create for the *Water-for-Life* Program.

I began developing a web site to be utilized by students not only in San Vito, but also in Puerto Viejo, near the La Selva Biological Station, and possibly in schools in San José and other Spanish speaking countries. This web site includes, but is not limited to, a digital form of the *Adopt-a-Stream* manual, educational activities for the classroom (including Pohlman's instruction manual), and links to other similar environmental educational resources. The web site is not only a comprehensive resource for the students and teachers involved with the *Water-for-Life* Program, but also a means of communication between any schools in Costa Rica that are participating in the program [e.g. local high schools in Puerto Viejo (near La Selva)] and San Jose. This will enable students to compare the results of their stream sampling and also to spur ideas to extend this program beyond just sampling to include restoration projects and/or possibly

garnering further community-wide support for the program. The web site also includes: 1) links to other water issues web sites; 2) contact information for visitors to the web site who are interested in more information about the program; and 3) resources relevant to users, specifically, users in Costa Rica (See Figures 8-13). One reason that a web site was an appealing option was the fact that anyone with Internet access in the Spanish speaking world could access this information. There are still relatively few useful Spanish language tropical water resources available online, although this is rapidly changing.

In the summer of 1999, I again traveled to San Vito in order to introduce the idea of a web site as an educational tool for general environmental education to the teachers at the high school and to members of OTS,. Costa Rica, unlike many developing countries, has reasonable Internet access, even in rural areas. In the summer of 1999, the San Vito high school had one Internet connection, and we expect Internet use to grow in rural communities throughout the country.

OTS expressed support for the program because they recognized it as a low cost, low maintenance tool for the people participating in the program. The *Water-for-Life* web site would also open up opportunities for sister-school relationships (i.e., a school in a different part of Costa Rica, or even the United States, could simultaneously participate in the *Adopt-a-Stream* program and compare results using the Internet as the method of communication). Also, those participating schools that have larger financial and educational resources at their disposal could potentially share those resources with those who do not. Several schools in the U.S. have expressed interest in participating in the program. These relationships can be further explored using the web site.

After deciding to develop a web site, I began to research how existing freshwater organizations were utilizing the Internet. I also wanted to identify which general web design tools would be useful and yet practical in the design of the *Water-for-Life* web site. Information was gathered from existing web sites and literature related to this topic. This survey portion of my thesis served as a guide to the practical considerations of designing a web site and developing an Internet strategy.

After analyzing information that I gathered from Chapters II-IV, I began designing a web site that could be used by people participating in the *Water-for-Life* Program. Although many web sites are dynamic and subject to constant updates, there are also many web sites that serve as reference tools. My goal was to duplicate these types of reference resources related to water quality. The web site was created using Microsoft FrontPage, an easy-to-use web design software program. Although the web site is an OTS-sponsored project, it is housed at the web site for the Institute of Ecology's Office for Public Service and Outreach (http://www.ecology.uga.edu/outreach/wfl) to make it easier to maintain. Future students at the Institute of Ecology will be able to make necessary changes to the web site as the *Water-for-Life* Program grows and evolves. The web site is also linked to the OTS web site, further demonstrating OTS' commitment to environmental outreach and education.

The following sections provide an overview of tools and resources that I identified on the Internet and how they are being used by various freshwater conservation organizations. Although not all the tools and resources in these sections were incorporated in the design of the *Water-for-Life* web site, they served as useful guides in the development of the web site. Evaluating the survey results helped me to determine

who my audience is, and will be, and design the web site accordingly. At each stage of my research I was reminded of how valuable a resource the Internet can be to programs like *Water-for-Life*, reaffirming my belief that I had chosen an appropriate outreach vehicle.

CHAPTER II

Overview of How the Internet is Being Utilized for Freshwater Conservation with a

Focus on Non-governmental Organizations

While the developed world is more advanced in its utilization of the Internet, the

low cost and increasing accessibility of Internet access will help developing countries

prepare to bridge this technological divide. Developing countries, specifically in Latin

America, can learn from strategies employed by developed countries. My goal in this

chapter was to identify Internet strategies utilized by freshwater conservation non-

governmental organizations (NGOs) that would be relevant to Costa Rica, which is the

focus of the *Water-for-Life* Program. The goals of the *Water-for-Life* Program are very

similar to many freshwater organizations throughout the developed world where water

quality and quantity are at risk of severe pollution and exploitation. I incorporated the

Internet strategies of existing organizations into the development of the *Water-for-Life*

web site.

Internet History

In the past ten years, the Internet has become an indispensable technology for

many organizations throughout the world. The Internet is a global network of computers

and technical hardware that communicate via a modem routed to a mainframe, or server.

The Internet originated within the United States Defense Department, which laid down

the principal infrastructure. The purpose of this vast communication network was to

allow scientists and military personnel to communicate with colleagues over great distances and to continue to communicate in case of a nuclear war. The role of the Internet quickly changed as larger segments of the population obtained access to personal computers and inexpensive Internet server providers. The demographics of Internet users have broadened from academics and military personnel to university students, and finally, to that large segment of society that can afford Internet access (http://www.pbs.org/internet/timeline/timeline-txt.html).

In the fall of 1994, between seven to ten thousand Internet web sites existed. By 1998, that number surpassed 10 million (Zakon 1999). These numbers demonstrate exponential growth, which is the pattern most experts predict will continue, as more individuals, corporations, small businesses, and other organizations begin to use and establish a presence on the Internet.

The United States leads the world in the growth of new web sites. The dominant language online is fast becoming English, mainly due to the number of web sites originating in the United States. Close to 75 percent of all web users use English as the preferred language for their web site viewing when visiting English-language web sites, which make up the bulk of existing material online. Chinese is a distant second, with 4.9%. Spanish, the language used on the *Water-for-Life* web site, is far behind at 1.1% all these users. (http://websnapshot.mycomputer.com/languages.html). Many countries lag far behind the United States in the percentage of the population that have access to the Internet. Fifty percent of all Americans have access in one form or another, either at work or at home, whereas even in an industrialized country such as Japan, the number is

closer to 10% of the population. Much of this activity is credited to the favorable

regulatory climate that the United States has established for the Internet (Tolbert 2000).

Internet Stages

        Different NGOs can be categorized by the various ways that they have established

an Internet presence. A useful categorization scheme was created by a member of the

Institute for Global Communications (IGC) as part of IGC listserve to help NGOs define

and justify its Internet strategies. It also provides a key for freshwater conservation

groups to assess their current status in capitalizing on Internet technology.

        According to this model, there are three primary stages for an NGO establishing

an Internet presence. The first stage is the *experimental* stage. An NGO at this stage has

an online account and uses the Internet regularly to retrieve information already available

online. The second stage is the *broadcast* stage. This stage is defined by how the NGO

is utilizing Internet technology. For example, if an NGO receives an e-mail and provides

its response through other means (fax, paper, or telephone), then this organization is

working at the *broadcast* stage. Other signs that an NGO is working at the *broadcast*

stage include: 1) people in the organization have e-mail accounts; 2) materials are

developed to be displayed online; 3) the organization has a web site; 4) there is active

listserve participation. An NGO is at the *interactive* stage when it has a clear Internet

strategy and is working towards a substantial presence on the Internet. Everyone in the

organization has an e-mail account. The group processes in-going and out-going

materials so they can be made available online. There is also significant e-mail dialogue

occurring on within the organization and active participation with online workgroups

with similar missions. An NGO at the *interactive* stage is deeply committed to furthering

its goals through an online strategy. The group has incorporated the technology into their

daily tasks and has modified other behaviors to allow for the needs and demands of

online activities (Yurman 1999).

It is important for freshwater NGOs to identify their current stage and the stage

they would eventually like to attain. Some NGOs do not desire to reach the *interactive*

stage because it is cost prohibitive or not relevant to the mission of their organization.

However, some groups would like to achieve the *interactive* stage and should adjust their

Internet strategy accordingly. In order to move from one stage to the next an NGO

should identify the ways in which the Internet could be useful.

This guide also served as a useful model in the development of the *Water-for-Life*

web site. I would categorize the *Water-for-Life* web site as in the *Broadcast* stage. One

of the main purposes of the *Water-for-Life* web site is to post educational products online.

The *Water-for-Life* web site could potentially reach the *Interactive* stage, but that will

depend on what type of feedback we receive from people using the web site and the

additional types of resources they demand. A web site at the *Interactive* stage, as

mentioned, has fully integrated the Internet in its daily operations. It will take some time

and feedback before it can be determined whether this type of commitment is warranted

in the *Water-for-Life* Program.

Publicity

According to Cliff Landesman of the Internet Nonprofit Center, there are eight

general ways that an NGO can exploit the Internet (Landesman 1996): 1) publicity; 2)

public education; 3) fundraising; 4) volunteer recruitment; 5) service delivery; 6)

advocacy; 7) research; and 8) communication These eight categories outline the advantages of strategies for Internet use.

Although freshwater organizations and environmental NGOs generally receive favorable attention from traditional sources of mass media (newspapers, TV, etc.), the time allotted to their particular campaigns is usually limited. Only when a newsworthy item arises (i.e., specific clean water or clean air issues) are NGOs given a forum to spotlight a particular issue. For example, the American Rivers organization, an NGO focusing on freshwater conservation, puts out a "Most Endangered Rivers" list that highlights severely degraded or threatened rivers. Each year, the listing receives national attention from the traditional media outlets, so it is an annual opportunity to shed light on a particular waterway. American Rivers can now focus on specific issues throughout the year through their web site, that includes updates and newsletters that keep the public, legislators and other forms of media involved and educated about the issues (Keys 2000). The Internet loosens the shackles that have kept freshwater conservation stories limited to short sound bites in national, or more likely, local news sources.

Public Education

Public education about freshwater issues is the ultimate tool for freshwater NGOs. By empowering the public with factual information based on sound science, freshwater NGOs can influence the public's perception about and actions toward water resource issues (White 1999). Only an educated public will make wise management decisions regarding their aquatic resources. The advent of Internet technology allows freshwater NGOs to tailor their message in many creative and interesting ways on a web site. It

takes certain technological skills to build a dynamic, educational site, but in general, these skills are not out of the reach of ambitious freshwater NGOs.

There is a tremendous amount of educational material geared toward school-aged children on the Internet. This is an important demographic for NGOs to target if they want to make an early and significant impact regarding the public's attitude toward proper stewardship of aquatic resources. Numerous sites now include games and projects designed for a younger audience. For example, GREEN (Global Rivers Environmental Education Network) provides water quality kits that are designed with children in mind (http://www.earthforce.org/green). In most cases, these resources are free to the public.

Fundraising

For freshwater NGOs, donating online is quickly becoming a popular method for fundraising. Citizens can donate online by providing a credit card number or simply finding a postal address online to mail a check. Numerous NGOs are building creative web sites to solicit donations. The Hunger Site (http://www.hungersite.com), for example, donates a certain quantity of rice to the United Nations World Food Program whenever any one visits their web site and clicks a "Donate" button. These organizations are able to provide this charitable service by allowing advertisers to promote products on these web sites, which pays for the rice in this example. This example can be a useful model for freshwater NGOs that are looking for interesting and creative ways to raise money over the Internet.

Volunteer Recruitment

More and more people are beginning to use the Internet as one of their principle sources of information retrieval. This is especially true among younger people. College students are increasingly looking to the Internet to provide opportunities for volunteering and internships. Many web sites provide various opportunities for people to get involved with their organizations. Soliciting volunteers can be logistically easier and more cost efficient by using online sign-up forms rather than other methods.

NGOs can also recruit volunteers by emailing their membership base. For example, the Lake Champlain Basin Science Center posts a list on their web site where volunteers can choose what type of volunteer assignments they would like to do. The volunteer can submit a request through an e-mail (http://homepages.together.net/~lcbsc/volopps.html). Email applied to volunteer recruitment is easy and inexpensive, both of which make it an attractive model for freshwater NGOs generating interest in a volunteer campaign. Volunteerism is at the heart of most *Adopt-a-Stream* programs. The *Water-for-Life* web site is poised to facilitate the recruitment process by promoting these volunteer opportunities throughout Costa Rica and Latin America.

Service Delivery

In many ways, freshwater NGOs are similar to private corporations in that they provide a service to their membership. These services can be as simple as providing news updates about a particular water issue, or they can also encompass numerous and complex services, ranging from lobbying, grass roots organizing, and scientific analysis.

The delivery of these services in a timely and cost efficient manner is the goal of many of these organizations. There is no doubt that the Internet is fundamentally transforming how freshwater NGOs, and environmental organizations in general, conduct business. Larger NGOs with greater financial resources are determining what role the Internet will play in their organizational goals. Smaller NGOs are learning from the larger groups and are exploiting the technology in a manner that fits with their limited financial resources.

Conservation International uses its web site to disseminate scientific data focusing on Conservation Biology. Visitors to their web site can access a variety of different resources on various topics. For example, Conservation International provides videos on such topics as "Hot Spots" and "Atlantic Forest," both of which spotlight issues in the tropics (http://www.conservation.org). American Rivers provides "Action Alerts" that spotlight specific freshwater topics. This service keeps its members and the media aware of ongoing projects within its organization (http:///www.amrivers.org). The Center for Watershed Protection provides opportunities to register for "Watershed Workshops" online that train attendees on how to better manage water resources (http://www.cwp.org). These are just a few examples of the many ways NGOs are adapting and exploiting the Internet to provide services to their member bases.

Advocacy

Campaigning for a particular issue is a traditional role for many freshwater NGOs. The Internet has simplified campaigning by providing a medium that has no tangible boundaries in the form of advertising costs, direct mail costs, etc., as experienced by many traditional paper media outlets. Collecting signatures for a particular issue can

be time consuming and exhaust limited financial resources. By conducting these

petitions online, an organization can solicit responses from many geographical regions,

that otherwise may have been impossible to collect. Greenpeace used the Internet to

solicit nearly 40,000 digital signatures to object to nuclear testing by the Chinese

government (Keys 2000). This example justifies the time spent and costs associated with

having an Internet strategy.

Although more and more households are hooking up to the Internet, there is a

racial divide among people accessing this online world. Asian-Americans have the

highest rate, with 64% of these U.S. households connected to the Internet. Caucasians

are at 34% and African-Americans are at 23% (Wice 1999). Governmental efforts are

attempting to close this gap with a variety of new technological initiatives and federal

subsidies (Johnston 1999). These numbers should concern freshwater NGOs that target

those populations that are most affected by the pollution of waterways.

Freshwater conservation groups need to identify an effective strategy to empower

these groups by letting them know the information that is available online so they can

take action in their area. It is one thing to provide the technology, with free computers

and Internet access, but another to convince people to use the technology. Technology

accessibility is of special concern in the developing world, so it is necessary to allow

these areas as much opportunity to use these limited resources as possible.

Research

The very essence of the Internet is in the incredible amounts of information that is

readily accessible to the general public and NGOs. Most nations in the world, even

developing ones, have an Internet presence of one kind or another. The majority of

federal agencies provide public access to some information through a web site. States

also provide substantial online services, some more than others. In numerous states,

citizens and freshwater NGOs can access enormous amounts of information - ranging

from pending legislation, to rules and regulations relating to a particular industry that is

impacting water quality. These various resources offer many opportunities for freshwater

NGOs to conduct research on the Internet.

While many businesses lead the way with the amount of information that they

provide online, federal, state and local governments are not far behind in providing

valuable information through the Internet. For example, the United States Geological

Survey (USGS) allows visitors to access real-time and historical streamflow information.

Previously all this information was printed solely in a paper edition, making "real-time"

data pointless. The USGS web site also provides information on water quality and use,

various sections on geographic information systems, acid rain, and any available

publications put out by the USGS.   Freshwater NGOs working in a specific watershed

can now access this data to identify potential sources of problems. This information can

be accessed quickly and more importantly, at any time, which could have a significant

effect on freshwater policy. These governmental web sites also provide free user

software that can help interpret the enormous amount of data that is available. (Cochrane

and Hagman 1998).

Access to information is one of the main benefits that freshwater NGOs are

reaping from using the Internet. By accessing information relevant to their organization

from various sources (federal, state, other NGOs, private citizens, etc.), NGOs can apply

this information in a timely and low-cost manner. Time not spent gathering materials can be spent on other issues. Most freshwater NGOs are strapped by resource limitations and the Internet has been able to address this issue to some degree by empowering these NGOs with universally accessible information (White 1999). Also, services are becoming available that will send freshwater NGOs updates on relevant issues. Groups no longer have to search out this information themselves (Motavalli 1996).

Communication

As more freshwater NGOs construct web sites, the freshwater conservation community will continue to grow. The number of groups online necessitate web pages that provide groupings of freshwater NGOs. Envirolink (http://www.envirolink.com) is a web site that lists a variety of different environmental organizations that choose to register with this site. This web site can be extremely valuable to those NGOs that have a specific interest, which Envirolink organizes into different topics. As more and more groups go online, the demand for central, organizing web sites like Envirolink will increase (Motavalli 1996). Groups and organizations in Latin America can also form these online communities. By creating a community with a specific theme or purpose, more relevant information can be exchanged by all parties involved. A high school class sampling a stream in rural Columbia might be of more interest to a freshwater NGO in Peru than an equivalent class in the United States. Online communities help groups communicate in a more efficient manner.

Freshwater NGOs can now use listserves, chat rooms, web conferencing and electronic mail to communicate with their membership base, other NGOs, or any group

they need to contact that is of interest to their organization. For example, a major governmental agency calculated that they spent about $5 per information request using traditional mail services, versus $0.05 using the Internet (Cochrane and Hagman 1998). This is an enormous savings, especially if multiplied by thousands or millions of requests. Many NGOs have recognized these savings and are quickly adapting and modifying the information they send out to their membership base in hopes of achieving this cost savings. Electronic mail is quickly replacing traditional forms of mail as the standard way to communicate between organizations (Kneeshaw 1996).

Summary of Internet Justification

These eight examples provided a basis for developing the *Water-for-Life* web strategy. All the examples are relevant to any potential effort in Costa Rica, although two in particular, research and communication, were especially relevant in the creation of the web site. The *Water-for-Life* web site incorporates many excellent scientific materials available online by linking with other web sites and also makes available the science tools created by graduate students participating in the *Water-for-Life* Program. Also, by providing contact information, the web site facilitates communication between those involved in the program and those interested in learning more about it or implementing it in their community. The following section will provide analysis of the different tools and resources available for web site design that were used in the development of the *Water-for-Life* web site.

CHAPTER III

Identifying Internet Resources for Web Design and Application

Chapter III focuses more closely on the tools and specific resources available on the Internet and the application of these tools in the design of a web site for an NGO that focuses on freshwater conservation issues. Although the situation in Costa Rica is unique and not all tools and resources discussed in this chapter were incorporated into the *Water-for-Life* web site, it is important to be aware of different tools that may eventually be included on the web site as the program evolves and more graduate students participate in the *Water-for-Life* Program. This is not an exhaustive discussion, but it provides an overview of the different options available and should serve as a guide to current and future students involved in the program. The various tools and resources described in this chapter were selected based on their possible use to freshwater NGOs, since they are serving as the model for the *Water-for-Life* web site.

Internet Resources

An NGO can utilize various resources, i.e., listserves, science data, etc., on the Internet. Not every organization uses all of them, either because they are not necessary, or they simply don't realize they exist. Many organizations are unfamiliar with the latest technologies, and do not have staff that is capable of using these technologies. The

following is a review of several of the most useful resources that a freshwater

conservation NGO should include in their Internet strategy.

<u>Search Engines</u>

The easiest way to find information on the Internet is by using 'search engines.'

A search engine allows the user to find web sites that contain specific information and

attempts to filter out all the information that is irrelevant. If someone were to conduct a

search for 'aquatic' and 'conservation', the search engine would scan its database of web

sites and retrieve what appears to be the most useful information. Sometimes a very

specific query will return a search of thousands, if not millions, of individual web pages.

This is more information than most users will ever need (See Table 1). However, usually

pages are ranked in order of relevance, so that the first web sites listed should be the most

relevant to the search.

Table 1 demonstrates the enormous amount of information through which

freshwater conservation groups must navigate in order to obtain relevant and useful web

pages. The variation among the different search engines reflects search functions within

a given search engine. The *Yahoo* web site, for example, is not a search engine but a

listing service. A person, rather than a computer, categorizes every site listed on *Yahoo*.

Therefore, although there are fewer web pages returned, those that are returned are more

likely to be relevant. Most search engines merely search for key words in the text,

headings or meta-tags (hidden keyword lists) of a web page and rank the relevance of the

different sites, based on the number of appearances of a certain key word. If someone is

doing a search request for "Snake River" and "Dams", the search engine will retrieve the

list of web pages, in order of how often those words appear on a web site; or whether they appear in titles or headings. As the various search terms demonstrate, using a particular key word can contribute to the retrieval of an enormous quantity of web pages. The casual viewer must also be cautious about inferior or false information. It is easy for a web designer to create a site that looks professional and legitimate for a company that is not.   On the other hand, legitimate organizations frequently have poor quality, unprofessional web sites, so often knowledge of a field or background checking is important when using information from the web.

A freshwater NGO using the Internet to look for a specific piece of information needs to be aware of how search engines work so it can maximize its time on the Internet and retrieve more relevant information. If an NGO is looking for another organization with a mission similar to its own, it must be cognizant of how to use key words. Putting in "freshwater", "conservation" and "organization", in that order, listed over 6 million web pages on the Infoseek search engine. NGOs simply do not have the time to filter through and utilize this massive amount of information, much of which is completely irrelevant. When using a search engine, general key words should be replaced by more precise or less common words. For example, in addition to "freshwater" and "conservation", the user should include a focus area e.g., ("Snake River.") These are simple instructions, but they can save significant time and effort when searching the ever-expanding Internet.

Corporate Sponsorships on the Internet

Many non-profit groups are starting to exploit corporate relationships on their web sites. For example, the World Wildlife Fund (WWF) has a partnership agreement with several corporate interests, including Amazon.com, ClickRewards, and Cybergold. Individuals who include an Amazon.com web link on their own personal web sites can contribute financially to the World Wildlife Fund. When a user clicks on this link, Amazon.com will donate between 1 and 10 percent of that user's purchase to the WWF (http://www.wwf.org). For each person who signs up with Cybergold.com (http://www.cybergold.com) as a member, Cybergold will donate one dollar to the WWF.

These corporate sponsorships represent new and exciting ways for NGOs to exploit the Internet. This type of Internet strategy saves the organization significant financial resources that would have otherwise been wasted on traditional paper mail. Several of these partnerships owe their existence to the Internet.

WWF has the benefit of being a world renowned and respected conservation organization. Smaller groups will find it more difficult to acquire corporate sponsorships, particularly if they are considered too 'extreme' or on the fringe of the environmental movement. Still, smaller NGOs can look to local corporate interests to establish these type of relationships. A local aquatic conservation organization might want to establish corporate relationships with local businesses. These could be almost any type of business that already has a web site, but is seeking to expand users to that web site. By creating a relationship with a local non-profit group, a business has an opportunity to do something charitable and also generate additional revenue. This also provides a unique opportunity for a business interest to appeal to an established base of Internet users. Finding an

audience on the Internet can be a daunting task, and these types of donor relationships can be an useful vehicle to reach a certain type of consumer (Lane 1995).

<u>Media</u>

One interesting and advantageous way that the Internet has established itself as a useful medium is through the vast amounts of information that an NGO can provide on issues through its web site. In many circumstances, the media shows little interest in covering environmental stories. In situations where they are covered, it is usually at a critical moment in a particular campaign. A web site can post all relevant information regarding a particular issue so that the user can understand the history of that issue. Recently, Vice-President Al Gore toured the Everglades to announce a new plan to protect the park with federal money. It is difficult for viewers to fully comprehend the significance of this initiative based on a one-minute story on national television. The Internet can provide information about the history of the program. Users can see how the development of this federal plan came to fruition by the actions of various stakeholders involved in the process. They can access commentary and related stories that provide a more thorough representation of the Everglades program. The Internet allows aquatic conservation organizations to provide media on their own terms without being at the mercy of larger, more traditional media formats (Keys 2000).

Also, traditional forms of print media offer the reader little or no opportunity to interact with the source of that information. The Internet offers excellent opportunities for this type of interaction. For example, the web site for the Friends of Earth organization offers a map that identifies each location of the United Kingdom Chemical

Release Inventory

(http://www.foe.co.uk/campaigns/industry_and_pollution/factorywatch2/). A map of the

United Kingdom is provided on the web site in which the public can click on a region or

enter their zip code and it displays the industries that are polluting in that region. This

offers an excellent opportunity for users to identify point-source or even non-point

sources of pollution in their watershed by bypassing the traditional method, (i.e.

gathering specific information from the various relevant governmental agencies).

Web site services exist that allow freshwater conservation NGOs to release

information to various news sources and receive environmental news. By using the

Internet to promote a message, an NGO can target a larger audience than by using

traditional means, such as telephone, fax, or postal mail. One such service, the

Environmental News Service, transmits information to over 1,500 newsrooms, reporters,

and people involved in the environmental movement throughout the world. It also sends

environmental news updates to an NGO's e-mail account (http://ens.lycos.com).

Although this service is not free, it facilitates awareness and can keep a freshwater NGO

abreast of current environmental issues. Integrating Internet message delivery with other

traditional methods of issue awareness is the most effective way to achieve organizational

goals (http://onenw.org/toolkit/webdesign/strategy.html).

These types of services provide yet another example of how the environmental

community is opening up new avenues of dialogue. These avenues can prevent

freshwater conservation NGOs from becoming isolated within their own region by

accessing all relevant and available media on the Internet. By becoming aware of issues

facing similar groups, a freshwater NGO can sharpen its own mission and goals and be prepared to face new challenges as they arise in their area.

Scientific Research

The ability of NGOs to disseminate information is dependent on efficient gathering and comprehension of reliable and sound science. Many web sites are providing a medium for scientists to interact directly with the public (Beard et al. 1998). The amount of scientific information on the Internet is staggering. Scientific societies, federal and state agencies, private foundations, universities, and individual scientists are continually adding information to the Internet. Freshwater conservation NGOs need to be aware that this information provides many opportunities as well as challenges.

Information online may be inaccurate. Even if the information is reliable, it may be disorganized, and lacking acceptable references (Carling and Harrison 1996). Using 'bad' science can severely undermine an NGO's ability to fulfill its mission and also maintain its reputation within the conservation movement. Therefore, only someone with the skills to identify quality work from unreliable work should be sent out to search for information on the Internet.

Scientists are increasingly using the Internet to organize and exchange ideas. For example, the Biodiversity Conservation Information System (BCIS) links conservation organizations with extensive data and technical resources to new and emerging information technologies like the Internet. BCIS (http://www.biodiversity.org/) serves as a massive information warehouse of reliable scientific data that can be accessed by those groups working toward the conservation of biodiversity. This web site provides members

with data on such topics as vegetation, land cover, taxon names, and geographic

information and how these topics relate to biodiversity (Carling and Harrison 1996).

These central, organized metadatabases are becoming increasingly popular with NGO

members and scientists because they bring a sense of uniformity to a platform - the

Internet - that is increasingly disorganized.

Another example of a metadatabase available on the Internet is the Multi-state

Aquatic Resources Information System (MARIS)

(http://www.gis.uiuc.edu/maris/Default.htm).   This database maintains fisheries datasets

for lakes in the states that are participating: Iowa, Michigan, Minnesota, Ohio, and

Wisconsin. The dataset allows anyone to access fish record information through the

Internet. Spurring the creation of many of these metadatasets are mandates by federal

and state agencies to provide assessments of biological resources. Putting this

information on the Internet can be a cost-effective way of allowing access to this

information (Beard et. al 1998).

Other examples of scientific data becoming available online is proliferation of

Geographic Information Systems (GIS) web sites. Freshwater conservation NGOs now

have access to huge amounts of GIS data available through universities, other NGO web

sites and state and federal agencies. The Environmental Protection Agency (EPA)

provides a "Surf your Watershed" web site where visitors can find individual watersheds

and identify threats to those systems (http://www.epa.gov/surf3/locate/). This

information can be extremely valuable to an NGO that is trying to identify potential and

existing threats to aquatic ecosystems in their focus areas.

There is also a drive to provide more *real-time* data sets online. *Real-time* data is when a user has access to live video feed from a particular location. Cities place cameras on highways to keep track of traffic problems with live instant footage. With real-time data, an NGO can access web sites that display what is currently going on in a particular stretch of river. All too often pollution in aquatic ecosystems occurs without any form of oversight and it is difficult to determine the location and cause of this pollution. With real-time data, an NGO can monitor the situation more closely.

There are other examples of real-time applications. For example, members of Greenpeace were able to provide live video coverage of the nuclear weapons testing conducted by the French government in the South Pacific. Web users were able to log on and *see the action live*. This real time capability allows environmental groups, and the public, to respond almost immediately without waiting for traditional means of media to cover the event, if they cover it at all (Keys 2000).

Another example is a proposed Internet web site at the Institute of Ecology at the University of Georgia that would provide a virtual tour of the Altamaha Watershed. Users would be able to travel down the Altamaha River using their own computer. These virtual trips will give the user a first person perspective on what the river looks like. More importantly, this first person perspective can give users a direct look at the threats to the watershed. They can see development that is occurring along the river and how it adversely affects the watershed. All this information will be accessible via the Internet (Personal communication Laurie Fowler, Institute of Ecology, University of Georgia).

The *InterWET* web site combines mathematical tools and the Internet to model anthropogenic effects on watersheds

(http://server.age.psu.edu/dept/grads/parson/research/home.htm). It acts basically as a

calculator that computes impacts of certain actions within a watershed. For example, it

can be used to calculate the percentage change in surface runoff with changes in housing

development policy. Although this particular site is geared toward a region in

Pennsylvania, the technology can be exploited by organizations throughout the world.

The appeal of this tool is that is allows the average web user to visualize cause and effect

relationships regarding their watersheds. With the Internet, this type of information it is

available to any organization or individuals who are interested in exploiting the

technology.

Another web site that is providing a watershed management model over the

Internet is Patuxent Watershed Management

(http://kabir.cbl.umces.edu/PLM/WMAN/PWA.html). The goal of this project was to

provide watershed management models that stakeholders could access to understand the

functioning and dynamics of watersheds. Although it has had limited use, the creators of

this Internet based modeling system have received positive feedback for the continued

use of this type of web-based decision supporting tool (Voinov and Costanza 1999).

Scientists and NGOs are increasingly using listserves to exchange and refine ideas

before they are put to practical use. For example, the Florida Everglades are currently

undergoing a massive restoration through the work of local, state, federal and non-

governmental organizations. Scientists and engineers working on the project created a

listserve. They posted their proposals on this listserve with the specific purpose of

eliciting feedback from other professionals and individuals with an interest in the project.

This feedback process has allowed the various proposals to incorporate a wide a variety

of voices. Posting directly on a listserve allows immediate contact with other involved parties. It also permits rapid feedback time. All too often, people feel left out of the decision making process, but in this example, the listserve provided a broader platform to be heard (Personal Communication Cyril Zaneski, Editor, Miami Herald).

Listserves are a useful way to disseminate and gather information about a specific subject. Listserves are usually created with a particular subject in mind. Environmental listserves can be on almost any subject, ranging from water quality or toxic waste, to environmental law. Many listserves are created for a specific region.

The Altamaha River listserve (ALTAMAHA@LISTSERV.UGA.EDU), for example, was created to provide a forum for stakeholders in the Altamaha watershed, located in southeast Georgia, to discuss issues relating to this watershed. Although anyone can participate, participants are generally those people with an interest in the chosen topic (http://www.state.ia.us/main/help/listhelp.htm#Why). Some of the topics of discussion on the Altamaha listserve include: how a proposed construction of a bridge may adversely impact wetlands adjacent to the construction site; solicitation of volunteers to pick-up trash along the river; and letting other people know the organizations that are involved in the watershed. The format is relatively informal and people are free to discuss whatever topic they deem appropriate.

These listserves provide an excellent medium to research specific topics because they allow the researcher to scan archived dialogues. Many web sites offer listserve services for free. Some of the more complex listserves have a mediator who provides some direction to the dialogue, but usually it is up to the participants to determine what the content will be. Another freshwater conservation NGO that takes advantage of

listserves is the International River Network that has listserves for numerous projects throughout the world. People can comment on dam construction projects in China, India, and any place the International River Network has a presence (http://www.irn.org).

As these examples demonstrate, the opportunity is growing to exploit scientific information on the Internet. Freshwater conservation NGOs need to recognize these resources and utilize them to further the goals of their individual organizations.

Electronic Mail

Electronic mail, or "e-mail", is the most popular form of communication on the Internet. Most freshwater conservation NGOs establish e-mail accounts through their Internet service provider. These accounts allow members of the organization to send and receive e-mail.

E-mail allows users to communicate with people over vast distances. The cost and time associated with traditional methods of mail (postal) delivery can make constant contact cost prohibitive or impractical in circumstances where information is needed immediately. An activist working in India on a dam related issue could e-mail a colleague to ask for information immediately. All too often, decisions need to be made rapidly and based on sound science. E-mail allows the user to retrieve this information and apply it in a quick, practical manner.

In Estonia and Russia, activists are collaborating in a joint management project to protect Peipsi-Chudskoye Lake. The goal of this project was to allow a variety of stakeholders in this region to give input on how the lake should be managed. This lake serves as a border between the two countries and the regulation of it has been made more

difficult because two governments have jurisdiction. E-mail has allowed activists from both countries to communicate and focus on the conservation of this specific resource without having to navigate the traditional bureaucratic systems that might have made participating in a joint project like this impossible. E-mail is also used to coordinate activities within the watershed in a timely and cost efficient manner. Although most of the outreach is done via face to face contact, e-mail allows communication to occur across political boundaries so participants can adopt more effective strategies. This cross border communication can be especially relevant to participants in the *Water-for-Life* Program. Resources not available in Costa Rica may be solicited through the *Water-for-Life* web site through e-mail to organizations outside the country that have access to these tools.

Participants in this project are also using e-mail to solicit help and expertise from other, more established freshwater conservation groups. Typically, acquiring sound scientific information on a particular subject can be an expensive endeavor, but e-mail allows the users to locate and solicit this information at a relatively low cost and without access to extensive research libraries. Electronic linkages between organizations can help a group understand what other organizations are doing so they modify their own mission so as to be more effective in their goals (O'Lear 1997).

The value of e-mail is becoming more apparent as more individuals use it to exchange information. It is quickly replacing the telephone as the preferred method of communication. As more and more freshwater conservation organizations recognize the value of e-mail, its place within the workplace will become even more prominent (Sherwood 2000).

Web Rings

As more information becomes available online, conservation organizations will

find it difficult to be heard over the vast number of other environmental organizations. A

new tool evolving on the Internet is a web ring. This allows similar groups to sign up to a

web ring service. If a group is a member of this service, then it will have a web site link

that allows the user to visit other groups who are also members of that same web ring.   It

is basically a centralizing service to which organizations can subscribe that lets the online

world know what they are doing.   It provides an opportunity for conservation groups

with similar missions to network together. All too often conservation groups are unaware

of the activities of similar groups. By networking, these groups can avoid redundancies

in their projects and offer their own research to other organizations. These web rings are

gaining popularity because they attempt to solve the time-cost dilemma of searching

through the Internet (http://nav.webring.com/what.html).

Web Design Tools

The following section identifies tools NGOs can integrate into their web sites.

These tools are used for actual web site construction. While this is only a partial listing

of available tools, it includes the most relevant to freshwater NGOs. Many resources for

general web design can be easily located on the Internet.

Because a web site is the main interface an Internet user has with an organization,

the web site should explain the organization's mission in simple terms. It should also be

organized simply so the average user can easily maneuver (Rowland 2000). The Internet

is still a relatively young technology and many private corporations and nonprofit groups

are determining the best interface, e.g., the layout of the web site, they provide. The technology is quickly evolving so that in five years, the web sites that are currently available could be fundamentally different in appearance and in the services they provide.

The challenge for many freshwater NGOs is to design a web site that will be both practical and appealing to visitors. There are many considerations when constructing a web site, the primary one being: *who is your audience*? Various software is available that can be used in designing a web site, but many of these programs are complex, difficult to use, and expensive. An NGO should be aware of the options available to it. There are a variety of inexpensive software programs that many NGOs are utilizing today. Microsoft FrontPage, for example, can be purchased for as little as $150.00. And for those interested in used products, an NGO can purchase Microsoft FrontPage for $35.00 on Ebay (http://www.ebay.com)

Users have various reasons for visiting a particular site, including looking for general or specific information on that particular organization or on a specific issue; searching for a link to another similar site; reading publications; locating contacts; searching for job opportunities; looking for voluntary options, locating causes to donate to, etc. Freshwater NGOs need to factor in this information when designing a web site, and include information for each of these consumer needs.

Web site Index

One of the easiest ways for a user to find a specific piece of information is by including a site index. A web site index should be accessible on every page, especially the home page, because users frequently become frustrated when they can not find the

link they are looking for. A site index should include a list of all web pages within the web site. It is also critical that each link is labeled properly. For example, if an organization has several publications on the effects of dams on rivers, it would be more sensible to call that link "publications", rather than "Effects of Dams on Rivers." People might not interpret the latter as a publication as opposed to some other form of information. Most of these recommendations are based on common sense, but there are guides that can help structure the design of your web site (Rowland 2000).

Links Page

An important resource that any page should include is a links page. Most links are relevant to that particular site. Many visitors to a web site are just using it to find a link to a more relevant site. A links page makes a web site an open site through which users can maneuver to other sites with similar topics without doing a search for those links.

Someone looking for a freshwater conservation organization in the Mississippi watershed might have been led to a particular web site by a search engine, but this site may not include the information they are looking for. But if you have a links page that includes organizations and agencies with similar goals as your organization, then the user can use your web site to locate something more relevant. This is just as important as providing a publication or a photo to someone who came to visit your site specifically. This web site was used to help solve an information request, even if they were only using the web site briefly. NGOs need to be aware of this type of "traffic" when attracting people to their web sites. Even if these users are visiting a web site for a brief period, a layout design that catches their eye can easily be designed. Some web sites receive more

traffic than others, simply because they offer an extensive links page. Visitors are not interested in the content of that web site, but of the links provided to other similar web sites. NGOs should take advantage of this traffic by designing their site with this type of transitory visitor in mind. If the visitors like the web site, they may be inclined to spend more time there and potentially donate to that organization. The links page on the *Water-for-Life* web site includes web addresses for a variety of different organizations. These include Spanish language environmental organizations, governmental and grant agencies, along with other tropical education web sites.

Organizational Contact Information

Many visitors to web sites have a specific query that can not be answered by the information available on the web site. In these cases, providing contact information for the organization will be useful. Visitors may have questions about recent activities, job opportunities, or publications that are not available online. A "Staff Contact" page with e-mail addresses of all employees should be readily accessible. Providing a description of the different employees and their role in an organization helps the user determine whom to contact. A generic e-mail address should also be provided on every page in a web site. A user should not have to maneuver back to the home page to find a contact. The ideal web site should have the contact in a consistent place, usually at the bottom of the page. This way, if a visitor has a question about a specific piece of information, they can look on that same page and click on the e-mail address. Predicting what a user is looking for when they visit a site is difficult. By having contact information on each page, you provide this option whenever the user feels the need to use it.

Statistics Monitoring

Using a *hit counter* can be advantageous to an NGO that is looking to track the type of traffic that is coming to their web site. It is a relatively simple way of determining if and how a web site is being used through analyses of the valuable demographic information about the visitors entering a web site. For example, a *hit counter* can identify the type of computer someone is using, access speeds, operating systems, and Internet service providers, to name just a few of the options available on some of these *hit counter* software programs. An NGO can use this information to identify in a general manner who their visitors are and their locations (http://www.superstats.com).

If a web site does not have a *hit counter*, the NGO can not determine how many people are visiting a web site. If an NGO is investing time and financial resources into a web site, they are obviously doing it so that it will be used. By identifying the type of traffic and the volume of traffic, the NGO can alter its Internet strategies to reach a larger audience. As more NGOs begin creating a larger role for their web sites, they will need statistical data to justify the effort and expense that go into those web sites. There are a variety of hit counters available online. Web design software such as Microsoft FrontPage offers hit counters as an option.

Multi-Media

Many freshwater conservation NGOs put photos of the rivers or lakes they are working on their web sites. The Internet lends itself to visual information so an NGO would be wise to include images along with text on their web sites. Although there are

exceptions to this rule, there are very few ways to attract the attention of a casual visitor than by having a pleasing image on the main page.

Freshwater conservation NGOs can also use photos to highlight focus areas. This can give the visitor an understanding of what is being protected.   Having an image of a open pipe draining into a stream can be a substantially more powerful message than the same topic explained in text. There are many creative ways to use images on a web site. NGOs can include maps, animations, and photo galleries as ways to attract attention to their web sites.

However, one potential concern with including numerous images on a web site is that they generally take longer to download if a connection is slow. An NGO needs to know who its audience is and decide if having large images is appropriate for its clientele (http://www.webreview.com/pub/2000/03/10/feature/index3b.html).

Employment Opportunities

Many NGOs are posting job openings on their web sites. This can save them expenses that would otherwise have been spent in newspaper advertisements and announcements in employment journals. By posting a job opening online, the NGO can reach a national, or even international audience, and attract the best candidates for a given position. There are also numerous environmental job postings web sites to which NGOs can submit position announcements. There are literally dozens and dozens of these services, so if an NGO is really interesting in reaching as wide an audience as possible, the Internet can be a tool to achieve this (Hansen 2000).

These are a few of the many tools and resources that an NGO can put on a web site. It is beyond the scope of this thesis to provide an explanation of them all. These examples were used to give the reader an idea of the various opportunities in employing an Internet strategy. As these examples demonstrate, the opportunity for growth on the *Water-for-Life* web site is substantial. It will be important for future participants in the program to correctly identify the online resources that will be most useful to them and determine if these resources can be reasonably incorporated into the *Water-for-Life* web site.

The *Water-for-Life* web site incorporated many of the tools described in this chapter. The outreach products created by former graduate students in the *Water-for-Life* Program were developed by gathering sound scientific information and applying that information into the design of environmental outreach tools. E-mail, a web site index, a links page and organizational contacts were also incorporated into the design of the *Water-for-Life* web site.

Future graduate students participating in the program can easily incorporate search engines, corporate sponsorships, newsletters and statistic monitoring tools. The inclusion of these tools will demonstrate the level of commitment to the *Water-for-Life* Program. It is difficult to predict what tools will be most useful and only by soliciting feedback on the existing tools can future participants evaluate the potential needs of the web site.

CHAPTER IV

A Survey of the Internet Strategies of Selected Freshwater Conservation Organizations

In Chapters II and III of this thesis, I focus on the variety of resources and strategies available to freshwater NGOs. In Chapter IV, I identify specific examples of how these organizations are using the Internet in their daily operations. To achieve this, I directly surveyed selected freshwater NGOs with an Internet presence. This chapter serves as a practical guide as to "what works" and "does not work" when developing an Internet strategy and web site. These "real-world" examples helped me develop the *Water-for-Life* web site by offering insight on what practical considerations in designing a web site and developing an Internet strategy.

A survey was conducted to identify computer use and Internet strategies for various types of freshwater conservation NGOs throughout the U.S.A. Criteria for picking these particular organizations were relatively simple. Survey groups represent mostly smaller organizations working at a regional level, state level, or even watershed level. Many of these groups have very limited financial resources. Some, but not all, rely on volunteers to build and maintain their web sites. I targeted these groups because they were more likely experiencing a sharp learning curve. My goal was to identify models that could be incorporated in the *Water-for-Life* web site.

All of the NGOs surveyed had a web site. I included groups that focused on conservation of freshwater ecosystems, (e.g., lakes, rivers, and streams). Several of the groups focused exclusively on an animal species (e.g., California Trout), and since the

protection of these focal species is related to the health of the ecosystem, I included these groups within my survey. I excluded groups concerned solely with water quality and similar organizations that do not focus on ecosystem management. I avoided larger organizations, such as *The Nature Conservancy* and the *World Wildlife Fund*, because they have access to substantial financial resources and are able to hire professional web designers and marketers. Their Internet strategies are fully funded by the organizations and thus do not fit my selection criteria of small groups experiencing a sharp learning curve.

The eighteen question survey (See Table 2) was sent out to 51 different freshwater conservation organizations, with geographic regions ranging from single stretches of a river to entire watersheds, some working on a nationwide scale. A total of 20 respondents replied (See Table 3) to the survey, which is a 39%, return rate. Responses from several questions are not addressed because information was redundant or the information did not lend itself to analysis. Some of the respondents were unable to answer questions because they lacked the technical expertise to understand the question, but the overwhelming majority were able to answer most of the questions. Survey results are analyzed in the following sections of this chapter.

One of the questions in the survey was: "*Do you think environmental groups should use the Internet? Why?*" Although this was a generic, open-ended question, I received some useful and insightful responses from those individuals working in the field of freshwater conservation about how their organizations were adapting to Internet technology. Although the vast majority of the respondents to this question answered in a

positive manner, there were a few critical comments. Negative and positive excerpts are

listed below:

Question: *Do you think environmental groups should use the Internet? Why?*

Positive responses

- "I think it is important for environmental and other civic groups to use the Internet to disseminate information. The resources the Internet provides for educational and informational purposes is too great a resource to not be used by groups. E-mail discussions, chat rooms, message boards and such are extremely effective at bringing people together to support a unified message or cause." *Friends of the White River*
- "They must use the Internet. It can be used to quickly get the word out and also keep people informed." - *Visual Voices*.
- "Yes - it moves information quickly [and] to a diverse audience." *Allegheny Watershed Network*
- "Sure. The ability to get large amounts of information out to people at very low expense is great. Plus, the immediacy of the communications. Also, environmental groups should always support something that produces less waste." *California Trout*
- "Absolutely…This technology enables people to inform themselves about the issues. It will take an active population to deal with the impacts of humans on our planet." *Grand River Conservation Authority*
- "The key to the Internet allows us to network with many other small organizations that we may not have had the chance to connect with otherwise." *Coldwater Fisheries Restoration and Conservation*
- "Yes, if you want to reach the public, it is an essential tool." *French Creek*
- "Absolutely - quick action is the essence of grassroots advocacy." *Friends of the Locust Fork River*
- "It is a timely, readily accessible, and represents a major way that a growing number of people acquire information. It has also led to the acceptance of terrible spelling and horrible grammar…" *Potomac River*
- "Yes. Saves resources. Environmentalists fight an uphill battle and any way you can be more efficient and more effective should be used." *West Virginia Rivers Coalition*

Negative responses

- "The biggest limitation is publicizing locally to get those types of individuals that do not normally use the Internet as a means of communication." *Visual Voices*.

- "Yes [but] it can be misused. There is a huge amount of misinformation out there." *Glen Canyon Institute*
- "Environmental groups, like any other person, should decide for themselves how best to communicate. If they are working with poor and impoverished people, i.e., on a Native American reservation, they should not [use the Internet]." *Mississippi River Basin Alliance*

The above comments indicate that the freshwater conservation community is actively embracing this new technology. Many see its primary role as a communication facilitator, but there are numerous other ways these NGOs are using the Internet for freshwater conservation. Although creating a web site can be relatively easy, it still consumes time and financial resources that could be spent on other projects within an organization. One survey question attempted to identify why NGOs committed time and resources to an Internet strategy.

Question: *Why did your organization decide to commit time and resources to a web site?*

- "We saw the need and a board member provided the resources and then pushed for it." *West Virginia Rivers Coalition*
- "Save[s] resources, could put a lot of information on the web so people can more quickly access…rather than mailing out information." *River Alliance of Wisconsin*
- "Offered free." *Saugatucket River Heritage Corridor Coalition*
- "To increase our presence, cut down on the number of info requests we get, and eventually, to be able to share water quality data sets over the [Inter]net." *Potomac River*
- "Large geographic area covered, small staff." *Mississippi River Basin Alliance*
- "We feel strongly that the Internet has a major role to play in the delivery of programs and services and as a means of raising the general level of awareness about the issues in our watershed." *Grand River Conservation Authority*
- "Education with regards to the White River of Central Indiana is our main goal. I was moved to become Webmaster due to an environmental crisis that occurred recently on the White River. I felt it was necessary to disseminate good information regarding the current crisis." *Friends of the White River*
- "We started in 1996, because we knew that is was a growing source of information for students and others." *French Creek*

- "Needed to communicate timely info without a large mailing budget." *Coldwater Fisheries Restoration and Conservation*
- "It is a relatively inexpensive way to disseminate a broad range of materials to interested parties. Rather than going to the expense of printing up 4-color brochures that become outdated within months, we have our web site which can be updated in hours. It also gives a forum that is on equal footing with the "big boys" we can have as big a presence on the web as organizations with millions of dollars to spend." *California Trout*
- "An information and public relations tool." *Izaack Walton League*

The feedback for this particular question recognizes many of the benefits associated with the Internet. These quotes do not include all twenty respondents. Many responses are redundant and address similar rationales. The most common responses recognized the role the Internet plays as an information warehouse and also as a means to communicate with a large audience in a relatively inexpensive way. As *California Trout* observed, the Internet is a great equalizer. Groups that have traditionally been unable to compete with large businesses (i.e. those that have enormous financial reserves) can now focus attention on a specific issue by posting information on a web site. Before, these organizations were at the mercy of the general media, one of the few platforms for a wide message delivery.

Friends of the White River decided to invest time and resources in a web site due to an environmental crisis in the White River. The Internet can provide a forum for immediate action, which the *Friends of the White River* discovered. When the crisis occurred, *Friends of the White River* used the Internet to bring attention to the issue. In many situations, reacting to an environmental crisis in a timely manner may be the only way to achieve tangible results, and now freshwater conservation NGOs have a resource that allows their voice to heard almost immediately.

The following figures represent responses to the survey. These results are based on the 20 respondents that answered the questions in the survey.

Figure 1
Types of Internet Connections
n = 20

T- 1/3 Connection 5%
DSL 14%
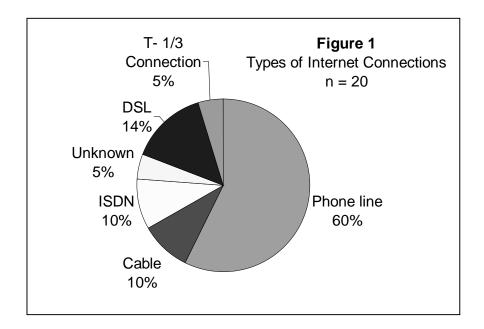Unknown 5%
ISDN 10%
Cable 10%
Phone line 60%

Figure 1 represents a snapshot of the different types of Internet connections that freshwater conservation NGOs are using to access the Internet according to my survey. Internet connections can either be slow or fast, relatively speaking. The technology has come a long way in a only a few, short years, but to many, there is still a demand to increase these access speeds. Faster speeds can save an NGO time and money. The Georgia Wildlife Federation found that e-mail correspondence was taking up a substantial amount of time, so acquiring faster access was a practical decision. Faster access has also allowed the Georgia Wildlife Federation to respond to requests for its revenue generating native plant sale. Requests for these plants can be addressed more quickly and in larger volumes. In the next few years, more and more organizations will begin to utilize faster Internet connections (Katz 1999).

When designing a web site, one needs to be aware of different connection speeds. Currently, most Internet users are accessing the Internet using a phone line, with speeds ranging between 14400 kilobytes per second (kps) to 56,000 kps. These numbers represent the amount of data that can be transferred through phone lines and determine how fast a page will load onto a computer screen. Some organizations are taking advantage of cable line access, high speed Digital Subscriber Lines (DSL) lines, and satellite service. Connection speeds are even slower in other countries, especially developing ones, where users are frequently using connection speeds of 14,400 kps, a very slow speed. Access speeds in Costa Rica are currently much slower than the access speeds in the U.S.A. I had to factor these different access speeds in when designing the *Water-for-Life* web site. I needed to avoid loading the web site with large image files because these web pages would take a substantial amount of time to download.

Based on the 20-sample survey, there are six categories of Internet connections. DSL, Cable, Integrated Services Digital Network (ISDN), and the T – 1/3 connections represent high-speed access to the Internet. These connections give the user some of the fastest speeds currently available. Close to 40% of survey respondents used high-speed connections. This number will likely increase. One respondent indicated that he/she did not know what type of Internet connection his/her organization had, which probably reflects a low-level of technical expertise.
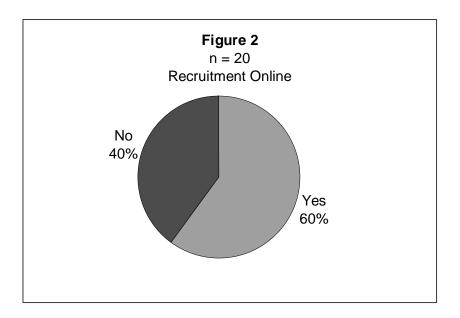
Although substantial portions of the respondents are using a high-speed connection, the majority are still using telephone lines. Cost is likely a major reason these NGOs are not using high-speed connections. These access fees can be substantially higher than telephone access fees. For example, some telephone services can be as low

as $19.99 a month ([http://www.negia.net)](http://www.negia.net), while cable modem access can run as high as

$40.00 a month. Many NGOs lack the technical expertise to identify what options are

available, even if they have the financial resources to purchase additional resources.

Those using high-speed connections recognize the value of accessing information on the

Internet at high-speeds. The importance of speed can not be understated. When an NGO

needs to download larger files, such as large documents and audio and video files, the

need for a speedier connection becomes apparent. Some NGOs may not use speedier

connections simply because their cities or regions do not offer these services. There are

still significant areas of the country where individuals and businesses are unable to obtain

cable-modem access. Freshwater conservation NGOs based in rural areas may be at a

disadvantage with respect to their ability to obtain high-speed connections. Connections

in rural areas will be of particular concern for individuals participating in the *Water-for-*

Life Program since developing countries still do not have the high-speed access available

in the developed world.

Freshwater conservation NGOs will need to decide what priority they will place

on having high-speed access. Those groups using the Internet mainly for electronic

communication may not need to invest in a high-speed connection. Those NGOs that are

using the Internet as a major method of research will begin to place a higher priority on

accessing large files quickly. As the Internet evolves, so too will the priorities of the

NGOs using it.

Figure 2 represents the percent of survey respondents whose organizations recruit

volunteers online. This means that they use e-mail or a web site to recruit people to

volunteer for their organization in numerous capacities. This could mean recruiting

people to participate in a trash pickup or placing interns within their organization. Some
of the NGOs surveyed do not recruit volunteers, since it is not relevant to their particular
organizations. These NGOs fell under the "No" category.

Figure 2
n = 20
Recruitment Online

No
40%

Yes
60%

As Figure 2 demonstrates, NGOs are increasingly using the Internet to recruit
volunteers. Recruiting people through the Internet can be an efficient, cost effective way
that can save an NGO financial resources that might have otherwise been spent on
telephone fees or paper materials. It also can be an enormous time saver. Instead of
tying up an NGO's staff time with recruiting, a web site offers the opportunity for
volunteers to register online.

Freshwater conservation NGOs should also be aware of problems associated with
depending solely on the Internet for volunteer recruitment. There are substantial numbers
of people who currently do not have e-mail addresses or access to the Internet. These
people could potentially constitute a significant volunteer base that is being overlooked
by an organization that only uses the Internet to recruit volunteers.

Freshwater NGOs should view the Internet as simply another inexpensive

opportunity to recruit volunteers. Some of the tools available, e.g., chat-rooms and

listserves, are valuable for approaching people to volunteer their time. Figure 2

demonstrates that opportunities do exist for recruiting volunteers online for the *Water-*

for-Life Program although program leaders must be aware of the unique situation in

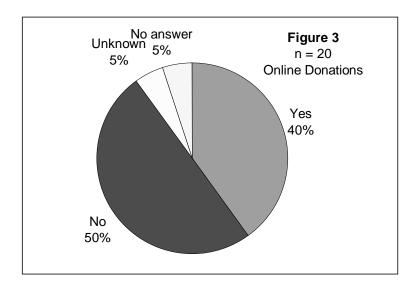Costa Rica and adjust their recruitment efforts accordingly.

Figure 3 illustrates the number of survey respondents that have established a

mechanism within their web sites that allow users to donate directly to that organization.

Forty percent of the respondents now have this option available on their web sites.

Although the number of NGOs that are raising money online continues to grow, many are

unaware of the enormous resources available to nonprofit groups on the Internet.

"Helping.org", for example, will construct and provide the maintenance for a web site

where individuals can donate online to a specific organization and Helping.org retains

2% of the money that is donated. The Internet can thus be extremely valuable to those

NGOs who want to establish an online fundraising presence, but do not have the financial

resources or technical expertise to maintain such an option on their individual web sites

(http://www.helping.org).

Figure 4
Has the Internet improved an NGOs Grant Process?
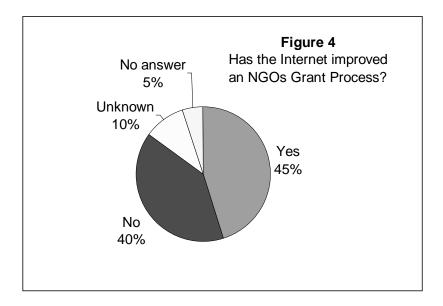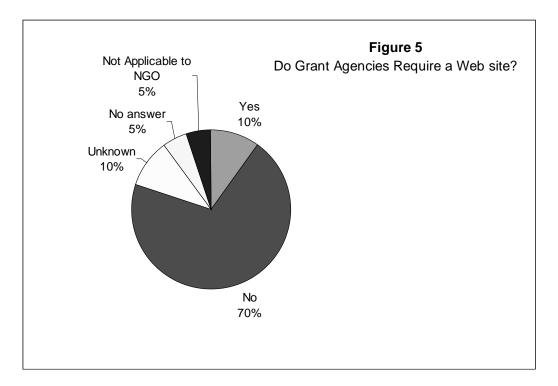
Yes 45%
No 40%
Unknown 10%
No answer 5%

Figure 4 illustrates how survey respondents reply to how the Internet has

facilitated the grant making process. Most NGOs rely on grants and donations from

individuals to operate their organizations, so grant approval is an important concern for

many of these groups (http://www.guidestar.org/about/help/faq_np.html).

Nearly half of the respondents said that the Internet has improved the grant-

solicitation process. The majority of the "Yes" replies were based on those NGOs using

the Internet to find grant awarding agencies and other related resources. In this capacity,

the Internet is being using as a research tool to find grant agencies that support freshwater

conservation. Negative responses are from NGOs that are currently funded and do not

need to actively seek out grants, and those NGOs unaware of the online resources

available.

Figure 5 represents the number of respondents whose grant agencies require that they construct a web site in return for funding. The vast majority of NGOs that responded are not required to have a web site. These numbers could be attributed to NGOs that do not require a web site or to grant agencies that have yet to see the value

Figure 5
Do Grant Agencies Require a Web site?

Not Applicable to NGO 5%

No answer 5%

Unknown 10%

Yes 10%

No 70%

or need for a web site. It is likely that increasing numbers of agencies will require an online presence from those NGOs that they fund. More than likely, most NGOs will not need this prodding and will quickly discover the merits of providing resources online themselves. Their membership base will demand it and they will also feel pressure to provide the same resources that other NGOs are providing.

Figure 6
n = 20
Membership Increases

Not
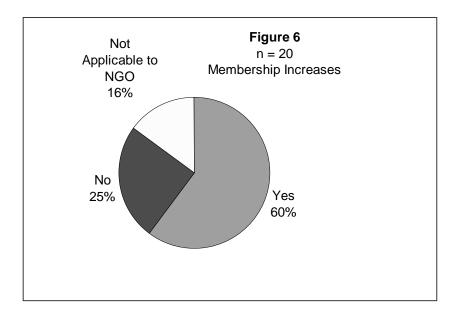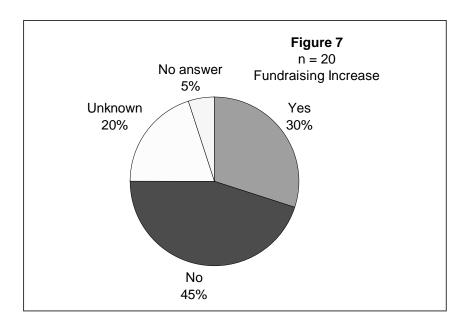Applicable to
NGO
16%

No
25%

Yes
60%

Figure 6 details membership increases associated with the Internet. NGOs are

now taking advantage of the Internet to increase their membership base, as they have

with volunteer recruitment. Sixty percent of the respondents identified the Internet as a

tool for increased membership within their organizations. Sixteen percent of the

respondents answered that the question was not applicable to their organizations because

they do not currently recruit members.

As more individuals use the Internet to pick and choose those NGOs that they

want to support, conservation organizations will need to focus more attention and

resources on their web sites. Using the Internet to increase membership bases is an

excellent way to identify and target groups that were not being reached through

traditional means. Increasing numbers of people are using the Internet for business,

pleasure, and charitable giving. Freshwater conservation NGOs need to adapt and take

advantage of this demographic.

Most of the respondents were unable to identify exactly how a member used the Internet to join the group, since they do not have a system in place that tracks this information. They attribute increases in membership to people randomly visiting the site, promotion of the site, or money directly donated on a web site. It is difficult to identify exactly how a visitor comes to a particular web site. They might have read a newspaper advertisement with a reference or used a search engine with a specific freshwater conservation query.

Figure 7
n = 20
Fundraising Increase

- No answer 5%
- Unknown 20%
- Yes 30%
- No 45%

Only 30% of respondents to the question "*Has the Internet increased your fundraising efforts?*" have seen an increase in fundraising related to their Internet presence (See Figure 7). Fundraising online can be attributed to having an online donation form, or possibly, people seeing the web site then writing or calling the NGO to donate. Although increasing in popularity, the Internet is still not the dominant method in which people donate to NGOs. Organizations should be aware of this so they do not focus all their fundraising activities on the Internet.

One of my questions focused on the nature of target audiences. The majority of the NGO respondents said that their target audience was anyone who was interested in freshwater conservation, however, other NGOs had a more focused constituency. Since some of the groups focus on specific watersheds (e.g., the *Saugatucket River Heritage Corridor Coalition*), they focus on individuals and groups within that region. Traditionally, limited financial resources may have prevented these smaller NGOs from attracting a larger audience, but with the Internet, these groups can generate interest from groups and individuals from all over the world. *Visual Voices* uses their web site to generate interest at the local level, but also to anyone across the nation interested in issues related to the impacts of dams on rivers. These web sites, although geographically focused, provide educational tools for a much wider audience. If the NGOs market themselves creatively, they can also try to solicit funds from groups or individuals outside their geographic region.

Several groups are focusing on students and college-age individuals. These groups recognize the demographic that is most likely to be using the Internet and have focused their marketing strategies on this age group. *California Trout* is hoping their online campaign will attract college age students who might be interested in water issues in the state. In most cases, these NGOs will solicit volunteers from within their geographic region, which is more practical for both the organization and the individuals volunteering. It must be noted, however, that these groups are able to attract more people from across the country, e.g., interns and potential employees. Web sites give volunteers a broad range of options from which to choose.

Two questions in the survey focused on tangible successes that NGOs have had with their Internet strategies. One question asked if any land was preserved based on the actions related to a given NGO's web site. The second question asked what general accomplishment their organization can attribute to their web site. To some organizations, the first question was not relevant, since their mission is not to acquire land. Some groups attributed their web sites to educating the public which could potentially lead to preserving some land, but as of yet, they could not quantify any land that had been conserved as a result.

A few groups attribute some preservation, albeit indirectly, to their actions on the Internet. The *West Virginia Rivers Coalition*, for example, believed that e-mail from the public helped sway a judge to rule that mountaintop removal mining practices were illegal in West Virginia. The Internet, specifically e-mail, is becoming increasingly popular with NGOs to garner interest and action on a particular subject. Legislators are finding themselves bombarded with e-mails when a particular legislative issue comes up that affects water quality in their region.

One NGO, the *Grand River Conservation Authority*, received favorable press from the local media due to their web site. Many NGOs are constantly seeking ways to get attention to convey their message, and by having a popular and accessible web site, the *Grand River Conservation Authority* was able to receive free media exposure.

Several groups recognize the power of the Internet and their own individual web sites as incredible tools to educate the public. The *Glen Canyon Institute* uses their web site to educate the public about the impact of the Glen Canyon dam on the river. They noted that "...it's amazing how many people don't realize that [Lake] Powell is not a

natural lake - that it is actually a reservoir formed by a dam." As the Internet becomes the preferred method for the public to acquire information, then NGOs will be able to finesse their messages to the Internet.

Some groups use the Internet to generate interest in their activities. *French Creek* used the Internet to give their users updates on their recreation of George Washington's canoe trip on the French Creek. The Internet lends itself to these creative ventures as a promotional tool that can be used to generate interest in an organization's activities.

Freshwater conservation NGO web sites are now providing a wealth of information relating to water quality and conservation. The respondents were asked if there was a demand from their users for particular resources on their web sites. The *West Virginia Rivers Coalition* has seen a demand for a variety of resources on its web site. The public has requested materials ranging from legislative information, issue updates, event calendars, educational resources, and finally, specific news items. All of these resources are easily placed on a web site and it provides users with the ability to retrieve all information from one web site, without having to contact the organization and consume their valuable time.

As information warehouses for topics related to freshwater conservation, many of these NGOs are receiving queries for specific scientific information regarding aquatic resources. The *Saugatucket River Heritage Corridor Coalition*, for example, has responded to requests from school age children about aquatic wildlife for their school projects. Not only does this provide a valuable service to the community at large, but it gives the NGO an opportunity to advertise itself and strengthen its reputation to the people its geographic area.

The *Coldwater Fisheries Restoration and Conservation* organization is involved with several ongoing projects and their web site provides the opportunity for Internet users to check the status of these projects. Users can also use e-mail to solicit more information about these projects that is not provided within the web site. One creative feature on the *California Trout* web page is a tutorial on the best technique for catch-and-release fishing. It is popular with those users interested in the long-term viability of trout.

Although most visitors to these web sites are sympathetic to the organization's goals, some visitors can be critical. *Visual Voices* explained how some visitors are using their web site to express their disagreement with the notion that dams have a negative impact. A dissenting voice is more likely to send off an e-mail than call or speak to someone in the office, thereby making it more likely that both sides are heard. Providing a forum for both sides of the argument can strengthen an NGO. This can help them to refine their message.

The Internet has opened enormous opportunities for NGOs to communicate with a broad range of people. The cost associated with contact outside a given geographic region is no longer a constraint. NGOs are now using e-mail and web sites to find and communicate with any group or individual that can contribute to their organization's goals. Sharing information has always been considered a productive means to freshwater conservation and the Internet is now the ultimate communicator.

The survey asked how the Internet has changed the way NGOs communicate. The survey results show the importance the Internet plays in facilitating communication not only within an organization, but with other similar organizations, governmental agencies, and concerned members. The *West Virginia Rivers Coalition* uses a listserve

with each of their projects. The listserve allows more than two people to contribute to a

dialogue and make suggestions that may be incorporated in the project. This process

allows an outside voice to make meaningful contributions.

The *Saugatucket River Heritage Corridor Coalition* sees both positives and

negatives with using the Internet. For example, there is less phone tag involved when

using e-mail, which can be substantially important to overworked NGO employees.

Also, fewer telephone calls means fewer interruptions at work. The downside is that this

organization receives a sizable amount of e-mail, most of which is not relevant to their

watershed, which can be tedious and time consuming to sort and delete. Many of these

organizations also rely on volunteer help and answering voluminous e-mail can take

away from other tasks these volunteers could be doing.

Approaching members from other organizations with a similar mission is an

excellent way to reach a demographic that may be sympathetic to a specific cause. The

Mississippi River Basin Alliance uses e-mail lists when contacting people. These lists

also save time by allowing an NGO to send out a similar message to an unlimited number

of people. Once again, the Internet can be a significant time and resource saver. The

Grand River Conservation Authority e-mail usage now exceeds its telephone usage.

Some NGOs need to build a consensus on particular issues and projects. Before,

NGOs relied on telephone contact to coordinate their activities, but with e-mail, these

consensus building projects can be done more quickly and efficiently. *California Trout*

uses "sign-ons" when creating a consensus on a particular project. "Sign-ons" allow

users to sign-on and give feedback.

These examples all demonstrate the flexibility of the Internet medium. Participants in the *Water-for-Life* Program should exploit this flexibility when using the *Water-for-Life* web site. There are innumerable ways to generate interest in the program or, more importantly, coordinate specific activities within the program by using a web site. The *Water-for-Life* web site can be used to post sampling data, geographic information, question posting, and as a reference source for those involved in the program. All these opportunities are currently available and it is up to those participating in the *Water-for-Life* Program to exploit these opportunities when possible.

Conclusions

This survey demonstrates the critical role that the Internet plays for many freshwater conservation NGOs. The rate at which these organizations are adopting Internet strategies is increasing. Each respondent acknowledged the Internet's value in providing tools for facilitating communication. These NGOs represent a growing number of smaller organizations that are exploiting this relatively inexpensive technology. As NGOs become more technologically savvy, they will further see the need to expand their Internet presence and identify a more comprehensive Internet strategy. Time and costs are still significant obstacles to NGOs. Many of these organizations will be at a severe disadvantage if they choose to ignore all the tools available on the Internet. They will find that their peers in the field are quickly embracing this technology and exploiting it to its fullest ability.

The *Water-for-Life* Program is positioned well to take advantage of these NGO's various Internet strategies. By taking this 'snapshot' of Internet use in the form of a

survey, valuable lessons were learned (i.e., research tools and communication techniques), and incorporated into the *Water-for-Life* web site. Every tool and strategy identified in this survey was not necessarily employed in the *Water-for-Life* web site, but the NGO's experiences did serve as a practical guide in my work. By recognizing the resources that were most useful and ascertaining what was actually accomplished by having a Internet strategy, I was able to make informed choices on what might be most relevant to the *Water-for-Life* web site.

The most important lesson I learned from the survey results was the need to focus on who my audience is and will be. The overriding concern in developing this product was the ability of users in Costa Rica to access this web site. This concern was allayed by my second trip to Costa Rica where past and current participants all expressed enthusiasm to proceed with the development of the *Water-for-Life* web site.

The survey results also served as a guide to the successes and failures each group has experienced in the development of their individual web strategies. I hope by describing their different methodologies in this thesis, future participants in the *Water-for-Life* Program can select the strategies that best suit them.

FINAL CONCLUSIONS

As more remote communities in developing countries obtain Internet access, they will have more options to access a wealth of data that is available online. All too often, developing countries have difficulty accessing printed editions of quality environmental educational materials (Pringle et al. 2000). A classroom can now access this information with a computer and a modem. Expensive purchases of environmental education books will no longer be a factor for groups interested in participating in a program like *Adopt-a-Stream*. Web sites offer an excellent opportunity to reach a wide audience at minimal expense.

It will now be important to expose members of the Costa Rican community, specifically those communities who have been involved in the *Water-for-Life* Program in the past, to the web site, so that they become comfortable with this technology and understand how they can use it to best protect their freshwater resources. As the *Water-for-Life* Program changes, so too should the web site that will serve as the central information source for those participating in the program. We are optimistic that the *Water-for-Life* web site will open up new opportunities for freshwater conservation throughout Costa Rica and Latin America. Several times during the course of my studies individuals interested in participating or learning more about the Water-for-Life Program have contacted me. We hope the *Water-for-Life* web site will let us take advantage of many of these missed opportunities. We can now forward these individuals to the *Water-for-Life* web site and ask them for feedback and also determine if they have interest in

participating directly or indirectly in the program. By establishing an online presence, we hope that the web site serves as a communication facilitator for those individuals currently working in the program and those potential future participants.

Cathy Pringle has expressed interest in recruiting more students to participate in the *Water-for-Life* Program. I would recommend that these students commit a percentage of their time in the continued development of the *Water-for-Life* web site. The web site currently is designed as a reference tool, but as Costa Rica is exposed to the resources on the web site, we expect to receive feedback on what new tools should be incorporated within this resource. The *Water-for-Life* web site will include a link to this Master's thesis so that future graduate students can access and identify which tools and resources they would like to include in newer designs of the web site.

It will be important to promote the *Water-for-Life* web site at all opportunities. There are numerous ways to promote the web site. Some examples include: 1) registering with search engines; 2) joining online communities, such as Envirolink, that focus on freshwater conservation; 3) establishing links with universities, NGOs, and other groups that have a presence in Latin America; and finally, 4) word of mouth.

Internet lessons learned by freshwater organizations in the developed world have served as useful models in the development of the *Water-for-Life* web site. The goal of protecting freshwater resources throughout the world is a common one and by using the Internet as a communication facilitator and as an information resource, we hope that the *Water-for-Life* web site can be used as one more tool in the worldwide arsenal to protect our freshwater resources.

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Table 1 – Search Engine Results

	freshwater + conservation	*freshwater + conservation + organization*	*aquatic + conservation*	*aquatic + conservation + organization*	*river + conservation*	*river + conservation + organization*
AltaVista	1,550,575	27,558	1,550,580	45,975	1,550,620	45,905
Northern Light	46,002	15,800	71,090	27,159	286,356	94,625
Yahoo	2	1	16	2	109	72
Hotbot	5,000	1,000	10,000	5,000	50,000	10,000
Infoseek	599,250	6,689,984	599,253	6,689,984	2,231,543	6,689,984
Google	44,199	11,196	71,399	18,798	225,995	58,500
All the Web	52,861	14,508	81,427	23,620	271,432	68,514

Table 1 The number of web pages returned using specific key words relating to aquatic conservation. Search was conducted on March 1st, 2000 by Doug Parsons.

Table 2 – List of Survey questions sent out to 51 freshwater conservation organizations.

Equipment
1. Do you have cable modem internet access? (phone line, DSL, or cable)
2. What type of computer are you using?
3. What operating system?

Fundraising & Membership
1. Has the Internet increased your fundraising efforts?
2. If 'yes', by what percent?
3. Are you able to determine if people use the Internet to donate money (either through your web site or mentioned that they found your organization online then donated)?
4. Can you attribute any membership increases to your Internet presence? How much?
5. Do you use the Internet to recruit volunteers?
6. Has your grant applications process been improved?
7. Do any of the grant agencies you work with require that you provide information online?
8. What percent of your budget do you commit to your web site (hiring a webmaster, volunteer, scanning, etc.)?

Goals
1. Why did your organization decide to commit time and resources to a web site?
2. Who is your target audience? (ethnic, school age, legislative groups, other grassroots organizations, etc.)
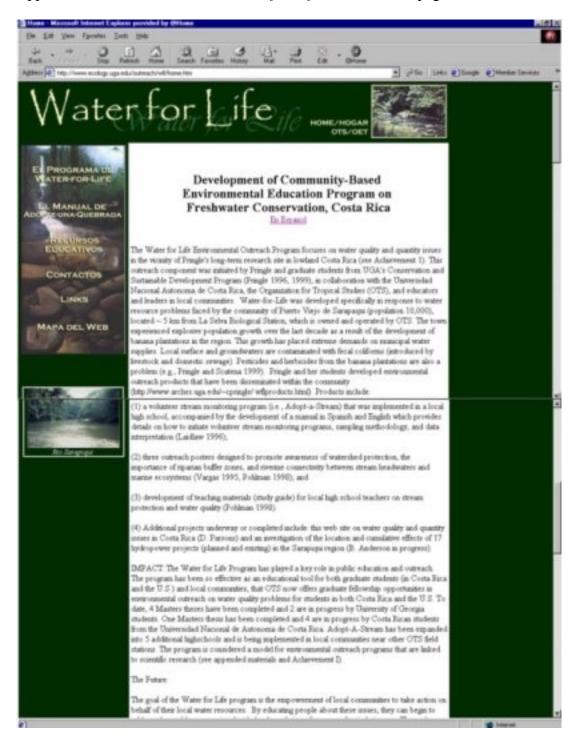
Accomplishments
1. How much land has been preserved that can be directly or indirectly attributed to the Internet? (For example, was the use of e-mail critical in getting land preserved?)
2. Name several accomplishments of your organization related uniquely to the presence of the Internet?
3. How has the Internet changed communication between your organization and other groups involved in similar programs?
4. Has there been a demand for a particular type of resource on your web site? (scientific data, educational tools, contacts, etc.)
5. Do you think environmental groups should use the internet? Why?

Table 3 - List of Organizations Contacted for Survey (Groups that responded are in bold)

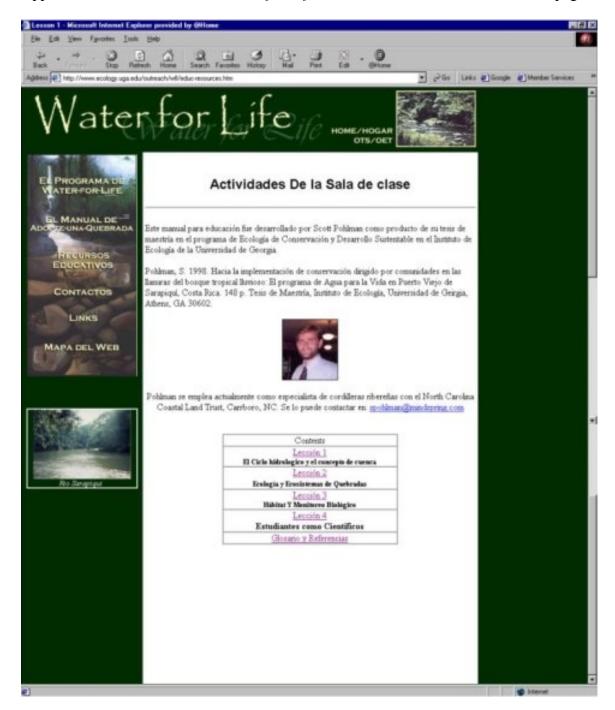|	
1.	**Allegheny Watershed Network**
2.	American Rivers Conservancy
3.	Amigos Bravo
4.	AnacostiaWS.org
5.	Anchorage Waterways Council
6.	Butte Creek Watershed Conservancy
7.	**California Hydropower Reform Coalition**
8.	**California Trout**
9.	Clark Fork Organization
10.	Clean Water Action Council
11.	Clean Water Network
12.	Clearwater Hudson
13.	**Coldwater Fisheries Restoration and Conservation**
14.	Columbia and Snake River Campaign
15.	Columbia River United
16.	**Connecticut River Watershed Council**
17.	Eno River Association
18.	Environmental Association for Great Lakes
19.	French Broad
20.	**French Creek**
21.	**Friends of Garcia River**
22.	Friends of the Kennebec Salmon
23.	**Friends of the Locust Fork River**
24.	Friends of the Reedy River
25.	Friends of the River
26.	Friends of the Shiawassee River
27.	**Friends of the White River**
28.	Give water a hand
29.	**Glen Canyon Institute**
30.	**Grand River Conservation Authority**
31.	Groundwater Foundation
32.	Haw River Assembly
33.	Herring Run Watershed
34.	**Housatonic River Restoration**
35.	**Izaak Walton League**
36.	**Kentucky Waterways Alliance**
37.	**Mississippi River Basin Alliance**
38.	**Potomac River**
39.	River Action
40.	**River Alliance of Wisconsin**
41.	River Council of Minnesota
42.	Rockingham County Watershed Preservation
43.	**Saugatucket River Heritage Corridor Coalition**
44.	Trout Unlimited
45.	Utah Rivers Council
46.	**Visual Voices**
47.	Water Keeper
48.	Water Wiser
49.	Watershed Council
50.	**West Virginia Rivers Coalition**
51.	Willamette Riverkeeper

APPENDICES

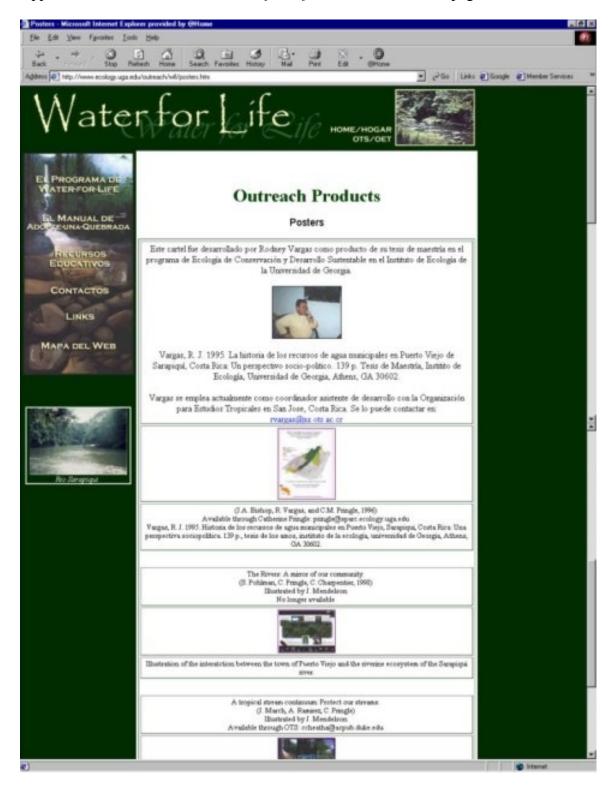Appendix 1: Screen shot for the *Water-for-Life* web site homepage

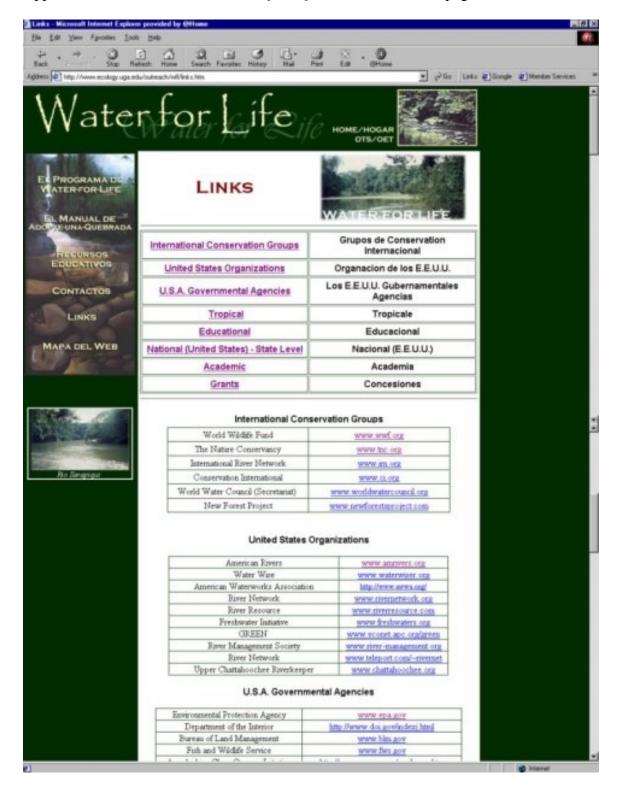Appendix 2: Screenshot of the *Water-for-Life* web site *Adopt-a-Stream* manual web page.

Appendix 3: Screenshot of the *Water-for-Life* web site Educational Activities web page.

Appendix 4: Screenshot of the *Water-for-Life* web site Poster web page.

Appendix 5: Screenshot of the *Water-for-Life* web site links web page.

Appendix 6: Screenshot of the *Water-for-Life* web site contact web page.